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THE
IMPERIAL ENCYCLOPÆDIA;
OR,
DICTIONARY

OF THE
Sciences and Arts;
COMPREHENDING ALSO THE WHOLE CIRCLE OF
MISCELLANEOUS LITERATURE.

IN THIS WORK
ALL THE SCIENCES ARE DIGESTED IN A SYSTEMATIC FORM,
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AND
Every Term of Art amply explained in Alphabetical Order.

The whole including all the Modern Discoveries in

ASTRONOMY, CHEMISTRY, ELECTRICITY, GALVANISM, GEOGRAPHY,
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PATRIARCHS, PROPHETS, APOSTLES, PHILOSOPHERS, POETS, PAINTERS, AUTHORS AND THEIR
WORKS, HEROES, LAWYERS, AND STATESMEN,

WITH EVERY OTHER TOPIC OF INFORMATION ESSENTIAL TO A WORK OF THIS NATURE.

BY THE
REV. W. M. JOHNSON, A. M.

CURATE OF HENBURY, AND CHAPLAIN TO THE RIGHT HONOURABLE LORD HUTCHINSON;

AND
THOMAS EXLEY, A. M.

TEACHER OF THE MATHEMATICS, BRISTOL.

APES debemus imitari, quæ ut vagantur et flores ad mel faciendum idoneos carpunt: deinde quicquid attulère, disponunt, ac per favos digerunt; ita debemus quæcunque ex diversâ lectione conessimus separare: melius enim distincta servantur: deinde, ad debitam facultatem ingenii, in unum saporem varia illa libamenta confundere; ut etiam si apparuerit unde sumptum est, aliud tamen esse, quàm unde sumptum est, appareat.
SENECA.

IN FOUR VOLUMES.

VOL. II.

LONDON:

PRINTED BY AND FOR J. AND J. CUNDEE, IVY-LANE;
AND SOLD BY SHERWOOD, NEELY, AND JONES,
PATERNOSTER-ROW.

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THE IMPERIAL ENCYCLOPÆDIA.

CONIC SECTIONS.

CONIC SECTIONS are the figures formed by cutting a cone by a plane. They are five in number corresponding to the different positions of the cutting plane; viz. a Triangle, a Circle, an Ellipse, a Parabola, and an Hyperbola. The last three of these only are peculiarly called conic sections. The more ancient mathematicians, before the time of Apollonius Pergæus, admitted only the right cone into their geometry, and they supposed a section made of it by a plane perpendicular to one of its sides; and as the vertical angle of a right cone may be either right, acute, or obtuse, this method of cutting these several cones produced all the three conic sections. The parabola was called the section of a right-angled cone, the ellipse the section of the acute-angled cone, and the hyperbola the section of the obtuse-angled cone. But Apollonius, who on account of his writings on this subject, obtained the title of the Great Geometrician, observed that these sections might be obtained in every cone, both oblique and right, and that they depended on the different inclinations of the section to the cone itself. There have been two methods employed in treating of the conic sections; by the one they are considered as cut out of the solid cone, which is the method of the ancients, and of some of the most elegant writers of the moderns; and by the other method certain curves are defined, either from some property by which any number of points may be found in them, or else by which they may be described mechanically upon a plane; or they are defined by means of an algebraical equation, and in either case these curves are shewn to have the very same properties as those which are formed by the intersections of a plane and cone. Each of these methods has its advantages; although some of the demonstrations of writers who have treated the subject geometrically by the latter, be short and perspicuous, yet there are others upon which depend some of the principal properties, that are tedious and difficult. The demonstrations of writers who have pursued the first method are free from this objection, being generally plain and concise; but they have been obliged to introduce so many previous propositions concerning the properties of lines touching and cutting conical surfaces, in order to arrive at the principal properties of the three sections, that it requires a considerable portion of time and resolution for a beginner in mathematical studies to go through them. Some writers, who have treated the subject algebraically, have reduced the whole into a narrower compass; but in their eagerness to avoid prolixity, they have fallen into another more exceptionable fault. The method in which they have deduced some of the properties, particularly the relations of the abscissæ and ordinates, is extremely operose and inelegant; each step in the process is so little connected with the

preceding one, that it is scarcely possible to retain them in the memory. The conic sections are of great use in physical and geometrical astronomy, as well as in the physico-mathematical sciences, and therefore they have been much cultivated ever since their great importance in these sciences was known.

DEFINITIONS OF THE CONE.

If an indefinite straight line ZX , fig. 1, Plate XLVIII. be made to revolve in the circumference of the circle $BCDE$ so as always to pass through a fixed point A without the circle, the surfaces so generated are called *conical superficies*, or conic surfaces, and when mentioned together, *opposite conical superficies*. Also the solid contained by the conical superficies and a circle is called *a cone*, and the solids contained by the opposite conical superficies, and two circles in parallel planes are called *opposite cones*. The terminating circle is called the *base* of the cone. The fixed point A is the vertex, and the line AF joining the vertex and centre of the base is the *axis* of the cone. When the axis is perpendicular to the plane of the base the cone is called a *right cone*, and when the axis is inclined to the plane of the base it is a *scalene cone*. See **CONE**.

Corollary 1. Hence it is evident, that a straight line drawn from the vertex to any point in the circumference base lies wholly in the conical superficies; for it coincides with the generating line.

Cor. 2. A section passing through the vertex will be a triangle. For let VOB , fig. 4, be a section passing through the vertex V , and meeting the circumference of the base in B and O , then VO , VB , are straight lines by *cor. 1.* and OB is a straight line, since it is the common section of two planes.

Cor. 3. A section parallel to the base is a circle. For let FGH , fig. 5, be a section parallel to the base meeting the axis in X , through the axis draw the plane VAD , and let its common sections with the given plane and with the base be FXH and ACD , also pass any other plane through the axis, as VCB , cutting the given plane and the base in XG and CB ; then because the planes FGH , ABD , are parallel, FH is parallel to AD , and XG to CB , hence by similar triangles $VC : VX :: CB : XG :: CD : XH :: CA : XF$, but CB , CD , CA , are equal; therefore XG , XH , and XF , are equal, hence FGH is a circle.

Cor. 4. If a scalene cone be cut through the axis by a plane perpendicular to the base, as VBC , fig. 6, and in this plane a line LM be drawn, making the angle $VLM = VBC$, and the cone be cut by a plane $MPLQ$, passing through LM , perpendicular to the plane VBC , the section will be a circle. Through any point H in ML draw a plane $GPFQ$ parallel to the base; PQ its common

section with MPLQ is perpendicular to the plane VBC, because the planes GPFQ and MPLQ are perpendicular to it; therefore PQ is bisected in H, and $HG \times FH = PH^2$; also the triangles MHG and FHL are similar, having the angles MGH and FLH equal, and also the vertical angles at H equal, hence $MH : HG :: FH : HL$; therefore $MH \times HL = HG \times FH = PH^2$, hence MPLQ is a circle whose diameter is LM. The circle MPLQ is called a sub-conary section. If a cone be cut by a plane which does not pass through the vertex, and which is neither parallel to the base, nor to the plane of a sub-conary section; the common section of the plane and the surface of the cone will be an ellipse, a parabola, or an hyperbola, according as a plane passing through the vertex parallel to the cutting plane, falls without the cone, touches it, or falls within the cone; as explained in the following definitions:

DEFINITIONS.

1. A *conic section* is the figure formed by the intersection of a cone and a plane. Scholium. The triangle and circle, though conic sections, are not treated under that denomination, but their properties are considered together in plane geometry.

2. A line drawn from the vertex to a point in the circumference of the base of the cone is called a *side of the cone*.

3. A plane passing through the vertex of the cone, and parallel to the plane of the section, is called the *vertical plane*.

4. A plane not cutting the cone, and passing through a side of the cone, is called a *tangent plane*.

5. A straight line drawn in the tangent plane is called a *tangent to the cone*.

6. When the vertical plane as VBN, fig. 7, is wholly without the cone, and not parallel to the base, the section PQ is called an *ellipse*.

Cor. It is evident that because the vertical plane, meets all the sides of the cone, the plane of the section which is parallel to it will meet all the sides of the cone, and cannot meet the opposite superficies. Hence the ellipse surrounds the cone.

7. When the vertical plane is a tangent plane as VBN, fig. 8, the section PQ is called a *parabola*.

Cor. It is evident that the cutting plane can never meet VB, the side of the cone through which the tangent plane passes; hence the curve of the section will not return into itself.

8. When the vertical plane VBN cuts the cone, as in MN, fig. 9, the section is called a *hyperbola*.

Cor. Since the vertical plane meets all the sides of the cone, the cutting plane will likewise meet them, and it is evident that it will meet those which are on one side of the vertical plane in one of the conical superficies, and those on the other side of the vertical plane in the opposite conical superficies, forming a hyperbola in each cone.

9. The two hyperbolas formed in the opposite cones are called *opposite hyperbolas*.

10. A line which meets a conic section but does not cut it, is called a *tangent*; any other line meeting a conic section is called a *secant*.

Cor. It is evident, that a tangent to a conic section is in the tangent plane, and is a tangent to the cone.

11. If the triangular section VAD, fig. 7, 8, 9, be perpendicular to the cutting plane, the common section of these planes, as PQ, terminated by the conical superficies, is called the *transverse axis*, and the extremities of the axis are its *vertices*.

Cor. 1. It is evident, that the transverse axis in the ellipse and opposite hyperbolas has two vertices, and that of the parabola only one vertex.

Cor. 2. It is also evident, that the transverse axis in the ellipse and parabola, is entirely within the section; and the transverse axis of the opposite hyperbolas entirely without the section.

12. The middle of the axis, as C, is the *centre* of the section.

Cor. The parabola has no centre, since PQ is unlimited.

13. If a plane EIFH be drawn parallel to the base of the cone, and cutting the conic section, the common section IH of this plane and the conic section, is called a *double ordinate*, and its half an *ordinate to the transverse axis*.

Cor. 1. The ordinate is at right angles to the axis, for the planes EIFH and PIQH are at right angles to VAD.

Cor. 2. The double ordinate IH is bisected in G, for it is at right angles to the diameter of the circle EIH. Hence IG or GH is an ordinate.

14. The segment of an axis contained between the vertex and ordinate, is called an *absciss*.

15. The double ordinate passing through the centre of the ellipse is called the *conjugate axis*, and its extremities are called the *vertices of the conjugate axis*.

16. If through C, the centre of the opposite hyperbolas, a plane be drawn forming in the cone the circle RS, and if from C a tangent CL be drawn to the circle, the tangent is called the *semi-conjugate axis of the opposite hyperbolas*.

17. The straight line which is a third proportional to the axis, and its conjugate, is called the *parameter of the axis*, or *latus rectum*, in the ellipse or opposite hyperbolas; and a third proportional to an absciss and ordinate in the parabola, is the *parameter of the axis of the parabola*.

Cor. The semi-transverse is to the semi-conjugate, as the semi-conjugate is to half the parameter.

18. The point where that double ordinate which is equal to the parameter cuts the axis, is called the *focus of the section*.

Cor. The ellipse and opposite hyperbolas will have two foci, the parabola only one.

19. If F, fig. 17 and 19, be a focus of an ellipse, or hyperbola, or opposite hyperbolas, and AG betaken in the transverse axis (on the opposite side of the vertex to the focus F), such, that AF is to AG as CF is to CA; then a line, as HK, drawn through G perpendicular to the transverse axis, is called a *directrix of the ellipse, hyperbola, or opposite hyperbolas*.

Fig. 18. But the directrix of a parabola is a line, as HK, perpendicular to the axis, drawn through a point G as far distant from the vertex of the axis on the one side as the focus is on the other side.

Cor. An ellipse, hyperbola, or opposite hyperbolas, have two directrices; one corresponding to each focus. For the same construction that is made for one focus may be made for the other focus.

20. The tangents DLQ, DTq, fig. 23, 24, which are drawn through the extremities of the ordinate passing through the focus, are called *focal tangents*.

21. Any line passing through the centre of an ellipse or hyperbola, and terminated both ways by the curve in the former, but by the opposite curves in the latter, is called a *diameter*.

22. A line drawn through any point in the parabola parallel to the axis, is called a *diameter of the parabola*.

23. Any point where the diameter meets the curve is called a *vertex to that diameter*.

24. If from the centre C, fig. 27, at the distance CA, half the transverse axis, a circle be described, cutting the directrix of the hyperbola in the points H, h, and lines drawn from the centre through the points of intersection, these lines are called *asymptotes*.

25. If AM be the transverse axis, and B b, the conjugate axis of two opposite hyperbolas, and two other hyperbolas be described, of which the transverse axis is B b, and conjugate axis AM, these hyperbolas are said to be *conjugate to the former*.

26. When the two axes are equal, the hyperbolas are said to be *equilateral*.

27. The straight line PR, fig. 33, 34, which is drawn from the point of contact perpendicular to the tangent, intercepted between the tangent and the axis of a conic section, is called a *normal*.

28. The segment of the axis NR, which is intercepted between the ordinate and the normal, is called a *subnormal*.

29. If a straight line be drawn through any point in the diameter of a conic section, parallel to a tangent at the vertex, and terminated both ways by the curve, it is called an *ordinate to that diameter*.

30. The segment of any diameter of a conic section; which is intercepted between an ordinate and the vertex, is called an *absciss*.

31. A diameter which is parallel to the tangent at the vertex of any diameter of the ellipse or hyperbola, is called a *conjugate diameter*.

32. A line which is a third proportional to any diameter of the ellipse or hyperbola, and its conjugate, is called a *parameter of that diameter*.

33. If a line be drawn through the focus of a parabola parallel to the ordinates of any diameter, terminated both ways by the curve, it is called a *parameter to that diameter*.

34. A circle is said to *touch a conic section* in any point, when the circle and conic section have a common tangent in that point.

35. If a circle touch a conic section in any point, so that no other circle can be drawn between the conic section and that circle, it is said to have the same curvature with the section in the point of contact, and is called the *circle of curvature*.

PROPOSITION I. Fig. 10.

A line parallel to a side of the cone will meet the conic surface in one point, and in one only.

Let IH, fig. 10, be parallel to AV, a side of the cone: then because AV meets VD, and IH is parallel to it, IH shall also meet VD; let it meet it in E, then the part EI is wholly within the cone, since it is parallel to AV; in like manner EH is wholly without the cone, therefore HI cannot meet the conical superficies, except in E.

PROP. II. Fig. 11.

Not more than one tangent plane can be drawn through the same side of the cone.

For if possible let each of the planes VBN, VBM, fig. 11, passing through the side of the cone VB, touch the conical superficies, and let BN, BM, be their common sections with the plane of the base; then because the two planes touch the cone, the common sections BN, BM, are tangents to the base of the cone, and at right angles to the radius CB, which is impossible.

PROP. III. Fig. 10.

A right line drawn through a point of a conic surface, so as neither to be a tangent, nor to be parallel to a right line contained in the conic surface, will meet either the same, or the opposite, conic surface again in another point.

Let a plane be drawn through the vertex of the cone and the right line FE or EG, fig. 10; then that plane will cut the cone; for if it do not, the right line FE or EG would be a tangent contrary to the hypothesis. Let VD and VA be the common sections of the plane and the conic surface; then since the right line FE or EG is not parallel to VD or VH contained in the conic surface, therefore it will meet VD and VH either in the same conic surface as FE, or, when produced in the opposite conic surface, as EG.

PROP. IV. Fig. 12, 13, 14.

If a straight line be drawn from the vertex of a cone to a point, as B, in the plane of the base, but not in the periphery of the base; and, through any point, as P, situated without or within the cone, another straight line, parallel to the former, be drawn to cut or touch the conic surface or opposite surfaces; then the square of the line drawn from the vertex of the cone to the point B is to the rectangle under the segments of the secant, or to the square of the tangent drawn from the point P, as the rectangle under the segments of any line drawn from B to cut the base of the cone, is to the rectangle under the segments of any line, parallel to the base of the cone, drawn through the point P, to cut the conic surface.

Let the point B, fig. 12, be without the base of the cone, and let PQ, cutting the conical superficies in R and Q, be parallel to VB, and let the plane VBPQ cut the conic surface in the lines VRG and VQH, and the plane of the base in the line BGH; and through P draw LK parallel to GH. Because QP is parallel to VB, and LK to GH, therefore the triangle QPL is equi-angular to the triangle VBH, and the triangle PKR to the triangle VGB: therefore 4. 6. E.

$$\begin{aligned} VB : PR :: BG : PK \\ VB : PQ :: BH : PL \end{aligned}$$

Consequently, $VB^2 : PR \times PQ :: BG \times BH : PK \times PL$, 23. 6. E. But the rectangle $BG \times BH$ is equal to the rectangle under the segments of any other line drawn from B to cut the base of the cone, 35 and 36. 3. E; and for the same reason the rectangle $PK \times PL$ is equal to the rectangle under the segments of any other line, parallel to the plane of the base, drawn from P to cut the conic surface, because the section formed by a plane passing through PL parallel to the base is a circle, and hence the proportion is manifest in this case.

And if the point B, fig. 13, be within the base of the cone, and a straight line, as PQR, parallel to the line VB that joins the point B

and the vertex of the cone, be drawn to cut the opposite surfaces through a point P, situated without or within the cone: the proposition may be demonstrated in this, as in the former case.

And if the point P, fig. 14, be without the cone, and the line VB, and PS, parallel to VB, be drawn to touch the conic surface, instead of cutting it; then the plane PVB will meet the conic surface in a line VSM; and BM will touch the base of the cone, and PN, parallel to BM, will touch the conic surface. And because the two triangles SPN and VBM are equiangular, therefore

$$\begin{aligned} VB : PS :: BM : PN \\ \text{And } VB^2 : PS^2 :: BM^2 : PN^2 \end{aligned}$$

But BM^2 is equal to the rectangle under the segments of any line drawn from B to cut the base of the cone; and PN^2 is equal to the rectangle under the segments of any line, parallel to the base of the cone, drawn from P to cut the conic surface; and hence the proposition is manifest in this case also.

PROP. V. Fig. 15.

If a point be assumed without or within a cone, and two lines be drawn through it to meet a conic surface, or opposite surfaces, and so as to be parallel to two straight lines given by position; then the rectangle under the segments of the secant, or the square of the tangent, parallel to one of the lines given by position, has to the rectangle under the segments of the secant, or to the square of the tangent, parallel to the other line given by position, a ratio that is constantly the same, wherever the point (from which the lines are drawn) is assumed without or within the cone.

Let VB and VC be two straight lines, fig. 15, drawn from the vertex of a cone to the plane of the base, and given by position (or parallel to lines given by position); and let PQ and MN be two straight lines drawn through any assumed point, as R, to cut the conic surface, and so as to be respectively parallel to CV and VB: then as CV^2 is to the rectangle $CK \times CL$ (contained by the segments of any line drawn from C to cut the base of the cone), so let D, any assumed line, or magnitude, be to E; and as VB^2 is to $BG \times BH$ (the rectangle contained by the segments of any line drawn from B to cut the base of the cone), so let F be to E; and draw ST parallel to the base of the cone through the point R; then, Pr. 4. ($CV^2 : CK \times CL$, or) $D : E :: PR \times RQ : SR \times RT$, and $BV^2 : BG \times BH$, or) $F : E :: MR \times RN : SR \times RT$. Therefore invertendo and ex æquo,

$$D : F :: PR \times RQ : MR \times RN.$$

And, as the same reasoning applies wherever the point R is assumed, therefore the ratio of the rectangles $PR \times RQ$, and $MR \times RN$ is the same with, or equal to, the constant ratio of D to F, wherever the point R is assumed. And, in like manner, may the proposition be demonstrated in all other cases, or in all positions of the lines PQ, and MN whether they cut, or touch, the same or opposite surfaces.

PROP. VI. Fig. 16.

If a right line, as PT, drawn through a point P in the surface of a cone, so as to be parallel to a right line VB contained in the conic surface, meet two parallel lines (in the points R and S) that cut or touch the conic surface or opposite surfaces: then PR is to PS as the rectangle under the segments of the secant, or the square of the tangent, drawn through the point R, is to the rectangle under the segments of the secant, or to the square of the tangent, drawn through the point S. Through the two parallels PT and VB, fig. 16, draw a plane cutting the conic surface again in the line VA, and the plane of the base in the line BA; and, through R and S, draw MN and HG parallel to AB. Because PT is parallel to VB, and RN to SG, therefore RNGS is a parallelogram; and $RN = GS$. It is obvious that the triangles PMR and PHS are equiangular: therefore PR is to PS as MR is to HS, 4. 6. E, or as $MR \times RN$ is to $HS \times SG$, 1. 6. E. But $MR \times RN$ and $HS \times SG$ are respectively equal to the rectangles contained by the segments of any two lines, parallel to the base of the cone, drawn through R and S to cut the conic surface, and hence the proposition is manifest, when PT meets two lines parallel to the plane of the base. And if PT meet two parallel lines DE and IK, not parallel to the plane of the base; then, let the same construction be made as before: and because DE is parallel to IK, and MN to GH; therefore,

$$DR \times RE : MR \times RN :: IS \times SK : HS \times SG;$$

Alternando,

Alternando, $DR \times RE : IS \times SK :: MR \times RN : HS \times SG$.
Therefore, as is obvious from what has already been shewn,
 $PR : PS :: DR \times RE : IS \times SK$.

And if S be without the cone, and the line drawn through it touch the conic surface instead of cutting it, the reasoning is still the same when the square of the tangent is taken in place of the rectangle under the segments of the secant.

PROP. VII. Fig. 7, 9.

In the ellipse and hyperbola the rectangle of the abscisses of the transverse axis, is to the square of their ordinates in a constant ratio which is the ratio of the square of the semitransverse axis, to the square of the semiconjugate.

Let PQ be the transverse axis, as in def. 11, and let IG , KO , be ordinates, and LC the semiconjugate; also let the plane VAD intersect the vertical plane in the line VB , then 16. 11. E . PQ is parallel to VB , and since IGH is parallel to the base of the cone, $VB^2 : AB \times BD :: PG \times GQ : IG \times GH = IG^2$. In the same manner it may be shewn that $VB^2 : AB \times BD :: PO \times OQ : KO^2 :: PC \times CQ = PC^2 : CL^2$; therefore $PC^2 : CL^2 :: PG \times GQ : IG^2$; hence the proposition is manifest.

Cor. 1. The square of the transverse axis is to the square of the conjugate as the rectangle of the abscisses to the square of their ordinate.

Cor. 2. Hence at equal distances from the centre, or from the vertices, the ordinates are equal; for the property is the same on both sides.

Cor. 3. Hence also the two foci are equally distant from the centre, or from either vertex.

Cor. 4. Because $PG \times GQ = PC^2 - GC^2$ in the ellipse, and equal $GC^2 - PC^2$ in the hyperbola, 5, and 6. 2. E . the same property is thus expressed $PC^2 : CL^2 :: PC^2 \propto GC^2 : IG^2$.

Cor. 5. The transverse is to its parameter as the rectangle of the abscisses to the square of their ordinate. For Cor. 1, $PQ^2 : 2 CL^2$

or by division $PQ : \frac{2 CL^2}{PQ} :: PG \times GQ$; or $PC^2 \propto GC^2 : IG^2$;

but $\frac{2 CL^2}{PQ^2}$ is equal to the parameter, def. 17; hence the Cor. is manifest.

Cor. 6. The distance of each foci of an ellipse from either extremity of the conjugate axis is equal to half the transverse axis; and the distance of either of the foci of a hyperbola from the centre is equal to the distance between the extremities of the transverse and conjugate axes.

For let G be the focus, then $PC : CL :: CL : IG$. def. 17. Cor. therefore $PC^2 : CL^2 :: CL^2 : IG^2$

but $PC^2 : CL^2 :: PC^2 \propto GC^2 : IG^2$,

Cor. 4. hence $CL^2 = PC^2 \propto GC^2$ that is $PC^2 - GC^2$ in the ellipse $GC^2 - PC^2$ in the hyperbola; but because GCL is a right angle, $CL^2 = GL^2 - GC^2$; hence in the ellipse $PC^2 = GL^2$, and $PC = GL$. And in the hyperbola $GL^2 = 2 GC^2 - PC^2 = GQ^2 + QL^2 + 2 QC \times GQ$, (12. 2. E .) $= GC^2 + PG \times GQ$. (6. 2. E .) $= GC^2 + 2 QC \times GQ + GQ^2$, therefore $QL^2 = GC^2$, and $QL = GC$; hence the corollary is manifest.

Cor. 7. The semiconjugate is a mean proportional between half the parameter and the two segments between the focus and each vertex of the ellipse, or opposite hyperbolas. For Cor. 6, $CL^2 = PC^2 \propto GC^2 = PG \times GQ$.

PROP. VIII. Fig. 8.

In a parabola the abscisses are proportional to the square of their ordinates.

Let the figure be as in the 7th definition, then because EF , AB , are parallel, $PG : PQ :: GE : QA$, and because GF , QB , are equal, GQ being parallel to FB ; $PG : PQ :: GE \times GF : QA \times QB$, but $GE \times GF = IG \times GH = IG^2$, and $QA \times QB = KQ^2$; therefore $PG : PQ :: IG^2 : KQ^2$.

Cor. 1. Hence the third proportion to the absciss, and ordinate, IG^2 or the parameter of the axis is a constant quantity. For $\frac{IG^2}{PG}$

$= \frac{KQ^2}{PQ}$ = the parameter of the axis, def. 17.

Cor. 2. The distance of the focus from the vertex is equal to half the ordinate passing through the focus. For let HI be the double ordinate passing through the focus, then IG is equal to half the parameter, def. 18; then $PG : GI :: GI : 2GI$, therefore $PG = \frac{1}{2} GI = \frac{1}{2} HI = \frac{1}{4}$ of the parameter.

Cor. 3. The rectangle of the parameter, or four times the distance of the focus from the vertex, and the absciss is equal to the square of the ordinate. Thus if G be the focus $4 PG \times PQ = KQ^2$.

PROP. IX. Fig. 17, 19.

Let AB be the transverse, and DE the conjugate axis of an ellipse, or hyperbola, or opposite hyperbolas; from any point in the curve, or opposite curves, as M , let MC be drawn to the centre, and MP perpendicular to the transverse axis, and take CO in the same axis, such that CO^2 may be equal to $MC^2 - CD^2$ in the ellipse, and to $MC^2 + CD^2$ in the hyperbola; then as AC is to CF , so is PC to CO .

For, because AB and DE are conjugate axes, therefore,

$AC^2 : CD^2 :: AP \times PB : MP^2$ (Prop. 7.) therefore, $AC^2 : AC^2 \pm CD^2 :: AP \times PB : AP \times PB \pm MP^2$. But in the ellipse $AC^2 - CD^2 = CF^2$; (Prop. 7. Cor. 6.) and $AP \times PB - MP^2 = AC^2 - CP^2 - MP^2 = AC^2 - MC^2 = AC^2 - CD^2 - CO^2$ (hyp.) $= CF^2 - CO^2$; and, in the hyperbola, $AC^2 + CD^2 = CF^2$; (Prop. 7. Cor. 6.) and $AP \times PB + MP^2 = PC^2 - AC^2 + MP^2 = MC^2 - AC^2 = CO^2 - CD^2 - CA^2 = CO^2 - CF^2$. Therefore, the last analogy becomes, $AC^2 : CF^2 :: AC^2 \pm CP^2 : CF^2 \pm CO^2$. Consequently, $AC^2 : CF^2 :: CP^2 : CO^2$, (19. 5. E .) And, $AC : CF :: CP : CO$.

PROP. X. Fig. 17, 19.

If M be a point in an ellipse or hyperbola, and MF and Mf be drawn to the foci; then, in the ellipse, the sum of MF and Mf is equal to the transverse axis; and, in the hyperbola, the difference of MF and Mf is equal to the transverse axis.

Draw MP perpendicular to the transverse axis, and take CO as in the last proposition. And, because

$AC : CF :: CP : CO$, Pr. 9,

Therefore, $AC \times CO = FC \times CP$; and $4 AC \times CO = 4 CF \times CP$. But, because AB and DE are bisected in C , therefore $4 AC \times CO = BO^2 - AO^2$, (8. 2. E .) and $4 FC \times CP = PF^2 - MF^2 = fM^2 - MF^2$, 47. 1. E ; therefore $BO^2 - AO^2 = fM^2 - MF^2$.

Again, $MF^2 + Mf^2 = fP^2 + FP^2 + 2MP^2 = 2FC^2 + 2CP^2 + 2MP^2 = 2FC^2 + 2MC^2 = 2FC^2 \pm 2CD^2 + 2CO^2 = 2AC^2 + 2CO^2 = BO^2 + AO^2$.

And, because $BO^2 + AO^2 = fM^2 + MF^2$, and $BO^2 - AO^2 = fM^2 - MF^2$; therefore, by adding the equals, $2 BO^2 = 2fM^2$; and, by subtracting the equals, $2 MF^2 = 2 AO^2$. Therefore $fM = BO$, and $FM = AO$; whence the proposition is manifest.

PROP. XI. Fig. 17, 18, 19.

A straight line drawn from any point in a conic section to a focus has to a perpendicular drawn to the corresponding directrix, a ratio that is constantly the same wherever the point is assumed in the curve; and, in the ellipse, the constant ratio is a ratio of minority (or of a less magnitude to a greater); in the hyperbola the constant ratio is a ratio of majority (or of a greater magnitude to a less); and, in the parabola the constant ratio is a ratio of equality.

Let M , fig. 17 and 19, be a point in an ellipse or hyperbola, and draw MF to a focus, and MK perpendicular to the directrix HG , which corresponds to that focus, draw MP perpendicular to the transverse axis, and take CO , as in Prop. 9. Then

$AC : CF :: CP : CO$, Pr. 9.

Invertendo,

$CF : CA :: CO : CP$

Therefore,

$CF : CA :: FO : AP$, (19. 5. E .)

But,

$CF : CA :: AF : AG$, Def. 19.

Therefore,

$CF : CA :: AO : GP$, (12. 5. E .)

But, as has been shewn in the demonstration of the last proposition, $AO = MF$, and $GP = MK$; therefore

$CF : CA :: MF : MK$.

But the ratio of CF to CA is a constant ratio; and it is a ratio of minority in the ellipse, and a ratio of majority in the hyperbola.

In the parabola, fig. 18, $GA = AF$, and $4 AF \times AP = MP^2$, Prop.

(Prop. 8, Cor. 3.) but $4 AF \times AP = GP^2 - PF^2$, 8. 2. E; therefore $MP^2 = GP^2 - PF^2$; and $MP^2 + PF^2$, or $MF^2 = GP^2$, or MK^2 . Therefore $MF = MK$.

Cor. CA and CG, fig. 17 and 19, are in the same ratio, For CF : CA :: FA : AG; therefore CF : CA :: CA : CG.; Hence CF, CA, and CG, are continual proportionals.

PROP. XII. Fig. 22, 23, 24.

If two straight lines DQ, Dg be drawn from the point D, where the axis meets the directrix, through L and T, the ordinate passing through the focus, which are produced both ways in the hyperbola; and through any point P in the curve of the section a line QPp be drawn parallel to the directrix, meeting DL and DT in Q and q; the segment QN, which is intercepted between either of the lines and the axis, will be equal to SP, the distance of P from the focus.

The triangles DNQ, DSL, are similar, therefore NQ : ND :: SL : SD, i. e. :: SP : ND. Prop. 11. Hence NQ = SP, and in the same manner it may be proved that Ng = Sp.

Cor. 1. If KAG be drawn through the vertex parallel to the directrix, SA will be equal to AK or AG.

Cor. 2. The lines DQ, Dg, touch the conic section in the points L and T. For the triangle SNP being right-angled, SP or QN is always greater than PN except when P is at L, where they coincide; therefore DQ meets the curve only in one point L. In like manner it may be shewn that Dg touches the curve at T.

PROP. XIII. Fig. 22, 23, 24.

If from the point G, where the straight line KG, which is drawn through the vertex parallel to the directrix, meets either of the tangents DQ, Dg, a line GR be drawn through the focus S, and produced both ways in the hyperbola, it will be parallel to the other tangent DQ in the parabola; it will meet it somewhere in g in the direction GSG in the ellipse, and in the opposite direction in the hyperbola.

Let SG meet the directrix in X. The triangles SAG, SDX, are similar; now SA = AG, Cor. 1. Prop. 12, therefore SD = DX, but in the parabola, fig. 22, SL = DS, therefore SL is equal and parallel to DX; and consequently XS is equal and parallel to DL. In the ellipse, fig. 23, SL is less than SD or DX, and therefore the lines DL, XS, must meet when produced in the direction XGS. In the hyperbola, fig. 24, SL is greater than SD or DX; and therefore the lines must meet when produced in the direction SGX.

Cor. 1. Because the triangles GAS, SNR, are similar, SN will be equal to NR.

Cor. 2. Fig. 23, 24. Hence where Q coincides with g; in the ellipse or opposite hyperbola, QN will be equal to gM, or SM; therefore SP will be equal to SN; and therefore SP will coincide with SN, and the curve will meet the axis in the point M.

Cor. 3. Hence the whole ellipse, fig. 23, is contained between the lines GK, gk, on one side of the directrix.

Cor. 4. In the parabola, fig. 22, NQ being always greater than NR, except at the vertex, SP is greater than SN; therefore the curve will meet the axis only in one point A, and it will extend without limit on one side of the directrix.

Cor. 5. In the hyperbola, fig. 24, NQ being greater than NR, except at A and M, SP is greater than SN, and the two curves will be extended without limit, on opposite sides of the directrix.

PROP. XIV. Fig. 25, 26.

The conjugate axis bisects all lines drawn parallel to the transverse axis, which are terminated by the ellipse, and by the opposite hyperbolas. Those lines which are equally distant from the centre are equal; and those which are nearer to the centre are greater in the ellipse, and less in the hyperbola, than those which are more remote.

Take CN any distance from the centre, between C and A in the ellipse, and in CA produced in the hyperbola. Take CR = CN, and draw the ordinates PNp, QRq; join PQ, pQ, meeting Bb in n and r. Because Pp and Qq are equal, Cor. 3, Prop. 7, and they are bisected in N and R, the lines PQ, NR, pQ, qR are equal and parallel, and because Pn, pr, are equal to NC, and Qn, qr, equal to RC, or NC, PQ, pQ, are bisected in n and r, and they are at equal distances from the centre, because Cn, Cr,

are equal to PN, Np. Lastly, as Cn decreases, PN decreases, and therefore CN increases in the ellipse, and decreases in the hyperbola; but Pn is equal to CN, Pn therefore increases in the former, and decreases in the latter, as Cn, its distance from C, decreases.

Cor. 1. The conjugate axis divides the ellipse into two equal and similar parts, and the two opposite hyperbolas are equal and similar.

Cor. 2. Suppose PQ, fig. 26, which is always parallel to AM, to move from the centre towards B, the points P, Q, will coincide at B, and the line EPQ will become a tangent to the ellipse; therefore the ordinates to the conjugate axis are parallel to the tangent at its vertex. A line parallel to Pp, and passing through A, is a tangent.

PROP. XV. Fig. 26.

The square of the semi-ordinate to the conjugate axis, in the ellipse, is to the rectangle under the abscissa as the square of the transverse axis to the square of the conjugate axis.

For PnQ being parallel to AM, it is perpendicular to Bb, and it is bisected in n, by the last Prop. it is therefore an ordinate to Bb, and by Prop. 7, PN^2 , or $Cn^2 : BC^2 :: AN \times NM : AC^2$, and by division $Bn \times nb : BC^2 :: CN^2$ or $Pn^2 : AC^2$, and by alternation and inversion $Pn^2 : Bn \times nb :: AC^2 : BC^2 :: AM^2 : Bb^2$.

PROP. XVI. Fig. 20, 21.

All the diameters of an ellipse or hyperbola are bisected in the centre.

From any point P in the curve draw PC to the centre, and PN perpendicular to the axis. Take Cn = CN; and draw nG parallel to NP, but on the other side of the axis, let it meet the curve in G, and join CG. Then because Cn = CN, the semi-ordinates Gn, PN, will be equal, Cor. 2, Prop. 7, and the angles at N and n are right angles, therefore the triangles CNP, CnG, are equal, therefore CG = CP, and the angle nCG is equal to NCP; hence it follows that GCP is a straight line, which is bisected at C.

PROP. XVII. Fig. 27.

If lines SH, Sh, be drawn from the focus S to the points H, h, in which the asymptotes cut the directrix, they will be perpendicular to the asymptotes; and these lines, as also AG, Aa, the segments of the tangent at the vertex, which is intercepted between the asymptotes, are each equal to half the conjugate axis.

For Cor. Prop. 11, CS : CA :: CA : CD, that is, CS : CH :: CH : CD; now the angle HCS is common to the two triangles CHD, CSH, therefore these triangles are similar, and the angle CHS = CDH = a right angle. In the same way it may be proved that CAs is a right angle.

Again, $SH^2 = SC^2 - CH^2 = SC^2 - CA^2 = CB^2$ by Prop. 7, Cor. 6; therefore SH = CB. In the same way it may be proved that Sh = CB: and because CH = CA, and CHS, CAa, are right angles, and the angle HCS is common to the triangles SHC, aAC, these triangles are equal, and Aa = SH = BC.

Cor. 1. Radius is to the sine of the angle contained by the asymptote and directrix in the constant ratio, mentioned Prop. 11, for CA or CH is to CD in the same ratio, and CH : CD :: radius : sine CHD.

Cor. 2. If a line PG, fig. 28, be drawn from any point P in the hyperbola, or in the opposite curve, parallel to the asymptote, meeting the directrix in G, PG will be equal to PS. Draw PE perpendicular to the directrix; and because the angle PGE = CHD, PG is to PE in the above-mentioned ratio, or as SP to PE, therefore PG = PS.

PROP. XVIII. Fig. 28.

The asymptotes never meet the curve, but any other line drawn parallel to an asymptote will meet one of the hyperbolas.

For, if it be possible, let the asymptote meet the curve in the point R. Join RS, and draw RN perpendicular to the directrix. Then by Cor. 1, last Prop. HR is to RN, as SR to RN, therefore RS = RH, and the angle RSH = RHS, which is impossible; for by last Prop. RHS is a right angle. In the same way it may be proved that it cannot meet the opposite curve. Let any other line GP be drawn parallel to the asymptote; and first let it be nearer to the focus. Join SG, and produce it to meet the asymptote CH in I: then the angle SGP = SIH, which is less

than SHR , a right angle; therefore, if GSP be made equal to SGP , SP , GP , will meet somewhere in P , which is a point in the curve. For draw PE perpendicular to the directrix, and the angle PGE being equal to CHD , PG is to PE in the constant ratio mentioned Prop. 11; therefore SP is to PE in the same ratio, and P is a point in the hyperbola.

Secondly, let gp be drawn parallel to the asymptote, at a greater distance from the focus. Join Sg , meeting HC in i ; the angle $Sgp = SiH$ which is less than a right angle; if therefore gSp be made equal to Sgp , the lines Sp , gp , will meet when produced in some point p , which is in the opposite hyperbola; for the angle pge being equal to CHD , pg is to pe , or SP is to pe in the same constant ratio; therefore p is a point in the curve.

Cor. Hence, if any line be drawn through the centre of an hyperbola within the angle contained by the asymptotes, it will meet both the curves.

PROP. XIX. Fig. 27.

The asymptotes are diagonals, of the rectangle, which is made by drawing tangents through the vertices of the four hyperbolas.

Let the tangents GAa , IMi , which are drawn through the vertices of the transverse axis, meet the asymptotes in G , a , and I , i . Join IB , GB , as also ab , ib . The triangles MCI , ACa , are equal, for $AC = CM$, the angle $MCI = ACa$, and $CMI = CAa$, therefore $MI = Aa$, which is equal to CB , Prop. 17. In like manner it may be proved that $Mi = Cb = CB$; therefore, IB , GB , are equal and parallel to MC , Ca , the angles IBC , GBC , are each a right angle, and IBG is one straight line, which is equal and parallel to MA . For the same reason iba is one straight line, which is equal and parallel to MA ; and because the lines IBG , iba , are perpendicular to the axis BCb , they are tangents to the conjugate hyperbolas, and $IGai$ is a rectangle of which the asymptotes Ia , Gi , are the diagonals.

Cor. 1. The asymptotes GCi , ICA , are also asymptotes to the conjugate hyperbolas. For $BI = BG = CA$, which is the semi-conjugate axis to the hyperbolas LBR , lbr .

Cor. 2. If the hyperbolas be equilateral, the asymptotes will be perpendicular to each other. See DEF. 25, 26.

PROP. XX. Fig. 29, 30, 31.

If a straight line Pp , which cuts a conic section or opposite sections in two points P , p , meets the directrix in H , and a right line HST be drawn through the focus, and SP , Sp , be joined; the angle PSH will be equal to pST .

Draw pT parallel to PS , and let it meet HS in T ; and draw PE , pe , perpendicular to the directrix. The triangles HPE , Hpe , are similar, as also HSP , HTp , and $SP : PE :: Sp : pe$; and alternately $SP : Sp :: PE : pe :: HP : Hp :: SP : pT$; therefore $SP = Tp$, and the angle $pST = pTS = PSH$.

Cor. 1. When P and p coincide, fig. 29, 31, or when HP becomes a tangent to the conic section, SP will coincide with Sp , and the angles PSH , pST , will be right angles.

Cor. 2. Hence if a line SP be drawn from the focus to any point P in a conic section, fig. 32, and SH be drawn perpendicular to SP , meeting the directrix in H , and HP be joined, it will touch the conic section in P .

Cor. 3. It is evident from this proposition, that a straight line cannot cut a conic section in more points than two.

PROP. XXI. Fig. 32.

If a tangent be drawn to any point in the parabola, it will bisect the angle contained by the two straight lines drawn from the point of contact, one to the focus, and the other to the directrix.

Let PH , which touches the parabola at P , meet the directrix in H . Join SP , SH , and draw PE perpendicular to the directrix. The angle SPE is bisected by PH . For $SP = PE$, and PH is common to the triangles SPH , EPH , and PSH , PEH , are right angles, therefore the triangles SPH , EPH , are similar; and the angle $SPH = EPH$.

Cor. 1. Hence if a straight line PH bisects the angle SPE , it will be a tangent to the parabola at the point P .

Cor. 2. Let PS meet the curve again in p , and let HI be drawn parallel to the axis, it will bisect Pp in I , and HI will be bisected by the curve in A . For the angle $IHP = HPE = HPI$, therefore $IP = IH$, and if pH be joined, the line pH will be a

tangent, and therefore for the same reason $Ip = IH$, therefore $IP = Ip$. Secondly, because $SA = AH$, the angles $ASH = AHS$, and the complements of these angles are equal, that is, $ASI = AIS$, therefore $AI = AS = AH$.

PROP. XXII. Fig. 33, 34.

If a tangent be drawn to any point in an ellipse or an hyperbola, and two lines be drawn from the point of contact to the foci, the angles contained by each of these lines and the tangent are equal. Let PT touch the ellipse or hyperbola at any point P , let it meet the directrices in T and t . Through P draw a line parallel to the axis AM meeting the directrices in E and e , draw PS , PH , to the foci, and join ST , Ht . Because the triangles TPE , tPe , are similar, $PE : PT :: Pe : Pt$, and $SP : PE :: HP : Pe$, therefore $SP : PT :: HP : Pt$, and the angles PST , PHt , are right angles, Cor. 1, Prop. 20, therefore the triangles SPT , HPt are similar, and the angle $SPT = HPt$.

PROP. XXIII. Fig. 35, 36.

The tangents at the vertices of any diameter of an ellipse or an hyperbola are parallel.

Let PCG be any diameter of an ellipse or hyperbola; draw the tangents PQ , GR , and join SP , PH , SG , GH . Because $SC = CH$, and $CP = CG$, and the angle $SCP = GCH$, also SP is equal and parallel to GH , therefore PH is equal and parallel to SG , and $SPHG$ is a parallelogram; therefore the angle $SPH = SGH$, and the halves of these angles, fig. 36, or the halves of their supplements, fig. 35, will be equal, that is, the angle $SPQ = HGR$, and if these be added to the equal angles SPC , CGH , in the ellipse, and subtracted from them in the hyperbola, $CPQ = CGR$, therefore PQ is parallel to GR .

PROP. XXIV. Fig. 37, 38, 39.

If two straight lines Pp , Qq , which meet each other in any point L , and are inclined to the directrix at any given angles LHX , LhX , cut a conic section, or opposite sections, in the points P , p , and Q , q ; the rectangles $LP \times Lp$, and $LQ \times Lq$, will be in a constant ratio to each other.

Let S be the nearest focus. Join HS , and produce it if necessary; also join SP , Sp . Draw LX , PE , perpendicular to the directrix; and draw LT , Lt , parallel to SP , Sp , meeting HS in T and t . Because (Prop. 20,) the angle $PSH = pST$, fig. 37, and 39, and $= pSW$, fig. 38, the angle $LIt = LtT$, and $LT = Lt$. On L as a centre, at the distance LT or Lt , describe a circle cutting Hpp in M and m . Join SL , and produce it to meet the circle in D and d ; and because the triangles HPE , HLX , are similar, as also HPS , HLT , $LT : SP :: LH : PH :: LX : PE$; and alternately $LT : LX :: SP : PE$, that is, in the constant ratio mentioned Prop. 11; therefore the radius of the circle is given when the distance of L from the directrix is given, whatever be the position of the line Pp . And because LT is parallel to PS , and Lt to pS ,

$$LP : TS :: LH : HT,$$

$$\text{and } pL : St :: LH : tH, \text{ therefore}$$

$$PL \times Lp : TS \times St :: LH^2 : HT \times tH.$$

But $TS \times St = DS \times Sd$, and $TH \times Ht = MH \times Hm - LH^2 - LM^2$, fig. 37, 38, or $= LM^2 - LH^2$, fig. 39. Therefore $PL \times Lp : DS \times Sd :: LH^2 : LH^2 - LM^2$, or $LM^2 - LH^2$. But $LH^2 : LT^2$, or $LM^2 :: PH^2 : PS^2$, and by division $LH^2 : LH^2 - LM^2$, or $LM^2 - LH^2 :: PH^2 : PH^2 - PS^2$, or $PS^2 - PH^2$; which ratio depends only upon the constant ratio, Prop. 11, and the angle LHX , SP being to PH in a ratio which is compounded of the ratios of SP to PE , and PE to PH , or of the constant ratio, and of the sine of the angle LHX to radius. In the same manner it may be proved that the rectangle $QL \times Lq$ is to $DS \times Sd$ in a ratio depending only on the same constant ratio, and the angle LhX , therefore $PL \times Lp$ is to $QL \times Lq$ in a constant ratio, whatever be the distance of L from the directrix.

Cor. 1. If either of the lines Pp , Qq , or both of them become tangents to the conic section, or opposite sections, the squares of the tangents must be substituted for the rectangles $PL \times Lp$, $QL \times Lq$. For let LP touch the section in P , fig. 40, 41, then QL being parallel to SP , by the preceding Prop. $LP : QS :: LH : HQ$; and $LP^2 : QS^2 :: LH^2 : HQ^2$; but $QS^2 = DS \times Sd$, and $QH^2 = MH \times Hm = LH^2 - LM^2$, therefore $LP^2 : DS \times Sd :: MH^2 : LH^2 - LM^2$, which was proved to be a constant

stant ratio; therefore LP^2 , is to Lp^2 or $QL \times Lq$, fig. 38, in a constant ratio.

PROP. XXV. Fig. 42.

If two right lines QL , Pp , meeting each other at any point L , one of which is parallel to the axis, and the other is inclined to the directrix in a given angle, cut a parabola in the points Q, p , and P , the rectangle under QL , and the latus rectum, will be to the rectangle $PL \times Lp$ in a constant ratio. Let LQ meet the directrix in X ; and from the centre L , at the distance LX , describe a circle, join QS , XS , S being the focus, let XS meet the circle in T , and join LT . Draw SO perpendicular to LX , take $OI = OX$, and join SI , then $SI = SX$, now $LT = LX$, and $QS = QX$, therefore LT is parallel to QS , and because the angle $QSX = SXQ = SIX$, the triangles QXS, SXI , are similar, and $IX \times XS :: XS : SQ :: ST : QL$, therefore the rectangle $IX \times QL = XS \times ST = DS \times Sd$, which by the preceding proposition is to $PL \times Lp$ in a constant ratio, and because $IX \times 2OX$, the distance of the focus from the directrix, therefore $IX = \text{latus rectum}$, therefore the rectangle under QL , and the latus rectum, is to $PL \times Lp$ in a given ratio.

LEMMA. Fig. 43.

If a straight line be divided in two points C and D , such, that the rectangle $CA \times AD = DB \times BC$, or $AC \times CB = BD \times DA$, the part AC will be equal to BD . First, let $CA \times AD = DB \times BC$. Bisect CD in E ; and $CA \times AD \times EC^2 = AE^2$, also $DB \times BC \times ED^2 = EB^2$, but $ED^2 = EC^2$, therefore $BE^2 = AE^2$, and $BE = AE$, and therefore $BD = AC$. Secondly, let $AC \times CB = BD \times DA$, by bisecting AB in E , it may be shewn as above, that $ED = EC$, and therefore $BD = AC$.

PROP. XXVI. Fig. 44, 45.

All lines parallel to any diameter of the ellipse or hyperbola, which are terminated both ways by the ellipse or opposite hyperbolas, are bisected by the conjugate diameter.

Let ACB be any diameter of an ellipse or hyperbola. Through the vertices A, B , draw the tangents AL, BM ; and through the centre C draw the diameter DCK parallel to AL or BM , which will be the conjugate diameter. Through N any point in DK draw LN parallel to AB , meeting the ellipse or opposite hyperbolas in P and Q , and the tangents AL, BM , in L and M . Then AL being parallel to CN and BM , and LN parallel to ACB , $AL = BM$, and $LN = NM$; and *Cor.* Prop. 24, $LA^2 : PL \times LQ :: BM^2 : QM \times MP$, therefore $PL \times LQ = QM \times MP$, therefore *Lem.* $PL = QM$, and, because $LN = NM$, $PN = NQ$.

Cor. 1. If the diameter DK bisect all lines parallel to AB , it will be the conjugate diameter to AB .

Cor. 2, Fig. 44. If a straight line RDT be drawn through D the vertex of the conjugate diameter parallel to AB , it will touch the curve in the point D .

PROP. XXVII.

Every diameter of a conic section bisects all its ordinates.

1st. If the section be an ellipse, it is evident, from the last proposition, for the ordinates of any diameter are parallel to the conjugate diameter.

2dly. If the section be an hyperbola, Fig. 45, of which ACB is any diameter; in the tangent RAL take $AR = AL$, through L and R draw PLQ, PRG , parallel to AB , meeting the opposite hyperbolas in P, Q , and F, G , and the tangent at B in M, T . Join PF , cutting the diameter in V : then PF will be an ordinate which is bisected at V ; for by last Prop. $PL = MQ$, and $FR = TG$; and *Cor.* Prop. 24, $FR \times RG : RA^2 :: PL \times LQ : LA^2$, but $LA^2 = RA^2$, therefore, $FR \times RG = PL \times LQ$, that is $RF \times FT = LP \times PM$; therefore *Lem.* $RF = PL$, and $PLRF$ is a parallelogram, and therefore PF is parallel to RAL , and $PV = VF$.

Lastly, let the section be a parabola, Fig. 46, of which AN is any diameter, and PNQ an ordinate; through the vertex A draw the tangent LAM ; and draw PL, QM , parallel to NA , then $PL = QM$, but the rectangle under LP and the latus rectum is to LA^2 as the rectangle under MQ and the latus rectum to MA^2 ,

therefore $LA^2 = MA^2$, and $LA = MA$, and therefore $QN = PN$.

PROP. XXVIII. Fig. 47.

If a straight line cutting the hyperbola, or opposite hyperbolas, meets the asymptotes in two points; the segments between the hyperbola or hyperbolas and asymptotes will be equal.

Let PQ cut the hyperbola, or the opposite hyperbolas in P and Q , and meet the asymptotes in R, T : the segments PR, QT , will be equal. For if PR be not equal to QT , let one of them, as QT , be the greater; and $Qo = PR$, join Co , which being produced will meet the curve in some point r , *Cor.* Prop. 18. Through q draw qpr parallel to QP meeting the curve in p and asymptote in r . Bisect PQ in N , and draw the diameter CNa , and PQ, pq , will be ordinates to that diameter. Because $NQ = NP$, and $Qo = PR$, therefore $No = NR$, and $oN : qn :: CN : Cn :: NR : nr$, therefore $nq = nr$; but $nq = np$, therefore $np = nr$, which is absurd; therefore QT is not greater than PR .

Cor. If the line TNR be supposed to move from N to A , the points P, Q , will coincide in A , and IA will be equal to AG ; therefore when a line touches an hyperbola, the segments between the point of contact, and the asymptotes are equal.

PROP. XXIX. Fig. 48.

If from any point P in the hyperbola PQ two straight lines PL, PH , be drawn to the asymptotes, and from any other point Q , in the same or in the opposite curve, there be drawn other two straight lines QE, QF , parallel to the two former lines PL, PH . The rectangle $QE \times QF$ will be equal to the rectangle $PL \times PH$.

Join PQ , and let it meet the asymptotes in R and T : and because the triangles TQF, TPH , are similar, as also the triangles $RPL, PQE, QF : PH :: TQ : TP :: RP : RQ :: PL : QE$; therefore the rectangle $QF \times QE$ is equal to the rectangle $PH \times PL$.

Cor. Hence, if from any two points, P, Q , in the same or in the opposite hyperbolas, two straight lines, PL, QE , be drawn to the same or to different asymptotes parallel to the other asymptote: the rectangles $CL \times LP, CE \times EQ$, will be equal; also the parallelogram $CLPH$ will be equal to the parallelogram $CEQF$; and the triangle CLP to the triangle CEQ .

PROP. XXX. Fig. 58.

If, from any point R in the asymptote of a hyperbola, there be drawn a straight line RT cutting the hyperbola, or opposite hyperbolas in P and Q , and the other asymptote in T ; the rectangle $PR \cdot RQ$ is equal to the square of the semidiameter which is parallel to RT .

Let AM, Bb , be the two axes, join AB meeting the asymptote in N . Draw the tangent IAa meeting the asymptotes in I and a . Because Aa is equal and parallel to BC , Prop. 17, AB is equal and parallel to aC , and $IA : Ia :: aC : AC$, or AB ; now IA is half of Ia , therefore AN is half of AB , and $AN = NB$.

Let CF be the semidiameter parallel to the line cutting the opposite hyperbolas, draw the tangent LH meeting the asymptotes in L and H , draw FE parallel to CL , meeting the asymptotes in E , and the conjugate hyperbola in D , and join CD . Because the rectangle $CN : NA$, or $CN : NB = CE : EF$, *Cor.* Prop. 29, and $CN : NB = CE : ED$: therefore $CE : EF = CE : ED$, and $EF = ED$, and FE is half of FD , but because LF is half of LH , *Cor.* Prop. 28, and FE is parallel to CL ; FE , is also half of CL , therefore $FD = CL$, and they are parallel, therefore CD is equal and parallel to FH , and CD is a conjugate diameter to CF . Let the line which cuts the hyperbola PFQ be parallel to CD or LH . Take any point t in the asymptote, and draw tr parallel to TR , cutting the curve or opposite curves in p and q , and the other asymptote in r . Draw PY, PZ, py, pz , parallel to the asymptotes. Because the triangles PYR, pyr , are equiangular.

$PR : PY :: pr : py$, and in like manner,

$PT : PZ :: pt : pz$, therefore

$RP \times PT : YP \times PZ :: rp \times pt : py \times pz$; but $YP \times PZ = yp \times pz$, *Cor.* Prop. 29; therefore $RP \times PT = rp \times pt$; or since $RP = QT$, Prop. 28, $PR \times RQ = pr \times rq$; and when P is taken at F , the rectangle $PR \times RQ$ becomes FL^2 , or FH^2 , which

which is equal to CD^2 ; and when P in the opposite hyperbola is at M, the rectangle $PR \times RQ$ becomes equal to GC^2 .

PROP. XXXI.

If two right lines meeting each other cut or touch a conic section, or opposite sections, the rectangles under the segments between the point of concourse and the points of intersection, or the squares of the tangents will be to each other as the squares of the semidiameters to which the lines are parallel.

If the lines be parallel to any of the diameters of the ellipse, or of the opposite hyperbolas, the proposition is evident from Prop. 24, because the lines which meet each other make the same angles with the directrix as those which pass through the centre, and the latter are bisected in the centre. But if either of the lines PLQ , LRT , or both the lines PLQ , NLM , be parallel to some of the conjugate diameters of the hyperbola, Fig. 49, produce QLP till it meet the asymptote in G, and through G draw FGH parallel to LRT , meeting the opposite curves in F and H. Let CB , CD , CA , be the semidiameters which are parallel to QP , MN , RT . Then Prop. 24, $PL \times LQ : RL \times LT :: PG \times GQ : FG \times GH :: CB^2 : CA^2$, Prop. 30. In like manner it may be proved, that $RL \times LT : NL \times LM :: CA^2 : CD^2$; therefore, $PL \times LQ : NL \times LM :: CB^2 : CD^2$.

If the lines touch the conic section or opposite sections, the squares of the tangents will be to each other as the rectangles under the segments of any two lines drawn parallel to them, which meet each other, and cut the section or opposite sections; and therefore they are as the squares of the semidiameters to which they are parallel.

Cor. If two right lines IQ , IN , Fig. 49, 50, meeting each other in I, touch an ellipse or hyperbola in Q, N, and are parallel to two other lines VT , VN , which meet each other in V, and touch the ellipse or opposite hyperbola, or hyperbolas, in T, N; $IQ : IN :: VT : VN$: for IQ^2 , IN^2 , are to each other as the squares of the semidiameters to which they are parallel, and VT^2 , VN^2 , are in the same ratio.

PROP. XXXII. Fig. 51, 52.

If an ordinate be drawn to any diameter of an ellipse or an hyperbola; the rectangle under the abscisses will be to the square of the semi-ordinate as the square of the diameter is to the square of its conjugate.

Let ACM be any diameter of an ellipse or hyperbola, to which PNQ is an ordinate, and let DCK be the conjugate diameter, which is parallel to PNQ . Then by the preceding proposition $AN \times NM : PN \times NQ$ (or PN^2) :: $CA^2 : CD^2 :: AM^2 : DK^2$.

Cor. 1. Because the parameter is a third proportional to the diameter and its conjugate, the rectangle under the abscisses is to the square of the semi-ordinate as the diameter is to the parameter.

Cor. 2. The two conjugate diameters being constant, the rectangle under the abscisses will vary as the square of the ordinate.

PROP. XXXIII. Fig. 53.

If an ordinate be drawn to any diameter of a parabola; the square of the semi-ordinate is equal to the rectangle under the abscisses and the parameter.

Let AN be any diameter of the parabola to which PNQ is an ordinate. Draw the parameter TSV , cutting the diameter in F; join SA , let the diameter meet the directrix in D. Because TF is half of TV , Prop. 27, and AF is half of DF , or TF , Prop. 21, Cor. $AF : FT :: FT : TV$, and $AF \times TV = FT^2$; but $AF \times TV : AN \times TV :: FT^2 : PN^2$, Prop. 25, therefore $AN \times TV = PN^2$.

Cor. Because $TV = 2TF = 4SA$, $4SA \times AN = PN^2$.

PROP. XXXIV. Fig. 54.

If two tangents be drawn at the extremities of any right line which is terminated by a conic section, and which does not pass through the centre of an ellipse, they will meet each other in the diameter which bisects that right line.

Let PQ meet the curve in P and Q; bisect PQ in N, and through N draw the diameter CNT . Through P draw the tangent PT meeting the diameter in T, and join TQ , which will

touch the conic section in Q. For draw any other line DCB parallel to PNQ , meeting TP , TQ , in L and M. The triangles TNP , TCL , are similar, as also TNQ , TCM , therefore,

$NP : CL :: TN : TC :: QN : MC$, and alternately $NP : NQ :: CL : CM$; therefore $CM = CL$, which is greater than CD or CB , therefore M is without the section, and the line TQ meets the curve only in one point Q.

Cor. If two right lines which touch a conic section meet each other, a right line drawn through the point of concourse bisecting the line which joins the points of contact, will be a diameter of the section.

PROP. XXXV. Fig. 55.

If a tangent to any point in the parabola meet a diameter, and an ordinate be drawn to that diameter from the point of contact, the segment of the diameter between the vertex and the tangent will be equal to the absciss.

Let TP , which touches the parabola in any point P, meet the diameter NA in T, and draw the ordinate PN . NA will be equal to AT . Draw the tangent AI meeting PT in I; join AP , and draw the diameter IG cutting AP in F, and PN in G; then $AF = FP$, Cor. Prop. 34. Therefore AI or $NG = PG$; and AI is half of NP ; but $AI : NP :: TA : TN$, therefore TA is the half of TN .

PROP. XXXVI. Fig. 56, 57.

If a tangent to any point in an ellipse, or an hyperbola meet a diameter, and from the point of contact an ordinate be drawn to that diameter, the semidiameter will be a mean proportional between the segments of the diameter, which are intercepted between the centre and the ordinate, and between the centre and the tangent.

Let PT touch the ellipse or hyperbola in any point P, and meet the diameter MA in T; draw PNQ an ordinate to the diameter MA , $CN : CA :: CA : CT$. Through the vertices A, M, draw the tangent AI , ML , meeting PT in I and L; take $CO = CN$, then Cor. Prop. 31, $IP : IA :: LP : LM$, and alternately $IP : LP :: IA : LM$, and because AI , NP , LM , are parallel, $AN : NM :: TA : TM$, and by composition, (fig. 57,) or by division, (fig. 56,) $ON : AN :: AM : TA$; and by taking the halves of the antecedents, $CN : AN :: CA : AT$, and by composition, (fig. 57,) or by division, (fig. 56,) $CA : CN :: CT : CA$, and by inversion $CN : CA :: CA : CT$.

PROP. XXXVII. PROBLEM. FIG. 59.

Two unequal straight lines being given, which bisect each other at right angles; to describe an ellipse, of which the given lines shall be the axes.

Let AM , Bb , be the given lines of which AM is the greater. From the centre B, with a radius equal to AC , describe a circle meeting AM in S and H, which will be the foci, Prop. 7, Cor. 6. Take a string equal in length to AM , and fix the extremities of it at the points S and H; and by means of a pin at P let the string be stretched, and let the pin be carried round, till it return to the same point; the point P will describe an ellipse, of which AM , Bb , are the axes, as is evident from Prop. 10.

PROP. XXXVIII. PROB. FIG. 60.

Two straight lines being given, which bisect each other at right angles; to describe an hyperbola, of which these lines shall be the axes.

Let AM , Bb , be the given lines, bisecting each other at right angles in C. Join AB ; and take CS and CH , in AM produced both ways, equal to AB . At the point H let one end of a ruler be fixed, so that it may move round this point as a centre; and let a string be taken, the length of which exceeds that of the ruler by a line equal to AM ; let one end of the string be fixed at L, and the other at the point S; apply the string, by means of a pin at P, to the side of the ruler LH ; and let the ruler be moved about the centre H, while the string is constantly applied, and kept close to the ruler by the pin at P. Then the difference between the whole length of the string SPL and the ruler HL being equal to AM , the difference between HP and PS will be equal to AM ; and the point P will describe one of the opposite hyperbolas of which AM , Bb , are the axes, as is evident from Prop. 10.

†

PROP.

PROP. XXXIX. PROB. FIG. 61.

Two right lines being given, one of which is bisected by the other at right angles; to describe a parabola, in which the right line bisected shall be an ordinate, and the other line the axis.

Let AC, Bb be the two given lines, one of which Bb , which is perpendicular to AC , is bisected in C . Find a third proportional to AC, CB ; and produce CA to D , so that AD may be a fourth part of that third proportional; take $AS = AD$, and draw DX perpendicular to DC . Let a ruler, the sides of which HE, EL , are perpendicular to each other, be placed in the plane CDX , so that the side EL may be applied to DX ; and take a string equal in length to the side HE , one extremity of which must be fixed at H , and the other at S ; and let part of the string be applied by means of a pin P to the side of the ruler HE ; and whilst the side EL moves along DX , let the string be stretched by the pin, and constantly applied to HE . Then, because the whole length of the string HPS is equal to HE , the part SP will always be equal to PE ; therefore the point P will describe a parabola, by Prop. 12, of which AC is the axis, S the focus, and DX the directrix; and BCb will be an ordinate, because it is perpendicular to the axis, and CB is a mean proportional between the absciss AC and $4AS$, or the latus rectum.

PROP. XL. PROB. FIG. 40, 41.

To draw a tangent to a conic section from any given point without it, which is not the centre of the hyperbola.

If the given point H be in the directrix; draw HS to the focus which is nearest to the directrix; draw SP perpendicular to SH , meeting the curve in P , and join HP , which will touch the conic section in P , Cor. 1, Prop. 20.

If the given point be in any other situation, as at L ; join LS , and draw LX perpendicular to the directrix. Take LD to LX in the constant ratio, Prop. 11, and from the centre L , at the distance LD , describe a circle DMq . From S draw SQ a tangent to the circle, meeting the directrix in H . Join LQ , and draw SP parallel to it, or perpendicular to SH . Join HL , and produce it to meet SP in P , which is in the conic section, and the line HP touches the curve at P . For the triangles HQL, HSP , are similar, as also LHX, PHE , therefore $SP:PH::QL:LH$, and $PH:PE::LH:LX$; therefore $SP:PE::QL:LX$, that is, in the constant ratio; therefore P is a point in the curve, and because PSH is a right angle, PH is a tangent. Cor. 1, Prop. 20.

Cor. Because two lines SQ, Sg , may be drawn from the point S to touch the circle; two tangents LP, Lp , may be drawn from L to the conic section.

PROP. XLI.

If a circle touches a conic section, and cuts off from the diameter, which passes through the point of contact, a segment equal to its parameter, the conic section is of the same curvature with the circle at the point of contact.

First let a tangent DM be drawn to any point D in the parabola, (fig. 62,) draw also the diameter DF , and the perpendicular DL : through any point Q in the curve, near to D , let the circle DQO be described to touch DM in D , and meet DF in P , join PQ, DQ , and draw QN parallel to MD , meeting DF in N . Then because the angle $DPQ = MDQ = DQN$, the triangles DNQ, PQD , having a common angle at D are equiangular; hence $PD:DQ::DQ:DN$, and $PD \times DN = DQ^2$: also $PD^2:PQ^2::DQ^2:QN^2$, therefore $PD^2:PQ^2::PD \times DN:P \times DN$, where P = parameter of DF . Now, it is evident, that the nearer the point Q is to the point D , the nearer will the circumference of the circle be to a coincidence with the curve at that point; and therefore, as no portion of these curves, however small, can be the same, the circumference of the circle will have approached the nearest possible to a coincidence with the curve at D , when the point Q falls upon it; in which case, the last analogy becomes $PD^2:PD^2::PD:P$, therefore $PD = P$, the parameter of DF ; therefore the proposition in the case of the parabola is manifest.

Next let DM be a tangent at any point in the ellipse or hyperbola, (fig. 63,) DF, EG , conjugate diameters, and DHO a perpendicular to the two parallels DM, EG .

Through any point Q in the curve, near to the point D , let the circle DQO be described, to touch DM in D , and meet DF in P . Let PQ, QD , be joined, and QN drawn parallel to DM , to

meet DF in N . The triangles DNQ, PQD , being similar, $DN:DQ::DQ:DP$, hence $DN:DP::DN^2:DQ^2$,

Or $DN:DP::QN^2:PQ^2$.

But $DF:P::FN \times ND:QN^2$, Prop. 32. Cor. 1.

Therefore $DF \times DN:P \times DP:FN \times DN:PQ^2$,

and $DF:FN::P \times DP:PQ^2$; this analogy, when Q coincides with D , becomes $DF:DF::P \times DP:DP^2$, in which case $P = PD$, where P = parameter of DF as before.

Cor. If, from any point D in an ellipse or hyperbola, a diameter DF be drawn, and a perpendicular DH to its conjugate EG , the radius of curvature at the point D is a third proportional to the perpendicular DH and the semi-conjugate diameter EC .

For since $DH:DC::DP:DO$,

and $DC:EC::EG:P$ or DP ;

therefore $DH:EC::EG:DO::EC:DH$, the radius of curvature.

PROP. XLII. FIG. 64.

If any ordinate and absciss of a parabola be completed into a parallelogram; the area of the parabola, included between the ordinate and the curve, is to the parallelogram as 2 to 3.

Let AN be the absciss, and PQ the ordinate; let the parallelogram $PQCB$ be completed, and let AN be divided into indefinitely small equal parts, of which ND is one; through D draw HI parallel to PQ , cutting the parabola in F and G , and through F draw KE parallel to NA ; take $KR = KP$, and draw RL parallel to KE . By Prop. 25, $HF \times HG:PN^2::HP:NA$, but because DN is indefinitely small, PQ or $2PN$ may be taken for HG ; and $PK = HF$, also $NA = PB$, therefore $2PK \times PN^2:PN::HP:PB$, and $2PK$, or $PR:PN::HP:PB$; now the parallelograms RB, PD , are equiangular; therefore they are equal, and the parallelogram $PD:KB::2:1$; and the sum of all the parallelograms in APN is to the sum of all those in APB in the same ratio of 2 to 1; but the sum of all the parallelograms in APN approaches indefinitely near to the curvilinear area AFP , when their breadths are continually diminished; and in like manner the sum of all the parallelograms in APB approaches to the curvilinear area AFP ; therefore area AFP :area AFP : $2:1$, and the area PAQ is to the parallelogram $PBCQ$ as 2 to 3.

PROP. XLIII. FIG. 65, 66.

If two ellipses or two hyperbolas have a common axis, and an ordinate be drawn through the same point in the axis to each of the curves; the areas included between the common absciss, the ordinates, and the two curves, also the whole areas of the ellipses will be to each other as the conjugate axes.

Let AP, AQ , be two ellipses or two hyperbolas; take any absciss AN , which is not greater than half the axis of the ellipse, and draw the ordinates NP, NQ . Let the absciss AN be divided into any number of equal parts AE, EF, FG, GN , &c.; draw the ordinates ERI, FSK, GTL , and complete the parallelograms AR, AI, ES, EK , &c. also draw Ii, Kk, Ll parallel to AN . Then it is evident that the difference between the circumscribed parallelograms AI, EK, FL, GQ , and the inscribed parallelograms Ei, Fk, Gl is equal to GQ ; and if parallelograms be inscribed in the same manner in the figure APN , the difference between these and the circumscribed parallelograms would be equal to GP , therefore the difference between each series of parallelograms, and the areas AQN, APN will be less than the parallelograms GQ, GP , and because $GP:GQ::NP:NQ$, and each parallelogram in the figure APN is to the corresponding parallelogram in the figure AQN in the same ratio, the sum of all those in APN is to the sum of all those in AQN as NP is to NQ , which is the same ratio with that of the conjugate axes. Conceive the breadths of the parallelograms to be now diminished, and their number increased ad infinitum, and the parallelograms APN, AQN will be ultimately equal to the areas APN, AQN , for the parallelograms GQ, GP will now vanish, therefore the areas APN, AQN are to each other as their conjugate axes; and if the sections be ellipses, their whole areas are to each other in the same ratio.

Cor. 1. If a circle be described about an ellipse, the area of the circle is to be the area of the ellipse as the transverse axis is to the conjugate.

Cor. 2. The area of an ellipse is equal to that of a circle whose diameter is a mean proportional between the two axes.

Cor. 3. The areas of two ellipses are to each other as the rectangles under their axes.

CONIFERÆ, in botany, the name of one of the orders of Linnaeus's fragments of a natural method, consisting of plants whose female flowers, placed at a distance from the male either on the same or distinct roots, are formed into a cone. Of this order are the *Abies*, *Cypressus*, &c. All the conifera yield a resin which renders most of them evergreen. The fruit in all is biennial, being produced in the spring, but not ripening and dropping its seeds until the spring after.

CONIGLIANO, a town of Italy, in the marquisate of Trevisano, and late Venetian territories; ceded by the French to the emperor, in 1797. Lon. 12. 40. E. Lat. 45. 50. N.

CONIL, a town of Spain, in Andalusia, 18 miles S. S. E. of Cadiz.

CONIN, or **KONIN**, a town of Poland, in the palatinate of Kalisch, 18 miles S. S. E. of Guesne.

CONINGSBECK, or **CONINGSECK**, a county of Germany, in the circle of Suabia.

CONINGSECK, the capital of the county, 20 miles N. of Constance. Lon. 9. 20. E. Lat. 47. 50. N.

CONJOINT DEGREES, in music, two notes which immediately follow each other in the order of the scale; as *ut* and *re*.

CONJOINT TETRACHORDS, two tetrachords, or fourths, where the same chord is the highest of one and the lowest of the other.

CONITZ, or **CHOINITZ**, a town of Poland, in Pomerellia, 40 miles S. of Dantzic.

CONJUGATE AXIS. See **CONIC SECTIONS**.

CONJUGATE HYPERBOLA. See **CONIC SECTIONS**.

CONJUGATION, [*conjugatio*, Lat.] in grammar, a regular distribution of the several inflexions of verbs in their different voices, moods, tenses, numbers, and persons, so as to distinguish them from one another. See **GRAMMAR** and **LANGUAGE**.

CONIUM, **HEMLOCK**: a genus of the digynia order, and pentandria class of plants; natural order, Umbellate. Partial involucre halved, mostly triphyllous; fruit subglobose, quinque-striated, the striæ crenated on each side. There are five species.

C. AFRICANUM, with prickly seeds, is a native of the Cape of Good Hope, and rarely grows above nine inches high; the lower leaves are divided like those of the small wild rue, and are of a greyish colour.

C. MACULATUM, or the greater hemlock, grows naturally on the sides of banks and roads in many parts of Britain. It is a biennial plant which perishes after it has ripened its seeds. It has a long taper root like a parsnip, but smaller. The stalks are terminated by umbels of white flowers, each composed of about ten rays or small umbels, and have a great number of flowers which spread open, each sitting upon a distinct footstalk; the seeds are small and channelled, and like those of anniseed. It flowers in June, and the seeds ripen in autumn. This species is sometimes applied externally, in the form of decoction, infusion, or poultice, as a discutient.

CONJUNCTION, in astronomy, the meeting of two stars or planets in the same degree of the zodiac. See **ASTRONOMY**.

CONJUNCTION, in grammar, an indeclinable word or particle, which serves to join words and sentences together, and thereby shews their relation or dependance one upon another. See **GRAMMAR**.

CONJURATION, properly implies magic words, characters, or ceremonies, whereby evil spirits, tempests, &c. are supposed to be raised, or driven away. The Romish priests pretend to expel devils, by preparing holy water in a particular manner, and sprinkling it over the possessed, with a number of conjurations and exorcisms. Some authors make the difference between conjuration and witchcraft to consist in this; that the former effects its end by prayers and invocation of God's name, &c. to compel the devil to do what is desired; so that the conjurer is supposed to be at war with the devil, and that evil spirit to act merely out of constraint: whereas the latter attains its end by an immediate application to the devil himself; and the devil's complaisance is supposed to be the consequence of some compact between them, so that the devil and the witch have a good understanding together. Both these, again, differ from enchantment and sorcery; in that these latter operate secretly and slowly by spells, charms, &c. without invoking the devil.

CONKERE, a town in Chinese Tartary. Lon. 102. 10. E. Lat. 44. 50. N.

CONLIE, a town of France, in the department of Sarthe, 10 miles N. W. of Mans.

CONNARUS, **CEYLON SUMACH**: a genus of the decandria order, and monodelphia class of plants. Stigma simple; capsule bivalved, unilocular, and monospermous. There are five species, natives of warm climates.

CONNAUGHT, the most western of the four provinces of Ireland, bounded on the E. by that of Leinster, on the W. by the ocean, on the N. and N. W. by part of the ocean and province of Ulster, and on the S. and S. E. by Munster. It is 130 miles long, and 84 broad; and was anciently a kingdom. It has no rivers of note, besides the Shannon. It has several convenient bays and creeks, and is fertile in many places. It contains five counties; viz. Leitrim, Sligo, Mayo, Roscommon, and Galway; which comprehend 1 archbishopric, 5 bishoprics, 7 market-towns, 8 places of trade, 10 boroughs, that send members to parliament, about 47,256 houses, 24 old castles, besides fortresses that have been recently erected, and 330 parishes. Galway is the chief town.

CONNAUX, a town of France, in the department of Gard, 9 miles N. E. of Uzes.

CONNECTICUT, a large river of North America, the most considerable one in the eastern part of the United States. It rises in the high lands which separate the states of Vermont and New Hampshire from Lower Canada. Its course is generally S. S. W. until it reaches the city of Middleton; after which it runs a S. S. E. course to its mouth.

CONNECTICUT, one of the United States of North America, called by the ancient natives Quannihctut, is situated between 41. 0. and 42. 2. lat. N. and between 71. 20. and 73. 15. lon. W. Its greatest breadth is 72 miles, its length 100 miles. It is bounded on the N. by Massachusetts, on the E. by Rhode Island; on the S. by the sound which divides it from Long Island, and on the W. by the state of New York. This state contains about 4674 square miles; equal to about 2,640,000 acres. Connecticut, though subject to the extremes of heat and cold, as well as to frequent and sudden changes, is very healthful. From accurate calculation it is found, that about one in eight live to the age of seventy and upwards; one in thirteen to eighty, and one in about thirty to ninety years of age. In the maritime towns the weather is variable, according as the wind blows from the sea or land. In the inland country it is less variable. Its principal productions are Indian corn, rye, wheat, oats, and barley, which are heavy and good; buck wheat, flax, hemp, potatoes of several kinds; pumpkins, turnips, peas, beans, and fruits of all kinds. The soil is well calculated for pasture and hay, which enables the farmers to feed large numbers of neat cattle and horses. The beef, pork, butter, and cheese, of Connecticut, are equal to any in the world. Connecticut is divided into eight counties, viz. Hartford, New Haven, New London, Fairfield, Windham, Litchfield, Middlesex, and Tolland. The counties are subdivided into upwards of 100 townships; each of which is a corporation, invested with power to hold lands, choose their own officers, to make prudential laws, the penalty of transgression not to exceed 20s. and to choose their own representatives to the general assembly.

CONNECTIVES, in grammar, one of the four species under which, according to Mr. Harris, all words may be included. They are of two kinds; and as they connect sentences or words, are called by the different names of conjunctions and prepositions. See **GRAMMAR**.

CONNELS, a town of the United States, in Pennsylvania, 25 miles W. S. W. of Chambersburg.

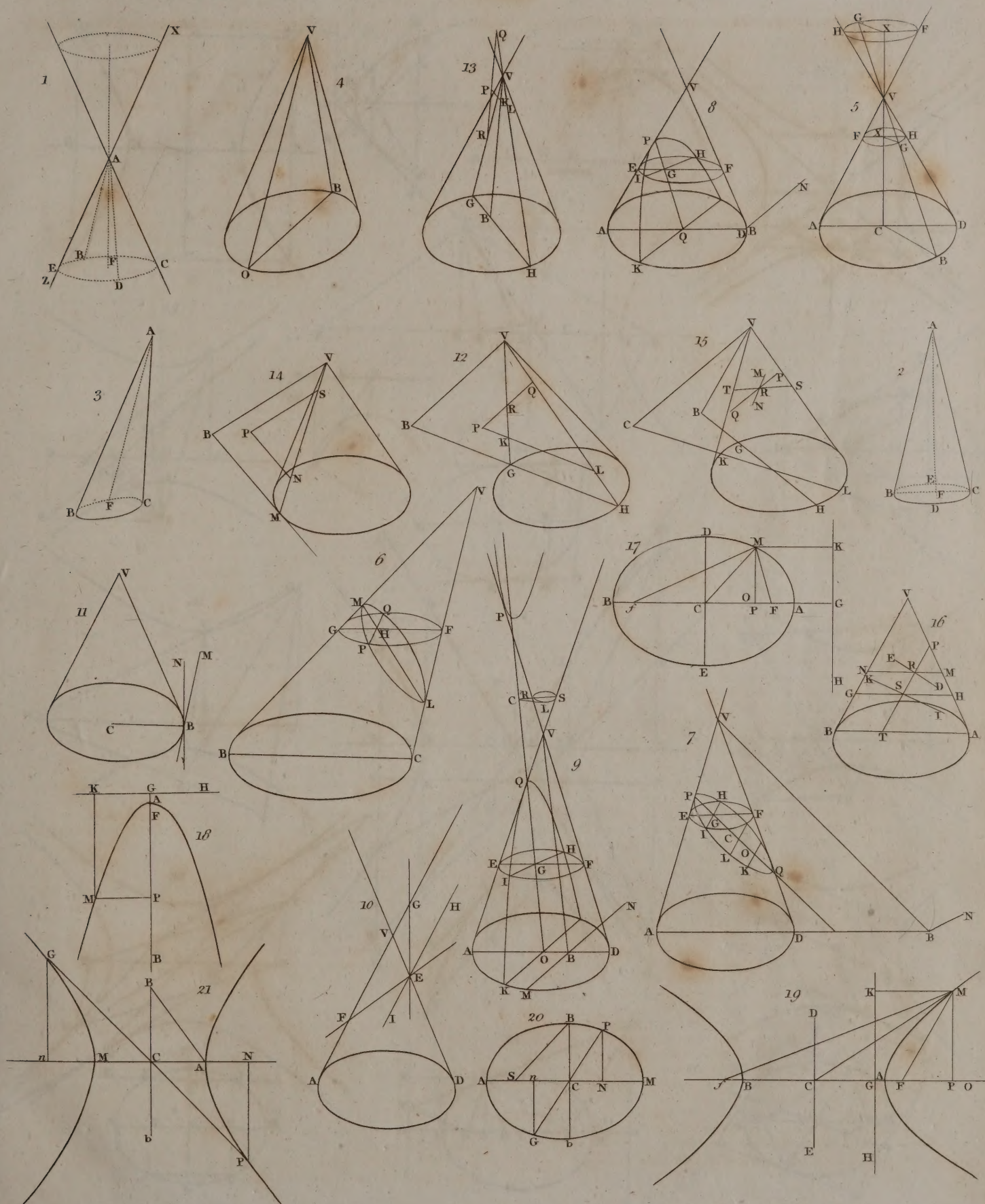
CONNERE, a town of France, in the department of Sarthe, 12 miles E. N. E. of Mans.

CONNEXION, the relation whereby one thing adheres to, or depends upon, another. Such is the relation between Euclid's propositions, that the latter cannot subsist but by its connexion with the former.

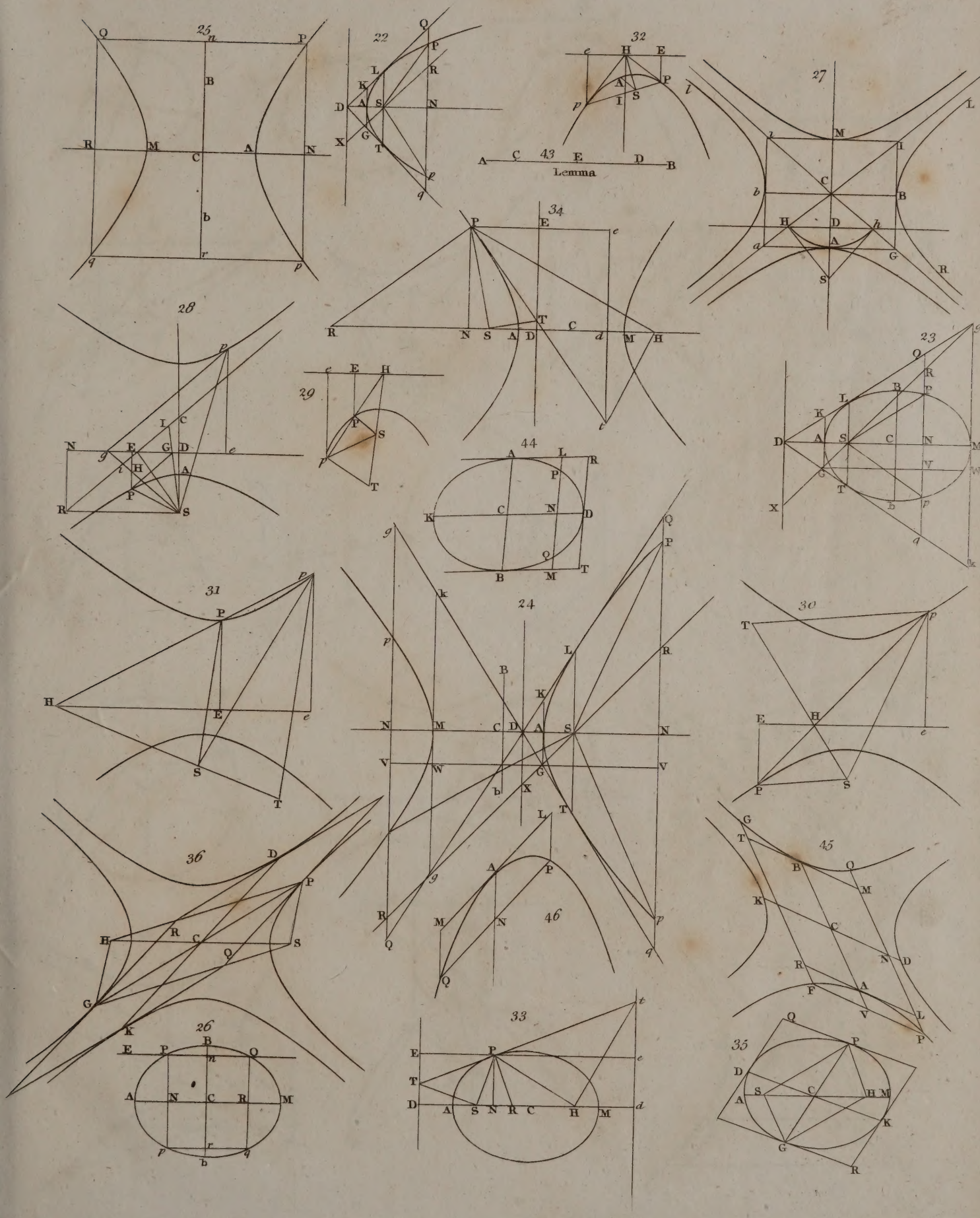
CONNEXION, or **CONTINUITY**, in the drama, consists in the joining of the several scenes together. The connexion is said to be observed, when the scenes of an act succeed one another immediately, and are so joined as that the stage is never left empty.

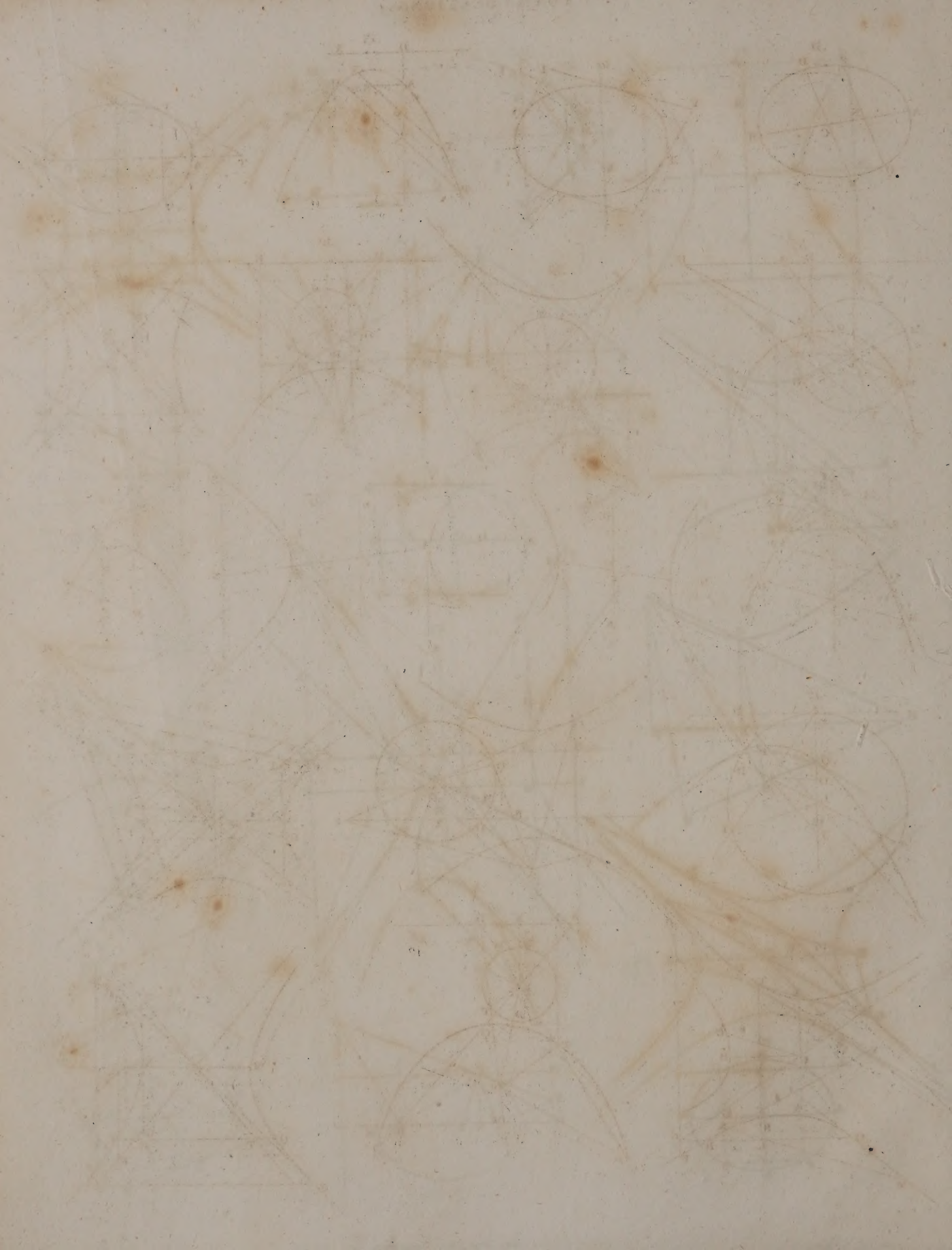
CONNIVENTES VALVULÆ, or **CONNIVENT VALVES**, in anatomy, wrinkles, cellules, and vasculæ, in the inside of the ilium and jejunum. See **ANATOMY**.

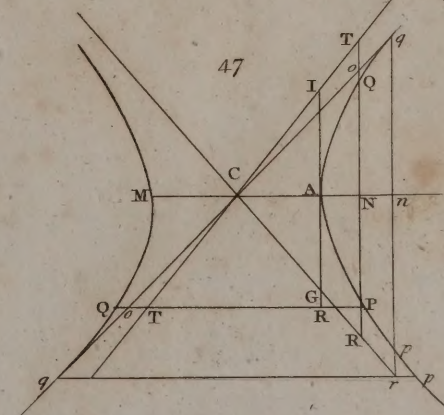
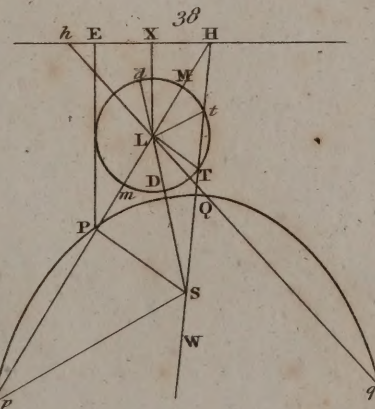
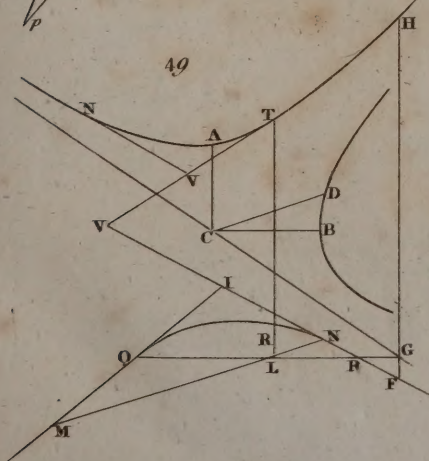
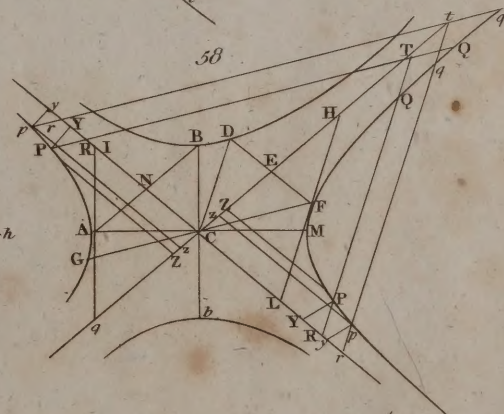
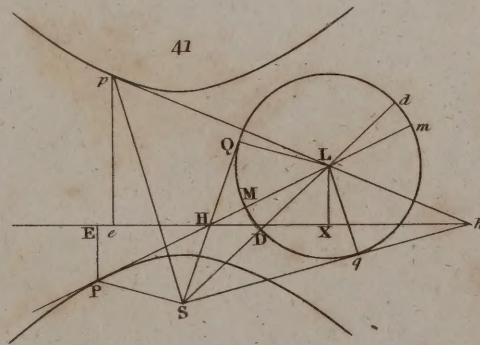
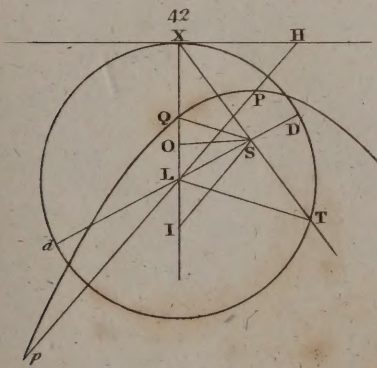
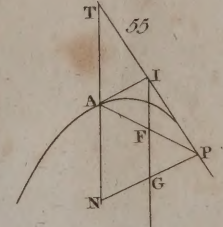
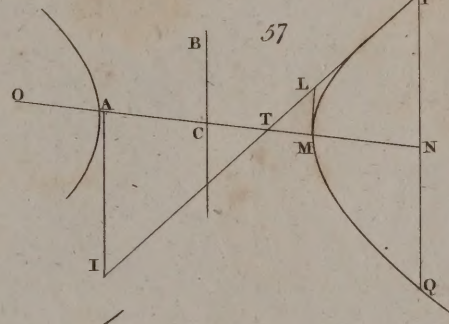
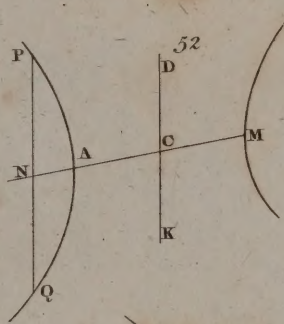
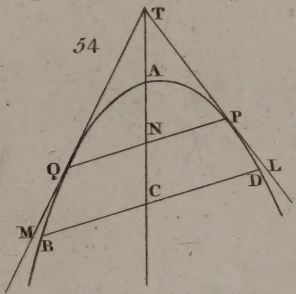
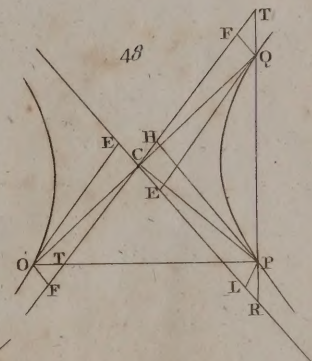
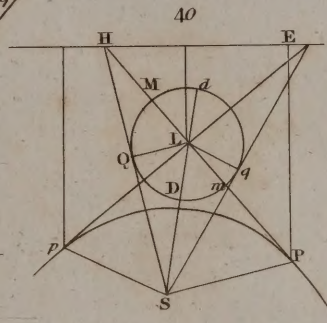
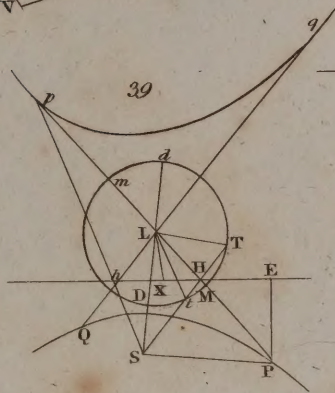
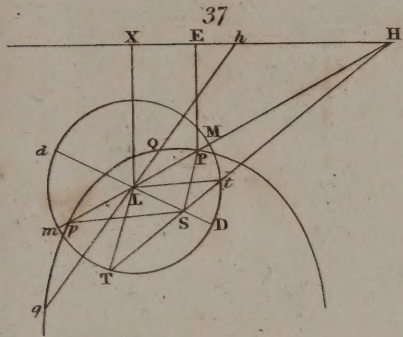
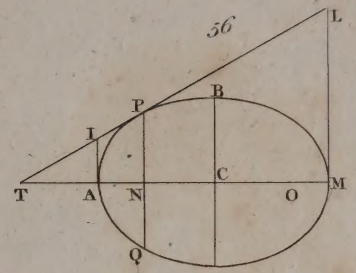
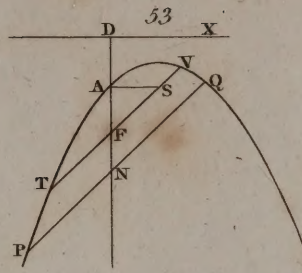
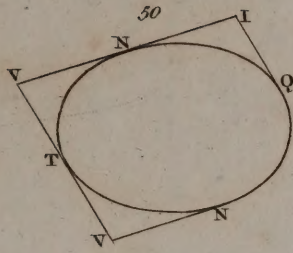
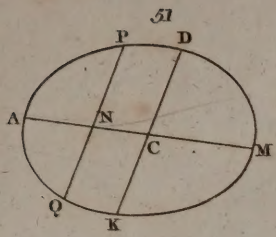
CONNOISSEUR, [from *connoître*, French, to know,] literally signifies a person well versed in any thing; and is used for

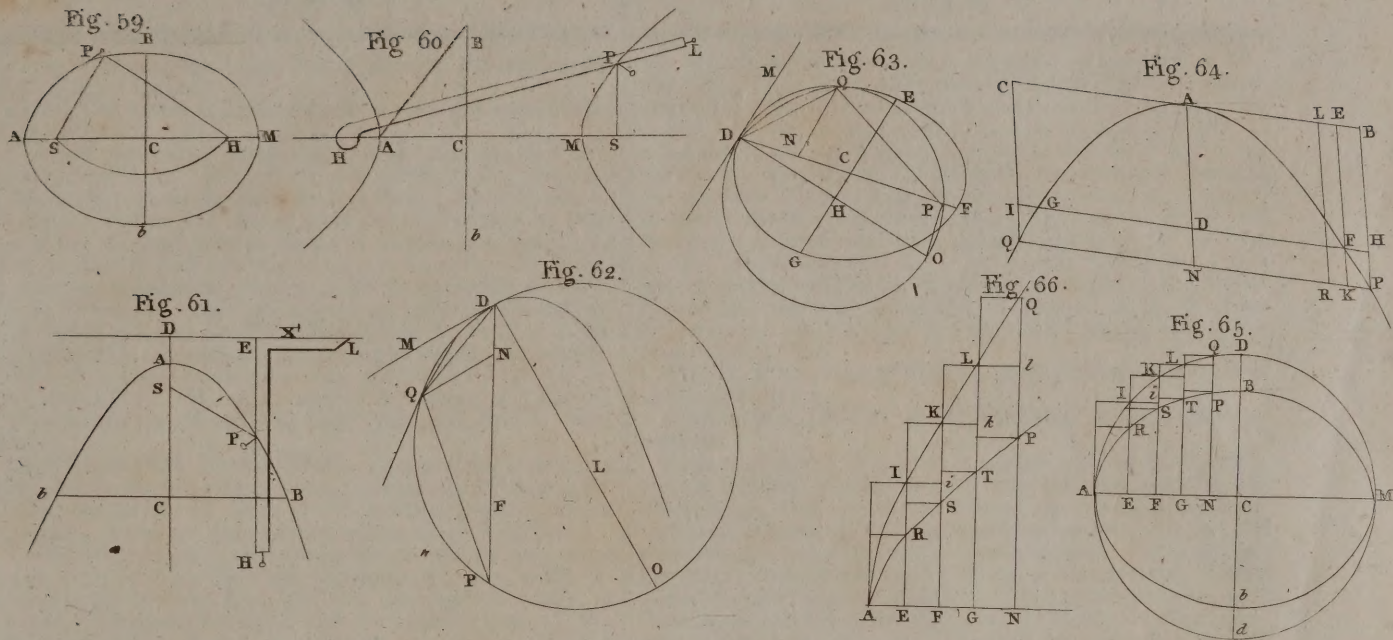




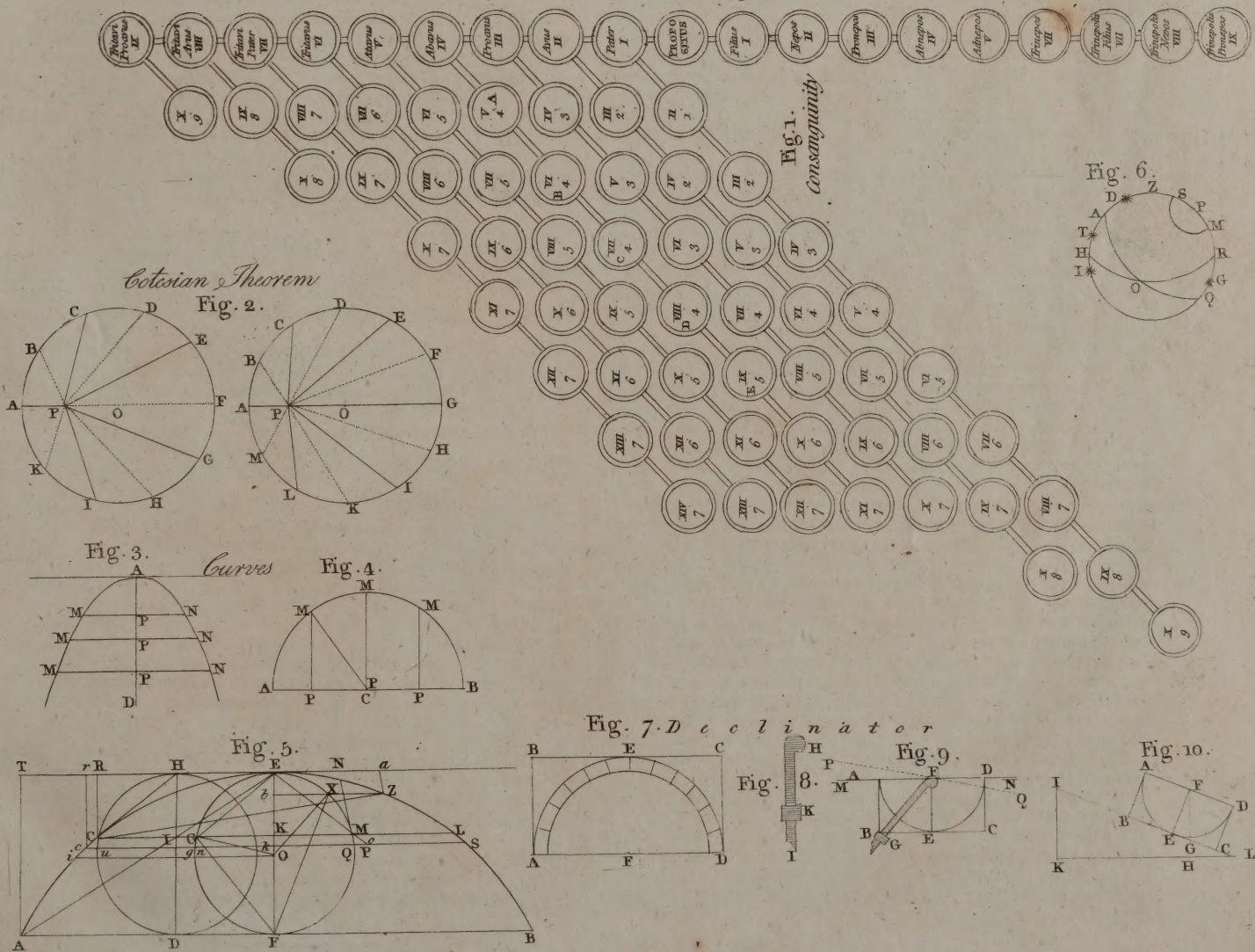








MISCELLANIES.



one who is a thorough judge in any science, but particularly painting and sculpture.

CONNOR, a town of Ireland, in the county of Antrim, 6 miles N. of Antrim.

CONNOR, BERNARD, M. D. and F. R. S. was born in Kerry, Ireland, about A. D. 1666. He studied physic in the university of Montpellier: and afterwards went to Paris. From thence he travelled to Venice, and through great part of Germany, to Warsaw, where he was made physician to king John Sobieski. In 1695, he came to England, read lectures in London, Oxford, and Cambridge, and became member of the Royal Society and College of Physicians. He wrote a singularly philosophical and medical treatise in Latin, entitled "Evangelium Medici," i. e. the Physician's Gospel; wickedly pretending to explain the miracles performed by Christ as natural events, upon the principles of natural philosophy. He wrote also "A History of Poland;" "Dissertations on Mount Vesuvius," &c. and died in 1698, aged 32.

CONOCARPUS, BUTTON TREE: a genus of the monogynia order, and pentandria class of plants; natural order, Aggregate. Corolla pentapetalous; seeds naked, solitary, inferior; flowers aggregate. There are three species, natives of the West Indies.

CONOID, a figure generated by the revolution of a conic section about its axis; there are, consequently, three kinds, answering to the three conic sections, viz. the elliptical conoid, or spheroid, the hyperbolic conoid, and the parabolic conoid. If a conoid be cut by a plane in any position, the section will be of the figure of some one of the conic sections; and all parallel sections of the same conoid are like and similar figures.

CONOIDES, the pineal gland. See **ANATOMY**.

CONON, a renowned Athenian general and admiral, who flourished about B. C. 395. After his defeat by Lysander, he fled to Evagoras king of Cyprus: after which he put himself under the protection of Artaxerxes king of Persia; with whose army he delivered Athens from his oppressors, and rebuilt its walls. In the 360th year of Rome, he beat the Lacedæmonians in a sea-fight near Cnidus upon the coast of Asia, deprived them of the sovereign rule they had on sea ever since the taking of Athens, and had some other considerable advantages over them: but falling into the hands of Teribazus, a Persian, who envied his glory, he was put to death.

CONOPEA, in botany, a genus of the class didynamia, and order angiosperma. Calyx five-cleft; corolla ringent, two-lipped; stigma two-lobed; capsule one-celled, four-valved; seeds many. One species, a native of Guiana.

CONOPOLI, a town of European Turkey, in Livadia, 10 miles N. E. of Lepanto.

CONOPS, in zoology, a genus of insects of the order diptera. Rostrum pored, and jointed like a knee; antennæ terminated by a flat and solid articulation, resembling the bowl of a spoon, with a lateral bristle. Twenty-two species are enumerated.

CONOU, a town of Persia, in Lariston, on the coast of the Persian Gulf, 66 miles E. S. E. of Lar.

CONQUES, a town of France, in the department of Aveiron, 18 miles N. of Rhodéz.

CONQUEST, in civil jurisprudence, is the acquisition of property in common by a number of persons. In some countries they confound acquisition with conquest; but, according to the most general acceptation, acquisition is the gaining of unappropriated goods before the establishment of a community: whereas by the term conquest, is ordinarily intended whatever is acquired by a number of persons in community; or by some one for all the others. As it is more especially in the union of persons by marriage that a community of property takes place; so it is in reference to them that we frequently use the word conquest. There are nevertheless conquests also among other persons who are in a tacit community or society; such as obtain by particular local customs. According to this sense of the word, it has been contended by several, that William I. claimed the kingdom of England; that is, not by right of arms but by right of conquest or acquisition; under promise of succession made by Edward the Confessor, and a contract entered into by Harold to support his pretensions to that succession; and by old writers, conquestus, acquisitio, and perquisitio, are frequently used as synonymous terms.

CONQUEST, in the law of nations. The right of conquest is derived from the laws of war; and when a people is subjected,

the conduct of the conqueror is regulated by four kinds of law. First, the law of nature, which dictates whatever tends to self-preservation; 2dly, our reason, which teaches us to use others, as we would be treated ourselves; 3dly, the laws of political society, to which nature has not assigned any precise boundary; lastly, the law which is derived from the particular circumstances attending the conquest. Thus, a state conquered by another will be treated in one of the four methods following: Either the conqueror will continue it under its own laws, and will only claim the exercise of civil and ecclesiastical sovereignty; or he will impose a new form of government; or he will destroy the frame of their society, and incorporate the inhabitants with others; or he will exterminate them: which last, to the disgrace of human nature, has been too often done.

CONQUET, a town of France in the department of Finisterre, 12 miles W. of Brest.

CONSANGUINITY, or **KINDRED**, is either lineal or collateral.

CONSANGUINITY, COLLATERAL, agrees with the lineal in this, that the collateral relations descend from the same ancestor; but differs in this, that they do not descend the one from the other. Collateral kinsmen are such as lineally spring from one and the same ancestor, who is the stirps or root, the stirps, trunk, or common stock, from whence these relations are branched out. Thus if Daniel Gogerly has two sons, who have each a numerous issue, both these issues are descended from Daniel Gogerly as their common ancestor; and they are collateral kinsmen to each other, because they are all descended from this common ancestor, and all have a portion of his blood in their veins, which denominates them consanguineous. Collateral consanguinity consists in this descent from one and the same common ancestor. Thus Daniel Gogerly and his brother George are related, because both are derived from one father. George and his first cousin are related, because both descend from the same grandfather; and his second cousin's claim to consanguinity is, that they are both derived from the same great-grandfather. In short, as many ancestors as a man has, so many common stocks he has from which collateral kinsmen may be derived. And as we are taught by holy writ, that there is one couple of common ancestors belonging to us all, from whom the whole race of mankind is descended, the obvious and undeniable consequence is, that all men are in some degree related to one another. For, indeed, if we only suppose each couple of our ancestors to have left, one with another, two children; and each of those children to have left, on an average, two more, (and without such a supposition the human species must be daily diminishing); we shall find that each of us now subsisting has above 268 millions of kindred in the 15th degree, at the same distance from the several common ancestors as we ourselves are, and in the 20th degree no fewer than 274,877,906,944: besides those that are one or two degrees nearer to or farther from the common stock, who may amount to as many more. And if this calculation should appear incompatible with the number of inhabitants on the earth, it is because, by inter-marriages among the several descendants from the same ancestor, a hundred or a thousand modes of consanguinity may be consolidated in one person; or he may be related to us a hundred or a thousand different ways. The method of computing these degrees in the canon law, which we have adopted, is as follows. We begin at the common ancestor, and reckon downwards; and in whatsoever degree the two persons, or the most remote of them, is distant from the common ancestor, that is the degree in which they are related to each other. Thus, George and his brother are related in the first degree; for from the father to each of them is counted only one: George and his nephew are related in the second degree; for the nephew is two degrees removed from the common ancestor, viz. his own grandfather, the father of George. To give an instance from the English annals: King Henry VII. who slew Richard III. in the battle of Bosworth, was related to that prince in the fifth degree. Let the propositus, therefore, in the table of consanguinity, represent Richard III. and the class marked E, Henry VII. Now their common ancestor was Edward III. the abavus in the same table: from him to Edward duke of York, the proavus is one degree; to Richard earl of Cambridge, the avus, two; to Richard duke of York, the pater, three; to king Richard III. the propositus, four; and from king Edward III. to John of Gaunt (A) is one degree; to John E. of Somerset (B) two; to John duke of Somerset (C) three; to Mar-

garet countess of Richmond (D) four; to king Henry VII. (E) five; which last mentioned prince, being the farthest removed from the common stock, gives the denomination to the degree of kindred in the canon and municipal law: Though according to the computation of the civilians, (who count upwards from either of the persons related to the common stock, and then downwards again to the other; reckoning a degree for each person both ascending and descending,) these two princes are related in the ninth degree; for from king Richard III. to Richard duke of York is one degree; to Richard earl of Cambridge two; to Edmund duke of York three; to king Edward III. the common ancestor, four; to John of Gaunt five; to John earl of Somerset, six; to John duke of Somerset, seven; to Margaret countess of Richmond, eight; to king Henry VII. nine. See the Table of Consanguinity, Plate LI, wherein all the degrees of collateral kindred to the propositus are computed, as far as the 14th of the civilians and the ninth of the canonists inclusive; the former being distinguished by numeral letters, the latter by common figures.

CONSANGUINITY, LINEAL, is that which subsists between persons of whom one is descended in a direct line from the other; as between John Stocks, the propositus in the table of consanguinity (See Plate LII,) and his father, grandfather, great-grandfather, and so upwards in the direct ascending line; or between John Stocks and his son, grandson, great-grandson, and so downwards in the direct descending line. Every generation, in this direct lineal consanguinity, constitutes a different degree, reckoning either upwards or downwards; the father of John Stocks is related to him in the first degree, and so likewise is his son; his grandsire and grandson in the second; his great-grandsire and great-grandson in the third. This is the only natural way of reckoning the degrees in the direct line; and therefore universally obtains, as well in the civil and canon, as in the common law. This lineal consanguinity falls strictly within the definition given by lawyers, of *vinculum personarum, ab eodem stipite descendit*; as lineal relations descend one from the other, and both of course from the same common ancestor. The doctrine of lineal consanguinity is sufficiently obvious; but it is astonishing to consider the number of lineal ancestors which every man has, within no very great number of degrees: and so many different bloods is a man said to contain in his veins, as he has lineal ancestors. Of these he has two in the first ascending degree, his own parents; he has four in the second; the parents of his father, and the parents of his mother: he has eight in the third, the parents of his two grandfathers, and of his two grandmothers; and, by the same rule of progression, he has 128 in the seventh; 1024 in the tenth; and at the 20th degree, or the distance of twenty generations, every person has above a million of ancestors, as common arithmetic will demonstrate. This will seem surprising to those who are unacquainted with the increasing power of progressive numbers; but is palpably evident from the annexed table, in which the first term is two, and the denominator also two; for each of us has two ancestors in the first degree, the number of whom is doubled at every remove; because each of our ancestors has also two immediate ancestors of his own.

A shorter way of finding the number of ancestors at any even degree, is by squaring the number of ancestors at half that number of degrees. Thus 16 the number of ancestors at four degrees, is the square of four, the number of ancestors at two; 256 is the square of 16; 65536 of 256; and the number of ancestors at 40 degrees would be the square of 1,048,576, or upwards of a million of millions. But notwithstanding these calculations are numerically just, they cannot be supposed to be strictly true of every individual. On the contrary, we are certain from the vast number of intermarriages, that have taken place among consanguineous relations in all ages and countries, that such estimates must be greatly beyond the truth with regard to a great majority of mankind. For instance, if a man's father and mother are cousins german, the son and daughter of two brothers, it is plain, that though he has two grandfathers, he has not four great-grandfathers, but only three. And on this principle, a Jew or Bramin, whose ancestors, for twenty generations, have constantly intermarried within their own tribe, or cast, must have fewer ancestors by many thousands, than a person whose ancestors were under no such restriction by law or custom. And we are certain that the patriarch

Noah, although he might have had 32 ancestors in the 5th degree, had in fact only two in the tenth. Admitting every deduction, however, for the identity of particular ancestors, by intermarriages among near relations, still the number of lineal ancestors, which every individual has, must be allowed to be very great.

CONSAR, a town of Persia, in the province of Irak, 52 miles N. W. of Ispahan.

CONSBACH, a town of Sweden, in S. Gothland, 32 miles N. of Wardbeg.

CONSCIENCE, [*conscientia*, Latin.] the knowledge or faculty by which we judge of the goodness or wickedness of ourselves.

CONSCIENCE, in ethics, the moral sense. See MORAL PHILOSOPHY.

CONSCIENCE COURTS OF, are courts of recovery of small debts, constituted by act of parliament in London, Westminster, &c. and other populous and trading districts.

CONSECRATION, a rite or ceremony of dedicating and devoting things or persons to the service of God, with an application of certain proper solemnities.

CONSECRATION is also used for the benediction of the elements in the eucharist.

CONSECRATION, in Jewish antiquity, the Mosaic law ordained, that all the first-born, both of men and beasts, should be sanctified or consecrated to God. We find also, that Joshua consecrated the Gibeonites, as David and Solomon did the Nethinims, to the service of the temple; and that the Hebrews sometimes consecrated their fields and cattle to the Lord, after which they were no longer in their power.

CONSECRATION, among antiquaries, is the representation on medals of the apotheosis of an emperor, or his translation among the gods. On one side is the emperor's head, crowned with laurel, sometimes veiled; and the inscription gives him the title of *divus*: on the reverse is a temple, a bustum, an altar, or an eagle taking its flight towards heaven, either from off the altar, or from a cippus. Sometimes the emperor is seen in the air, born up by the eagle; the inscription always consecratio. These are the usual symbols; yet on the reverse of that of Antoninus is the Antonine column. In the apotheoses of empresses, instead of an eagle there is a peacock.

CONSECRATION OF CHURCHES, &c. Among the ancient Christians, the consecration of churches was performed with a great deal of pious solemnity. In what manner it was done for the three first ages, is uncertain; the authentic accounts reaching no higher than the fourth, when in the peaceable reign of Constantine, churches were every where built, and dedicated with great solemnity. Some think the consecration consisted in setting up the sign of the cross, or in placing a communion table in the church; and others, that no more was done than preaching a panegyric sermon in commemoration of the founder, and that then they proceeded to prayers one of which was composed on purpose for the church to be consecrated. The Romanists have a great deal of foppery in the ceremonies of consecration; which they bestow on almost every thing, as bells, candles, books, water, oil, ashes, palms, swords, banners, pictures, crosses, agnus-dei's, roses, children's clouts, &c. In England, churches have been always consecrated with particular ceremonies, the form of which was left to the discretion of the bishop. That observed by archbishop Laud, in consecrating St. Catherine's church, in London, gave great offence.

CONSECTARY, deduction from premises; consequence; corollary. See COROLLARY.

CONSENT OF PARTS, in the animal economy, an agreement or sympathy, whereby, when one part is immediately affected, another at a distance becomes affected in the same manner. This mutual accord or consent is supposed to be effected by the commerce of the nerves, and their ramification throughout the body. The effect is so sensible as even to come under the physicians cognizance: the remedy, therefore, in such cases, is to regard the part originally affected, how remote and grievous soever may be the consequences and symptoms in other places. The fifth conjugation of nerves branched to the parts of the eye, the ear, those of the mouth, cheeks, præcordia, and parts adjacent, &c. is supposed by naturalists to be the instrument of that particular and extraordinary consent between those parts. Hence a savoury thing seen or smelled excites the appetite, and affects the glands and parts

parts of the mouth; that a shameful thing seen or heard affects the cheeks with blushes; on the contrary, if it please, it affects the præcordia, and excites the muscles of the mouth and face to laughter; if it grieve, it affects the glands of the eyes, so as to occasion tears, and the muscles of the face, putting them into an aspect of crying. Dr. Willis, quoted by Mr. Derham, imputes the pleasure of kissing, and its effects, to this pair of nerves; which being branched both to the lips and the genital parts, when the former are affected an irritation is occasioned in the latter. See SYMPATHY.

CONSENTES, in Roman antiquity, the twelve superior gods, or Dii majorum gentium. The word signifies as much as consentientes; that is, who consented to the deliberations of Jupiter's council. Ennius has briefly expressed their names in these lines,

Juno, Vesta, Minerva, Ceres, Diana, Venus, Mars,
Mercurius, Jovi, Neptunus, Vulcanus, Apollo,

CONSENZA, a town of Naples, in Calabria Citerior, anciently called Consentia, 16 miles from the coast. Lou. 16. 39. E. Lat. 39. 25. N.

CONSEQUENCE, [*consequentia*, Lat.] in logic, the conclusion, or what results from reason or argument. See CONCLUSION. The consequence is that other proposition in which the extremes or premises of a syllogism are joined or separated; and is gained from what was asserted in the premises. This word, in a more restrained sense, is used for the relation or connection between two propositions, whereof one is inferred from the other.

CONSEQUENT, something deduced or gathered from a former argumentation. But, in a more precise sense, it is used for the proposition which contains the conclusion, considered in itself, without any regard to the antecedent: in which sense the consequent may be true, though the consequence be false. See the preceding article.

CONSEQUENT OF A RATIO, in mathematics, the latter of the two terms of a ratio, or that to which the antecedent is compared; thus in $m : n$, or m to n , n is the consequent, and m the antecedent. See the articles RATIO and PROPORTION.

CONSERANS, a territory of France, being the S. W. division of the late province of Gascony.

CONSERVATOR, an officer ordained for the preservation of the privileges of some cities and communities, having a commission to judge of and determine the differences among them. In most catholic universities there are two conservators; the conservator of royal privileges, or those granted by kings; and the conservator of apostolical privileges, or those granted by the pope. The first takes cognizance of personal and mixed causes between the regents, students, &c. and the latter of spiritual matters between ecclesiastics.

CONSERVATOR OF SCOTS PRIVILEGES, AT CAMPVERE, an officer belonging to the royal boroughs of Scotland, who before the late revolution in the United Dutch States, took care of the mercantile affairs of Scotland, agreeably to the staple contract between them and the States-General.

CONSERVATOR OF THE PEACE, in the ancient English customs, was a person who had a special charge, by virtue of his office, to see the king's peace kept. Till the erection of justices of the peace by king Edward III. there were several persons who by common law were interested in keeping the same: some having that charge as incident to other offices; and others simply, or of itself, called custodes, or conservators of the peace.

CONSERVATOR OF THE TRUCE, AND SAFE CONDUCTS, was an officer appointed in every sea-port, under the king's letters patent. His charge was to enquire of all offences committed against the king's truce, and safe conducts upon the main sea, out of the franchises of the cinque-ports, as the admirals were wont to do, and such other things as are declared anno 3 Hen. V. cap. 6.

CONSERVATORIO, a musical school for the instruction of children in the profession of music. There are four of these at Venice, for the education of girls, and three at Naples, for that of boys.

CONSERVE, in pharmacy, a form of medicine contrived to preserve the flowers, herbs, roots, or fruits of several simples, as near as possible to what they were when fresh gathered. See PHARMACY.

CONSIDERATION, in law, the material cause or ground of a contract, without which the party contracting would not be bound.

CONSIGLIONE, a town of Sicily, in the valley of Mazar, 19 miles S. of Palermo.

CONSIGNMENT, in law, the depositing of any sum of money,

goods, papers, or commodities, in good hands; either by appointment of a court of justice, in order to be delivered to the persons to whom they are adjudged: or voluntarily, in order to their being remitted to the persons they belong to, or sent to the places they are designed for.

CONSIGNMENT OF GOODS, in commerce, is the delivering or making of them over to another; thus, goods are said to be consigned to a factor, when they are sent to him to be sold, &c. or when a factor sends back goods to his principal, they are said to be consigned to him.

CONSISTENCE, in physics, that state of a body wherein its component particles are so connected or entangled among themselves, as not to separate or recede from each other. It differs from continuity in this, that it implies a regard to motion or rest, which continuity does not, it being sufficient to denominate a thing continuous that its parts are contiguous to each other.

CONSISTENTES, in church-history, a kind of penitents who were allowed to assist at prayers, but who could not be admitted to receive the sacrament.

CONSISTORY, signifies as much as prætorium, a tribunal; it is commonly used for a council-house, session, or assembly of ecclesiastics.

CONSISTORY, is particularly used for the pope's senate and council, before whom judiciary causes were pleaded at Rome. This consistory, or College of Cardinals, (as it is also called) was the first court of tribunal at Rome before the revolution of the 15th Feb. 1798. It never met but when the pope pleased to convoke it: he presided in person mounted on a magnificent throne, and habited in his pontificalia; on the right sat the cardinal bishops and priests, and on the left the cardinal deacons. The place where it was held, was a large hall in the apostolical palace, where princes and ambassadors were received. The other prelates, protonotaries, auditors of the rota, and other officers were seated on the steps of the throne: the courtiers sat on the ground; ambassadors on the right, and consistorial and fiscal advocates behind the cardinals. Besides the public consistory, there was also a private one, held in a retired chamber, called the chamber of papegay; the pope's throne being only raised two steps. Nobody was admitted but the cardinals, whose opinions were collected, and called sentences.

CONSISTORY was also used among the reformed, for a council or assembly of ministers and elders, to regulate their affairs, discipline, &c.

CONSISTORY, or COURT, CHRISTIAN, in the English laws, is a council of ecclesiastical persons, or the place of justice in an ecclesiastical or spiritual court. Every archbishop and bishop has a consistory court, held before his chancellor or commissary, either in his cathedral, in some chapel, aisle, or portico, or in some other convenient place of his diocese, for ecclesiastical causes.

CONSOLATION, in rhetoric, one of the points, wherein the orator endeavours to moderate the grief of another.

CONSOLE, in architecture, an ornament cut upon the key of an arch, which has a projecture, and, on occasion, serves to support little corniches, figures, busts, and vases. They are also called mutules and modillions, according to their form.

CONSONANCE, in music, is ordinarily used in the same sense with concord, viz. for the union or agreement of two sounds, produced at the same time, the one grave and the other acute; which mingling in the air in a certain proportion, occasion an accord agreeable to the ear. See CONCORD.

CONSONANT, [*consonans*, Lat.] a letter which cannot be sounded, or but imperfectly, by itself.

CONSONANTS are divided into mutes and liquids; and subdivided into labials, dentals, &c. See GRAMMAR.

CONSPIRACY, in law, signifies an agreement between two or more, falsely to indict, or procure to be indicted, an innocent person of felony.

CONSPIRATORS are, by statute, defined to be such as bind themselves by oath, covenant, or other alliance, to assist one another falsely and maliciously to indict persons, or falsely to maintain pleas.

CONSPIRATORS in treason, are those that plot against the king and the government.

CONSPIRING POWERS, in mechanics, all such as act in direction not opposite to one another.

CONSTABLE, [from *comes stabuli*,] an officer anciently well known.

known in the empire; so called, because, like the great constable of France, (an office suppressed by Lewis XIII.) as well as the lord high constable of England, he was to regulate all matters of chivalry, tilts, tournaments, and feats of arms, which were performed on horseback.

CONSTABLE, LORD HIGH, OF ENGLAND, is the 7th great officer of the crown; and he with the earl marshal of England, were formerly judges of the court of chivalry, called in king Henry IV.'s time *Curia Militaris*, and now the court of honour. It is the fountain of the martial law, and anciently was held in the king's hall. The power of the lord high constable was formerly so great, and of which so improper a use was made, that so early as the 13th of king Richard II. a statute passed for regulating and abridging it, together with that of the earl marshal of England; and by this statute, no plea could be tried by them or their courts, that could be tried by the common law of the realm. The office of constable is said to have existed before the conquest. After the conquest, the office went with inheritance, and by the tenure of the manors of Harlefield, Newham, and Whitenhurst, in Gloucestershire, by grand sergeantry, in the family of the Bohuns earl of Hereford and Essex, and afterwards in the line of Stafford as heirs general to them; but in 1521, this great office became forfeited to the king in the person of Edward Stafford duke of Buckingham, who was that year attainted for high treason; and in consideration of its extensive power, dignity, and large authority, both in war and peace, it has never been granted to any person, otherwise than *hac vice*, to attend at a coronation, or trial by combat.

CONSTABLE, LORD HIGH, OF SCOTLAND, is an office of great antiquity and dignity. The first upon record is Hugo de Morville in the reign of David I. He has two grand prerogatives, viz. 1. The keeping of the king's sword, which the king, at his promotion, when he swears fealty, delivers to him naked. Hence the badge of the constable is a naked sword. 2. The unlimited command of the king's armies in the field, in the absence of the king; but this command did not extend to castles and garrisons. He was likewise judge of all crimes committed within two leagues of the king's house, which precinct was called the Chalmers of Peace.

CONSTABLES, INFERIOR. From the great office of high constable is derived that inferior order, since called the constables of hundreds and franchises; these were first ordained in the 13th year of Edward I. by the statute of Winchester: which, from the conservation of the peace, and view of armour, appointed that two constables should be chosen in every hundred and franchise. These are what we now call *constabularii capitales* or High Constables; because continuance of time, and increase of people, &c. have occasioned others of like nature, but inferior authority, in every town, called petty constables, or sub-constabularii, first instituted about the reign of Edward III. The former, or modern high constables, are appointed at the court leets of the franchise or hundred over which they preside; or, in default of that, by the justice at their quarter sessions; and are removeable by the same authority that appoints them. The petty constables have two offices united in them, the one ancient and the other modern. Their ancient office is that of head-borough, tithing-man, or bors-holder; who are as ancient as the time of king Alfred; their more modern office is that of a constable merely: which was appointed so lately as the reign of Edward III. to assist the high constable. And in general the ancient head-boroughs, tithing-men, and bors-holders, were made use of to serve as petty constables; though not so generally, but that in many places they still continue distinct officers from the constables. They are all chosen by the jury at the court-leet; or if no court-leet be held, are appointed by two justices of the peace. The general duty of all constables, both high and petty, as well as the other officers, is to keep the king's peace in their several districts; and to that purpose they are armed with very large powers of arresting and imprisoning, of breaking open houses and the like; of the extent of which powers, considering what manner of men are for the most part put upon these offices, it is perhaps very well they are generally kept in ignorance. One of their principal duties arising from the statute of Winchester, which appoints them, is to keep watch and ward in their respective jurisdictions. The constable may appoint watchmen at his discretion, regulated by the custom of the place; and these, being his deputies, have, for the time being, the authority of their principal.

CONSTADT, a town of Silesia in the principality of Oels, 13 miles E. S. E. of Namslau.

CONSTANCE, a strong town of Germany, in the circle of Suabia, seated between two lakes, 35 miles N. E. of Zurich. Lon. 9: 10. E. Lat. 47. 38. N.

CONSTANCE, LOWER, or ZELLER ZEE, a lake between Germany and Switzerland, 16 miles long and 10 broad.

CONSTANCE, UPPER, or BADEN ZEE, a large lake between Germany and Switzerland, 45 miles long and 18 broad. The Rhine runs through both it and the lower lake.

CONSTANCY, in ethics, implies steadiness, particularly under sufferings. It was the saying of a heathen philosopher, That there cannot be imagined upon earth a spectacle more worthy the regard of the Creator, than a brave man superior to his sufferings. Nothing indeed can be more honourable than to have courage to execute the commands of reason and conscience; and to be proof against poverty, pain, and death itself, so far as not to do any thing that is scandalous or sinful to avoid them. Of this virtue the following example is selected, as at least equal to any other upon record; though the martyrology of Scotland furnishes many not inferior. Sir William Askew of Kelsay, in Lincolnshire, had several daughters. His second, named Anne, had received a genteel education; which, with an agreeable figure and good understanding, rendered her a very proper person to be at the head of a family. Her father, regardless of his daughter's inclination and happiness, obliged her to marry a gentleman who had nothing to recommend him but his fortune, and who was a most bigoted Papist. No sooner was he convinced of his wife's regard for the doctrines of the reformation, than, by the instigation of the priests, he violently drove her from his house, though she had born him two children, and her conduct was unexceptionable. Abandoned by her husband, she came up to London, to procure a divorce, and make herself known to that part of the court who either professed or were favourers of Protestantism; but as Henry VIII. had just enacted the law of the six articles, commonly called the bloody statute, she was cruelly betrayed by her own husband; and, upon his information, taken into custody, and examined concerning her faith. The act denounced death against all who should deny transubstantiation; or, maintain the necessity of receiving the sacrament in both kinds; or affirm, that it was lawful for priests to marry; that the vows of celibacy might be broken; that private masses were of no avail; and that auricular confession to a priest was not necessary to salvation. Upon these articles she was examined by the inquisitor, a priest, the lord mayor of London, and the bishop's chancellor; and to all their queries gave proper answers; but not being such as they approved, she was sent back to prison, where she remained eleven days alone, being denied the small consolation of a friendly visit. The king's council being at Greenwich, she was once more examined by chancellor Wriothesley, Gardiner bishop of Winchester, Dr. Cox, and Dr. Robinson; but not being able to convince her of her supposed errors, she was sent to the tower. Mr. Strype, from an authentic paper, gives the following short account of her examination:—"Sir Martin Bowes (lord mayor) sitting with the council, as most meet for his wisdom, and seeing her stand upon life and death, I pray you, quoth he, my lords, give me leave to talk to this woman? Leave was granted. *Lord Mayor.* Thou foolish woman, sayest thou that the priest cannot make the holy body of Christ? *A. Askew.* I say so, my lord: for I have read that God made man; but that man made God I never read; nor I suppose ever shall read it. *L. M.* No! Thou foolish woman, after the words of consecration, is it not the Lord's body? *A. A.* No: it is but consecrated bread, or sacramental bread. *L. M.* What if a mouse eat it after consecration; what shall become of this mouse? what sayest thou, thou foolish woman? *A. A.* What shall become of her, say you, my lord? *L. M.* I say, that the mouse is damned. *A. A.* Alack, poor mouse!" Perceiving that some could not keep in their laughing, the council proceeded to the butchery and slaughter that they intended before they came there. It was strongly suspected, that Mrs. Askew was favoured by some ladies of high rank; and that she carried on a religious correspondence with the queen. So that the chancellor Wriothesley, hoping that he might discover something that would afford matter of impeachment against that princess, the Earl of Hertford, or his countess, who all favoured reformation, ordered her to be put to the rack; but her fortitude in suffering, and her resolution

not to betray her friends, was proof against that diabolical invention. Not a groan, not a word, could be extorted from her. The chancellor, provoked with what he called her obstinacy, augmented her tortures with his own hands, and with unheard of violence: but her courage and constancy were invincible; and these barbarians gained nothing by their cruelties but everlasting disgrace and infamy. As soon as she was taken from the rack, she fainted away; but being recovered, she was condemned to the flames. Her bones were dislocated in such a manner, that they were forced to carry her in a chair to the place of execution. While she was at the stake, letters were brought her from the lord chancellor, offering her the king's pardon if she would recant. But she refused to look at them; telling the messenger, that "she came not thither to deny her Lord and Master." The same letters were also tendered to three other persons condemned to the same fate; and who, animated by her example, refused to accept them. Whereupon the lord mayor commanded the fire to be kindled; and with savage ignorance cried out, *Fiat justitia*, "Let justice take its course." The faggots being lighted, she commended her soul, with the utmost composure, into the hands of her Maker; and, like the great founder of the religion she professed, expired, praying for her murderers, July 16, 1546, about the 25th year of her age.

CONSTANTIA, a district at the Cape of Good Hope, consisting of two farms, which produce the well known wine so much prized in Europe, and known by the name of Cape or Constantia wine.

CONSTANTINA, a territory of Africa, in the kingdom of Algiers.

CONSTANTINA, the capital of the above territory, 75 miles from the sea. Lon. 7. 12. E. Lat. 36. 4. N.

CONSTANTINA, a small territory of Spain, in Andalusia.

CONSTANTINA, the capital of the above territory. Lon. 5. 35. W. Lat. 37. 40. N.

CONSTANTINE, the name of 13 emperors of the East. There is a strange inaccuracy among authors in enumerating the emperors of this name. Some make only IX; others X; Alstedius reckons XI; Marcel and other good chronologists enumerate XIII; while almost all of them occasionally blunder in their numbers, when applied to particular emperors.

CONSTANTINE I. surnamed the Great, the first emperor of the Romans who embraced Christianity. Dr. Anderson in his *Royal Genealogies*, makes him not only a native of Britain, but the son of a British princess. It is certain that his father Constantius Chlorus, was at York, when, upon the abdication of Dioclesian, he shared the Roman empire with Galerius Maximinus in 305, and that he died in York, in 306; having first caused his son Constantine to be proclaimed emperor by his army, and by the Britons. Galerius at first refused to admit Constantine to his father's share in the imperial throne; but after having lost several battles, he consented in 308. Maxentius, who succeeded Galerius, opposed him; but was defeated, and drowned himself in the Tiber. The senate then declared Constantine first Augustus, and Licinius his associate in the empire, in 313. These princes published an edict, in their joint names, in favour of the Christians: but soon after Licinius, jealous of Constantine's renown, conceived an implacable hatred against him, and renewed the persecutions against the Christians. This brought on a rupture between the emperors, and a battle, in which Constantine was victorious. A short peace ensued; but Licinius having shamefully violated the treaty, the war was renewed when Constantine totally defeating him, he fled to Nicomedia, where he was taken prisoner and strangled in 323. Constantine, now becoming sole master of the whole empire, immediately formed the plan of establishing Christianity as the religion of the state; for which purpose he convoked several ecclesiastical councils: but finding he was likely to meet with great opposition from the Pagan interest at Rome, he conceived the design of founding a new city, to be the capital of his empire. See **CONSTANTINOPLE**. Constantine now displayed his regard for the religion which he had adopted, by building numerous churches, and taking a journey to Jerusalem to visit the holy sepulchre. In the Holy Land he erected a church at Bethlehem. At this time the Christian world was disturbed by the disputes between the orthodox and the Arians. At the head of the first stood Athanasius, to whom Constantine shewed but little favour, and consented to his banishment;

but afterwards he condemned the doctrines of Arius, and adhered to the Nicene confession. He poured a flood of wealth on the Christian world. With this zeal for religion he blended courage and justice. He performed many actions that entitled him to the name of Great. In 332, the Sarmatians implored his assistance against the Goths, who had made an irruption into their territories, and destroyed every thing with fire and sword. The emperor readily granted their request, and gained a complete victory. Near 100,000 of the enemy perished, either in the battle, or after it, with hunger and cold. In consequence of this overthrow, the Goths were obliged to sue for peace; but the ungrateful Sarmatians no sooner found themselves delivered from their enemies, than they turned their arms against their benefactor, and ravaged the provinces of Masia and Thrace. The emperor, receiving intelligence of this treachery, returned with incredible expedition, cut great numbers of them in pieces, and obliged the rest to submit. Constantine seems to have been a prince very highly respected, even by far distant nations. In 333, according to Eusebius, ambassadors arrived at Constantinople from the Blemies, Indians, Ethiopians, and Persians, courting his friendship. They were received in a most obliging manner; and learning from the ambassadors of Sapor, king of Persia, that there were great numbers of Christians in their master's dominions, Constantine wrote a letter in their behalf to the Persian monarch. Next year, the Sarmatians being attacked by the Goths, found themselves obliged to arm their slaves against them. They thus overcame the Goths: but the victorious slaves turning their arms against their masters, drove them out of the country. This misfortune obliged them, to the number of 300,000, to apply for relief to the emperor, who incorporated with his legions such as were capable of service; and gave settlements to the rest in Thrace, Scythia, Macedon, and Italy. This was the last remarkable action of Constantine. He died May 25, aged 66, 337, having divided the empire among his children and nephews, in the following manner. Constantine, his eldest son, had Gaul, Spain, and Britain; Constantius, the second, had Asia, Syria, and Egypt; and Constans, the youngest, Illyricum, Italy, and Africa. To his nephew Dalmatius, he gave Thrace, Macedon, and Achaia; and to king Annabalianus, his other nephew, Armenia Minor, Pontus, Cappadocia, and the city of Cæsarea, which he desired might be the capital of his kingdom.

CONSTANTINE, ROBERT, a learned physician born at Caen, taught polite literature in that city: and acquired great reputation by his skill in the Greek language, in history, and in medicine. He died in 1603, aged 103. He wrote a dictionary in Greek and Latin, and other works, which are esteemed.

CONSTANTINE, in geography, a kingdom of Africa, in Barbary, bounded on the N. by the Mediterranean, on the E. by the kingdom of Tunis, on the S. by Biledulgerid, and on the W. by the river Sufegmar, which separates it from the kingdom of Bugia. It is the new Numidia of the ancients, and had its own kings; but it is now a province of Algiers.

CONSTANTINOPLE, one of the largest and most celebrated cities in Europe, situated at the eastern extremity of Romania, and capital of the Ottoman empire. It is delightfully situated between the Black Sea and the Archipelago, and is now called Istambul by the Turks, and by the Greeks Stampoli. It is 700 miles S. E. of Vienna. Lon. 28. 59. E. from London, Lat. 41. 1. N. There are a great number of ancient monuments, of the original grandeur of Constantinople, still remaining. Among these may be mentioned the ancient Hippodrome, begun by Alexander Severus and finished by Constantine. The Turks call it *Atmeidan*. It has a pyramid of Theban marble inscribed with hieroglyphics. See **HIPPODROME**. There is also a colossus consisting of several square blocks of free-stone; a triangular pillar of cast brass representing three serpents entwined in each other, but the triple head is wanting; a column erected in honour of the emperor Arcadius, &c. but the superb temple of St. Sophia, now converted into a mosque, surpasses all the rest for grandeur and elegance. This city was enlarged and beautified by the emperor Constantine the Great, in 330. At the same time he transferred thither the seat of the empire; and this removal is generally thought to have been one of the principal causes of the sudden decline of the western empire. The number of inhabitants in this extensive city, has been variously estimated. Dr. Brookes and

Mr.

Mr. Walker state it at 800,000; of whom one-half are Turks; two-thirds of the other half Christians, and the rest Jews. Mr. Crutwell makes it 900,000; of whom 300,000 are Greeks, nearly 200,000 Armenians, and the rest Turks or other Europeans. But from the frequent depredations made by the plague, estimates of the population of this city made at different periods must necessarily vary.

CONSTANTINOPLE, THE STRAIT OF, anciently called Thracian Bosphorus, and forming the communication between the Euxine or Black Sea, and the Propontis, or sea of Marmora, is 20 miles long, and a mile and a quarter broad, where it is narrowest.

CONSTANTINOW, a town of Poland, in Volhynia, 96 miles S.E. of Lucko.

CONSTANTIUS I, surnamed **CHLORUS**, one of the few excellent emperors of Rome. He succeeded along with Galerius, A.D. 305, and died at York in 311, leaving a character completely amiable. To the military fame justly acquired in his victorious expeditions to Germany and Britain, he added the virtues of frugality, chastity, temperance, clemency, justice, and mercy. Though not a professed Christian himself, he would not suffer the Christians to be injured; and on his death-bed, he particularly recommended them to the protection of his son and successor, Constantine the Great.

CONSTAT, in law, a certificate which the clerk of the pipe and auditors of the exchequer make at the request of any person who intends to plead or move in that court for the discharge of any thing; and the effect of it is, the certifying what does *constare* upon record touching the matter in question. A *constat* is held to be superior to a certificate; because this may err or fail in its contents; that cannot, as certifying nothing but what is evident upon record. The exemplification under the great seal of the enrolment of any letters patent is also called *constat*.

CONSTELLATION, in astronomy, a system of several stars, near one another, but not in a cluster. Astronomers not only mark out the stars, but to bring them into order, they distinguish them by their situations and positions in respect to each other; and distribute them into constellations, allowing several stars to make up one constellation. For the better distinguishing of them, they reduce these constellations to the forms of animals, as men, bulls, bears, &c.; or to the images of some things known, as of a crown, a harp, a balance, &c.; or give them the names of those, whose memories they wish to transmit to future ages. The division of the stars by images and figures is of great antiquity, for in the book of Job, Orion, Arcturus, and the Pleiades, are mentioned; and we meet with the names of many constellations in the writings of Homer and Hesiod. The ancients, in their division of the firmament, took in only so much as came under their notice, distributing it into 48 constellations; but the modern astronomers comprehend the whole starry firmament, dividing it into three regions. See **ASTRONOMY**.

CONSTITUENT PART, in physiology, differs little from element and principle, which see.

CONSTITUTION, in a physical sense, is the particular temperament of the body, which depends chiefly on the state of its humours or fluids, and sometimes also on the solids, but especially the nerves. It is curious, says Dr. Percival, to observe the revolution that has taken place, within the last century, in the constitutions of the inhabitants of Europe. Inflammatory diseases occur less frequently; and in general are less rapid and violent in their effects, than they were formerly. This advantageous change, however, is more than counter-balanced by the introduction of debilitating articles of food and drink, several of which were utterly unknown to our ancestors, but now universally prevail. The bodies of men are enfeebled and enervated; and it is not uncommon to observe very high degrees of irritability, under the external appearance of great strength and robustness. The hypochondria, palsies, cachexies, dropsies, and all those diseases which arise from laxity and debility, are in our days often endemic; and the hysterics, which used to be peculiar to women, as the name itself indicates, now attack both sexes indiscriminately. It is evident that so great a revolution could not be effected without a concurrence of many causes; but amongst these (according to Dr. Percival), the general use of tea holds the first rank. The second may perhaps be allowed to excess in spirituous liquors. This pernicious custom, it is said, in many instances, owes its rise to the former, which, by the lowness and depression of spirits it occasions, ren-

ders it almost necessary to have recourse to something cordial and exhilarating. It is argued on the other hand, however, that tea tends to exhilarate instead of depressing the spirits; and that those of both sexes who are most addicted to excess in spirituous liquors, are almost always quite indifferent about tea.

CONSTITUTIONS, APOSTOLICAL, a collection of regulations attributed to the apostles, and supposed to have been collected by St. Clement, whose name they likewise bear. It is the general opinion, however, that they are spurious, and that St. Clement had no hand in them. They appeared first in the fourth century, but have been much changed and corrupted since. They are divided into eight books, consisting of a great number of rules and precepts, relating to the duties of Christians, and particularly the ceremonies and discipline of the church.

CONSTRUCTION, [*constructio*], in geometry, is the drawing of such lines, such a figure, &c. as are previously necessary for the making of any demonstration appear more plain and undeniable.

CONSTRUCTION OF EQUATIONS, in algebra, the method of drawing a geometrical figure, whose properties shall express the given equation, in order to demonstrate the truth of it geometrically. See **EQUATIONS, CONSTRUCTION OF**.

CONSTRUCTION, in grammar, the connecting of the words of a sentence according to the rules of the language. Construction is either simple or figurative, according as the parts of the discourse are placed in their natural order; or recede from that simplicity, when shorter and more elegant expressions are used than nature affords. The construction of words, called syntax, is distinguished into two parts, concord and regimen. See **GRAMMAR**.

CONSUALIA, in antiquity, feasts held in honour of the god Consus or Neptune; different from the Neptunalia. They were introduced with a magnificent cavalcade, because Neptune was reputed to have first taught men the use of horses. Evander is said to have first instituted this feast.

CONSUBSTANTIAL, [*ομοουσιος*], was a term first attempted by the fathers of the councils of Antioch and Nice, to express the orthodox doctrine the more precisely, and to serve as a barrier and precaution against the errors and subtleties of the Arians; who owned every thing except the consubstantiality. The Arians allowed that the Word was God, as having been made God; but they denied that he was the same God, and of the same substance with the Father: accordingly they exerted themselves to the utmost to abolish the use of the word. The emperor Constantine used all his authority with the bishops to have it expunged out of the symbols; but it was retained, and is still the distinguished criterion between an Athanasian and an Arian. Sandius insists, that the word consubstantial was unknown till the time of the council of Nice, but it is certain, it had been proposed to the council of Antioch and rejected.

CONSUBSTANTIATION. See **LUTHERANISM**.

CONSUEGRA, a town of Spain, in New Castile, belonging to the knights of Malta; 25 miles S.S.E. of Toledo.

CONSUL, [*consul*, *consulendo*, Lat.] the chief magistrate in the Roman republic. There were two magistrates invested with supreme authority for one year, and annually chosen in the Campus Martius. Brutus and Collatinus, the two first consuls, were elected A.U.C. 244. For 144 years afterwards the consuls were always chosen from Patrician families, but the people obtained the privilege of electing one of the consuls from their own body, A.U.C. 388, and sometimes both were plebeians. The first consul among the plebeians was L. Sextius. The *legitimum tempus*, the time fixed by law, for the consulship was 43 years of age. The candidate was always to appear at the election as a private man without a retinue, and it was requisite before he canvassed for the office to have discharged the functions of a *quaestor*, *edile*, and *praetor*. Sometimes these qualifications were disregarded.

CONSUL, at present, is an officer established by virtue of a commission from the king and other princes, in all foreign countries of any considerable trade, to facilitate and dispatch business, and protect the merchants of the nation. The consuls are to keep up a correspondence with the ministers of England residing in the courts whereon their consulate depends. They are to support the commerce and the interest of the nation; to dispose of the sums given, and the presents made to the lords and principals of places, to obtain their protection, and prevent the insults of the natives on the merchants of the nation. By the treaty of Utrecht between Great Britain and Spain, the consul residing in the king of Spain's dominions.

dominions shall take inventories of the estates of the English dying intestate in Spain; and these estates shall be intrusted with two or three merchants, for the security and benefit of the proprietors and creditors.

CONSULTATION, in law, a writ by which a cause being removed from the spiritual court to the king's court, is returned thither again; and the reason is, that if the judges of the king's court, by comparing the libel with the suggestion of the party, find the suggestion false or not proved, and on that account the cause to be wrongfully called from the ecclesiastical court, then upon this consultation or deliberation they decree it to be returned. This writ is in the nature of a *procedendo*; yet properly a consultation ought not to be granted, only in case where a person cannot recover at the common law. In causes of which the ecclesiastical and spiritual courts have jurisdiction, and they are not mixed with any temporal thing; if suggestion is made for a prohibition, a consultation shall be awarded.

CONSUMPTION, in medicine, is a very comprehensive term, including all those diseases, in which the body, from a defect of nourishment, is gradually reduced to a state of debility and emaciation. This fatal disorder may arise from a great variety of causes, such as a mal-conformation of the trunk; straitness of the chest; intemperance of whatever kind; obstructions in the pulmonary vessels; suppression of any natural evacuations; as likewise in consequence of pleurisy, coughs, catarrhs, diarrheas, grief, intense study, &c. More frequently, however, it originates from a neglected cold, especially in constitutions where a peculiar hereditary disposition prevails, without any other discoverable cause. See **MEDICINE**.

CONSUS, a name of Neptune, the pagan god of counsel. He had an altar under ground in the great circus at Rome, to shew that counsel ought to be kept secret.

CONTA, a river of Italy, in Liguria, which runs into the sea near Albenga.

CONTABULATE, *v. a.* [*contabulo*, Lat.] to floor with boards.

CONTABULATION, [*contabulatio*, Lat.] a joining of boards together.

CONTACT, [*contactus*, Lat.] is when one line, plane, or body, is made to touch another, and the parts that do thus touch, are called the points or places of contact. The contact of two spheres, and of a tangent with the circumference of a circle, is only in one point.

CONTAGION, [*contagio*, Lat.] infection, or the communication of a disease from one body to another. In some cases it is conveyed by immediate contact or touch; in others, by infected clothes, such as cotton, and particularly wool, which of all substances is the most susceptible, because it is extremely porous. Contagious matter is also, though we apprehend erroneously, said to be transmitted through the air, at a considerable distance, by means of effluvia arising from the sick, in which case the atmosphere is said to be infected. Some authors have asserted, that the gout and consumption are likewise contagious; but this appears to be very doubtful. It is, however, highly probable, that those diseases may be communicated by the milk of nurses. In temperate climates, like that of Britain, there is but little danger of contracting them by infection, among adults; though, in the warmer climates of Europe, it will be prudent to take the necessary precautions against such accidents. To obviate as far as possible all infection, we would recommend to those who are obliged to attend patients, never to approach them fasting; and, while they are in their apartment, to avoid both eating and drinking, and also the swallowing of their own saliva. Nor will it be altogether useless to chew myrrh, cinnamon, and similar drugs, which promote a plentiful discharge from the mouth. As soon as a person has returned from visiting an infected patient, he ought immediately to wash his mouth and hands with vinegar; to change his clothes, carefully exposing those he has worn to the fresh air; and then to drink a warm infusion of sage, or other aromatic herbs, which tends to open the pores, and expel, by means of a gentle perspiration, the pestilential virus, if any should have incorporated with the mass of his fluids. It will also be of considerable service to those who are employed about sick persons, frequently to smell vinegar and camphor, or to fumigate the apartments with tobacco, the pungency of which accelerates the circulation of the blood,

and is believed to prevent infection, by attracting the contagious effluvia.

CONTAGION, a disorder peculiar to cattle, more commonly called distemper, to which we refer.

CONTAY, a town of France, in the department of Somme, 10½ miles N.E. of Amiens.

CONTCHOUDESONG, a town of Asia, in Thibet, 380 miles E.N.E. of Lassa.

CONTEMPLATION, an act of the mind, whereby it applies itself to consider and reflect upon the works of God, nature, &c.

CONTEMPT, in law, is a disobedience to the rules and orders of a court, which hath power to punish such offence; and as this is sometimes a greater, and sometimes a less offence, so it is punished with a greater or less punishment, by fine or imprisonment.

CONTENT, in geometry, the area or quantity of matter or space included in certain bounds. The content of a tun of round timber is 43 solid feet. A load of hewn timber contains 50 cubic feet: in a foot of timber are contained 1728 cubic or solid inches; and as often as 1728 inches are contained in a piece of timber, be it round or square, so many feet of timber are contained in the piece. See **MENSURATION**.

CONTENTIOUS JURISDICTION, in law a court which has a power to judge and determine differences between contending parties. The lord chief justices, and judges, have a contentious jurisdiction; but the lords of the treasury, and the commissioners of the customs, have none, being merely judges of accounts and transactions.

CONTERMINOUS. Repetends, or circulates, containing an equal number of circulating places, are so called.

CONTEXT, among divines and critics, that part of scripture or of a writing that precedes and follows the text. See **TEXT**. In order to have the full sense of the text, the context should be regarded.

CONTI, a town of France, in the department of Somme, 62 miles N. of Paris.

CONTIGUITY, in geometry, is when the surface of one body touches that of another.

CONTIGUOUS ANGLES, in geometry, are such as have one leg common to each angle, and are sometimes called adjoining angles, in contradistinction to those produced by continuing their legs through the point of contact, which are called opposite or vertical angles. See **ANGLE**. The sum of any two contiguous angles is always equal to two right angles.

CONTINENCE, in ethics, is that moral virtue, by which we resist concupiscence. There is this distinction between chastity and continence in that it requires no effort to be chaste, which results from constitution; whereas continence appears to be the consequence of a victory gained over ourselves. The original verb, *continere*, signifies to restrain. The term, however is most usually applied to men; as chastity is to women. See **CHASTITY**. Continence is a virtue too little regarded in modern times. But however fashionable certain vices may be, solid virtue will always keep its place in the opinion of the wise and sensible part of mankind.

CONTINENT, [*continens*, Lat.] in geography, a great extent of land not interrupted by seas, in contradistinction to island, peninsula, &c. See **GEOGRAPHY**. The world is usually divided into two great continents, the old and the new. Whether there exists in the southern hemisphere another continent, or the whole be only an immense watery region, was a question that for near three centuries engaged the attention of the learned as well as the commercial world, and gave rise to many interesting voyages and discoveries.

CONTINGENT, [*contingens*, Lat.] falling out by chance; accidental; not determinable by any certain rule. Hence future contingent, in logic, denotes a conditional event which may or may not happen, according as circumstances fall out.

CONTINGENT is also a term of relation for the quota that falls to any person upon a division. Thus each prince in Germany, in time of war was formerly obliged to furnish so many men, and so much money and ammunition for his contingent.

CONTINGENT USE, in law, is an use limited in a conveyance of lands which may or may not happen to vest, according to the contingency mentioned in the limitation of the use. And a con-

tangent remainder is when an estate is limited to take place at a time to come, on an uncertain event.

CONTINGENT LINE in dialling, the same with the tangent line. It is supposed to arise from the intersection of the plane of the dial and the equinoctial; and is so called because it is a tangent to a circle, drawn upon the plane of the dial, and is at right angles with the substilar line. See **DIALLING**.

CONTINUAL, [*continuus*, Lat.] in law, a continual claim is made from time to time, within every year and a day, to land or other thing, which, in some respect, we cannot attain without danger. For example, if I be disseised of land into which, though I have right into it, I dare not enter, for fear of beating; it becometh me to hold on my right of entry to the best opportunity of me and mine heir, by approaching as near it as I can, once every year as long as I live; and so I save the right of entry to my heir.

CONTINUAL PROPORTIONALS, in arithmetic, are such numbers, wherein the consequent of the first ratio is the same with the antecedent of the second, as 4 : 8 :: 8 : 16. And, on the contrary, if the consequent of the first ratio be different from the antecedent of the second, the proportion is said to be discrete, as 3 : 6 :: 4 : 8.

CONTINUANCE OF A WRIT OR ACTION, is its continuing in force from one term to another, where the sheriff has not returned a former writ issued out in the same action. With respect to continuances, the court of king's bench is not to enter them on the roll till after issue or demurrer, and then they enter the continuance of all on the back, before judgement.

CONTINUED BASS, in music, thus called, says, Rousseau, because it is continued through the whole piece. Its principal use, besides that of regulating the harmony, is to support the voice and preserve the tone. They pretend that it was one Ludovico Viana, of whom a treatise still remains, who, towards the end of the last century first put the continued bass in practice.

CONTINUED FEVER, is such a one as sometimes remits, but never intermits or goes entirely off, till its period.

CONTINUED PROPORTION, in arithmetic, is that where the terms or quantities compared are continual proportionals; that is, where the consequent of the first ratio is the same with the antecedent of the second. See **CONTINUAL PROPORTIONALS**.

CONTINUITY is defined by some schoolmen the immediate cohesion of parts in the same quantum; by others, a mode of body, whereby its extremities become one; and by others, a state of body resulting from the mutual implication of its parts. There are two kinds of continuity, mathematical and physical. The first is merely imaginary, since it supposes real or physical parts where there are none. The other or physical continuity, is that state of two or more particles, in which their parts are so mutually implicated as to constitute one uninterrupted quantity.

CONTINUO, in music, or Basso continuo, is the continual or thorough bass, which is sometimes marked in music books by the letters B.C.

CONTOBADDITES, a sect which appeared in the 6th century. Their first leader was Severus of Antioch; who was succeeded by John the grammarian, surnamed Philoponus, and one Theodosius whose followers were also called Theodosians.

CONTORSION, in medicine, signifies, 1. The iliac passion: 2. An incomplete dislocation, when a bone is in part, but not entirely, forced from its articulation: 3. A dislocation of the vertebræ of the back side-ways, or a crookedness of these vertebræ: an 4. A disorder of the head, in which it is drawn towards one side, either by a spasmodic contraction of the muscles on the same side, or a palsy of the antagonist muscles on the other.

CONTOUR, in architecture, is the outline of any member, as that of a base, cornice, &c.

CONTOUR, among the Italian painters signifies the lineaments of the face.

CONTOURNE, in heraldry, is used when a beast is represented standing or running with its face to the sinister side of the escutcheon, they being always supposed to look to the right, if not otherwise expressed.

CONTOURNIATED, a term among antiquaries applied to medals, the edges of which appear as if turned in a lath.

CONTRABAND, [*contrabando*, Ital. contrary to proclamation,] prohibited; illegal; unlawful.

CONTRABAND, in commerce, a prohibited commodity, or mer-

chandise bought or sold, imported or exported, in prejudice to the laws and ordinances of a state, or the public prohibitions of the sovereign. Contraband goods are not only liable to confiscation themselves, but also subject all other allowed merchandise found with them in the same box, bale, or parcel, together with the horses, waggons, &c. which conduct them. There are contrabands likewise, which, besides the forfeiture of the goods, are attended with several penalties and disabilities. In this country, there are two principal contrabands for exportation, wools and live sheep, which all strangers are prohibited from carrying out of the country; the other that of sheep-skins and calf-skins.

CONTRACT, in a general sense, a mutual consent of two or more parties, who voluntarily promise and oblige themselves to do something, pay a certain sum, or the like. All donations, exchanges, leases, &c. are so many different contracts.

CONTRACT, in common law, an agreement or bargain between two or more persons with a legal consideration or cause; as where a person sells goods, &c. to another for a sum of money; or covenants in consideration of a certain sum, or an annual rent, to grant a lease of a messuage, &c. Contracts are two-fold, either express or implied. Express contracts are where the terms of the agreement are openly uttered, as to pay a stated price for certain goods. Implied are such as reason and justice dictate, and which, therefore, the law presumes that every man undertakes to perform: thus, if a man take up wares from a tradesman, without any agreement of price, the law concludes that he contracted to pay their real value.

CONTRACT, **USURIOUS**, is an agreement to pay more interest for money than the laws allow.

CONTRACTILE FORCE, [from *con*, together, and *traho*, to draw, Lat.] that property or power inherent in certain bodies, whereby, when extended, they are enabled to draw themselves up to their former dimensions.

CONTRACTION, [*contractio*, Lat.] in physics, the diminishing of the extent or dimensions of a body, or the causing of its parts to approach nearer to each other, in which sense it stands opposed to dilatation or expansion. See **EXPANSION**. Water and all aqueous fluids are gradually contracted by a diminution of temperature, until they arrive at a certain point, which is about 8° above the freezing point; but below that point they begin to expand, according as the temperature is lowered. Similar effects have been observed with regard to some metals. Glass and some metals are rendered very hard and brittle by being suddenly cooled. The cause of this effect is thus explained by Dr. Young. "When glass in fusion is very suddenly cooled, its external parts become solid first, and determine the magnitude of the whole piece, while it still remains fluid within. The internal part, as it cools, is disposed to contract still further, but its contraction is prevented by the resistance of the external parts, which form an arch or vault round it, so that the whole is left in a state of constraint; and as soon as the equilibrium is disturbed in any one part, the whole aggregate is destroyed. Hence it becomes necessary to anneal all glass, by placing it in an oven, where it is left to cool slowly; for, without this precaution a very slight cause would destroy it."

CONTRADICTION, a sort of direct opposition, wherein one thing is found directly contrary to another. It is usually defined in the schools, *oppositio inter ens & non ens*, *medio carens*; where by *ens & non-ens*, are meant any two extremes, one whereof affirms and the other denies; and it is said to be *medio carens*, in order the better to distinguish it from other species of oppositions: for the extremes here neither agree in subject, as is the case in form and privation, nor in essence and kind, as in contrariety. See **CONTRARIETY**, and **PRIVATION**.

CONTRADICTION, in a legal sense, a person that has a title to contradict or gainsay. An inventory of the goods of a minor should be made in presence of his guardian, or trustee, he being the legal contradictor. A decree against a farmer has no effect on the landlord, the first not being the legitimate contradictor.

CONTRADICTORY PROPOSITIONS, in logic, are such as differ both in quality and quantity, one being universal and the other particular, which constitutes the opposition of quantity; one affirmative and the other negative, which makes the opposition in quality: thus, A. Every vine is a tree. O. Some vine is not a tree.

CONTRADICTORY,

CONTRADICTORY, SEEMING, is when the members of a period quite disagree in appearance and sound, but perfectly agree and are consistent in sense; thus,

Cowards die many times before their death:

The valiant never taste of death but once.

CONTRA-HARMONICAL PROPORTION, in arithmetic, is that relation of three terms, wherein the difference of the first and second is to the difference of the second and third as the third is to the first: thus, 3, 5, and 6, are numbers contra-harmonically proportional, for 2 : 1 :: 6 : 3.

CONTRAMURE, in fortification, is a wall built before another partition-wall, to strengthen it, so that it may receive no damage from the adjacent buildings.

CONTRARIETY, [from *contrarietas*, Lat.] an opposition between two things, which imports their being contrary to one another; and consists in this, that one of the terms implies a negation of the other, either mediately, or immediately; so that contrariety may be said to be the contrast, or opposition, of two things, one of which imports the absence of the other, as love and hatred.

CONTRAST, [*contrasté*, Fr.] opposition and dissimilitude of figures, by which one contributes to the visibility or effect of another.

CONTRAST, in architecture, is the avoiding of the representation of the same thing, in order to please by variety.

CONTRAST, in painting and sculpture, expresses a difference of position, attitude, &c. of two or more figures; as where, in a groupe of three figures, one is shewn before, another behind, and another sideways, they are said to be in contrast. The contrast is not only to be observed in the position of several figures, but also in that of several members of the same figure: thus, if the right arm advance farthest, the right leg is to be hindmost; if the eye be directed one way, the arm to go the contrary way, &c. The contrast must be pursued even in the drapery.

CONTRATE-WHEEL, in watch-work, that next to the crown, the teeth and hoop of which lie contrary to those of the other wheels, whence it takes its name.

CONTRAVALLATION, [from *contra* and *vallo*, Lat.] the fortification thrown up by the besiegers, round a city, to hinder the sallies of the garrison.

CONTRAVALLATION, LINE OF. See **FORTIFICATION.**

CONTRAVENTION, in law, a man's failing to discharge his word, obligation, duty, or the laws or customs of the place.

CONTRE, in heraldry, an appellation given to several bearings, on account of their cutting the shield contrary and opposite ways: thus we meet with contre-bend, contre-chevron, contre-pale, &c. when there are two ordinaries of the same nature opposite to each other, so as colour may be opposed to metal, and metal to colour.

CONTRES, a town of France, in the department of Loir and Cher, district of St. Aignan, and late province of Blaisois, 10 miles S. of Blois.

CONTRIBUTION, in a general sense, the payment of each person's quota, or the share he bears in some imposition or common expence. Contributions are either voluntary, as those of expences for carrying on some undertaking for the public interest; or involuntary, as those of taxes and imposts.

CONTRIBUTION, in a military sense, an imposition or tax paid by frontier-countries to an enemy, to prevent their being plundered and ruined by him.

CONTRIBUTIOE FACIENDA, in law, a writ that lies where tenants in common are bound to do the same thing, and one or more of them refuse to contribute their part; as where they jointly hold a mill, pro indiviso, and equally share the profits thereof, if the mill falls to decay, and one or more of the persons refuse to contribute to its reparation, the rest shall have this writ to compel them.

CONTRITION, in theology, a sorrow for our sins, resulting from the reflexion of having offended God, from the sole consideration of his goodness, without any regard to the punishment due to the trespass, and attended with a sincere resolution of reforming them. The scripture never uses this term in this sense; but there are several passages which prove, that, without contrition, there is no repentance, and without repentance no remission of sins.

CONTROL, [*controlo*, that is, *contre role*, Fr.] a register or account kept by another officer, that each may be examined by the other.

CONTROLLER, an officer appointed to control or oversee the accounts of other officers; and, on occasion, to certify whether things have been controlled or examined. In Britain we have several officers under this title; as controller of the navy, the customs, the mint, &c. besides the following:

CONTROLLER OF THE HANAPER, an officer who attends the lord chancellor daily, in term and in seal time, to take all things sealed in leathern bags from the clerks of the hanaper, and to make the number and effect thereof, and enter them in a book, with all the duties belonging to the king and other officers for the same, and so charge the clerk of the hanaper with them.

CONTROLLER OF THE HOUSEHOLD, the second officer under the lord steward. His office is to control the accounts and reckonings of the Green Cloth, of which board he is always a member. He carries a white staff, and is always one of the privy council.

CONTROLLER OF THE PELLs, two officers of the exchequer, who are the chamberlain's clerks, and keep a control of the pell of receipts, and goings out.

CONTROLLER OF THE PIPE, an officer of the exchequer, that makes out a summons twice every year, to levy the farms and debts of the pipe. See **PIPE**, and **EXCHEQUER**.

CONTUMACY, [*contumacia*, Lat.] obstinacy; perverse-ness; stubbornness; inflexibility.

CONTUMACY, in law, a wilful contempt and disobedience to any lawful summons or judicial order.

CONTUSION, in medicine and surgery, any hurt of the body that is inflicted by a blunt instrument. See **MEDICINE**, and **SURGERY**.

CONVALESCENCE, or **CONVALESCENCY**, [from *convalesco*, Lat.] signifies the insensible recovery of health; or that state in which, after the cure of a disorder, the body, which has been reduced, has not yet regained its vigour, but begins to resume its power. Proper aliments conduce to the re-establishment of the languid faculties; but as the tone of the bowels is weakened, the digestive faculty is not equal to its office, which is shewn by light sweats over the whole body; and the smallest excess in this respect is oftentimes the occasion of dangerous relapses. A person in this state is like a taper relumined, which the least degree of wind is sufficient to extinguish.

CONVALLARIA, THE LILY OF THE VALLEY, in botany, a genus of the monogynia order, and hexandria class of plants; natural order, Sarmientaceæ. Corolla sexfid; berry spotted, trilocular. There are eleven species.

CONVENE, an ancient people of Gallia Narbonensis, said by Pliny to have been originally robbers and slaves, whom Pompey compelled to settle at the foot of the Pyrenees, after the Sertorian war.

CONVENER, the title given to the præses of the 14 deacons of the Incorporations, or Trades of Edinburgh, from his power of convening the deacons, or the whole incorporations, upon any emergency.

CONVENT. See **MONASTERY**, and **MONK**.

CONVENTICLE, is a diminutive of convent; denoting, properly, a secret assembly of a part of the monks of a convent, to make a party in the election of an abbot. Hence the word is come into disrepute, and stands for any seditious, or irregular assembly. The word was first attributed as an appellation of reproach to the religious assemblies of Wickliffe, in this nation, in the reigns of Edward III. and Richard II. and is now applied to illegal meetings of non-conformists. There were several statutes made in former reigns, for the suppression of conventicles. But the 1st W. and M. cap. 18. ordains, that protestant dissenters shall be exempted from penalties: though if they meet in a house with the doors locked, barred, or bolted, such dissenters shall have no benefit from 1 W. and M. Officers of the government, &c. present at any conventicle, at which there shall be ten persons, if the royal family be not prayed for in express words, shall forfeit 40*l*. and be disabled. 10 Anne, cap. 2.

CONVENTION, a treaty, contract, or agreement between two or more parties. Every convention among men, provided it be not contrary to honesty and good manners, produces a natural obligation, and makes the performance a point of conscience. Every convention has either a name and a cause of consideration, or it has none; in the first case it obliges civilly and naturally, in the latter only naturally.

CONVENTION, is also a name given to an extraordinary assembly

bly of parliament, or the states of the realm, held without the king's writ; as was the convention of estates, who, upon the retreat of James II. came to a conclusion that he had abdicated the throne, and that the right of succession devolved to King William and Queen Mary; whereupon their assembly expired as a convention, and was converted into a parliament.

CONVENTUS JURIDICI, in Roman antiquity, courts of justice established in the provinces; with jurisdictions circumscribed within certain limits, whither all who were of the resort were to repair for justice.

CONVERGE, [*convergo*, Lat.] to tend to one point from different places.

CONVERGING, or **CONVERGENT LINES**, in geometry, are such as continually approach nearer one another; or whose distance becomes still less and less. These are opposed to divergent lines, the distance of which become continually greater: those lines which converge one way diverge the other.

CONVERGING HYPERBOLA, is one whose concave legs bend in towards one another, and run both the same way.

CONVERGING RAYS, in optics, those rays that, issuing from divers points of an object, incline towards one another, till, at last, they meet and cross, and then become diverging rays. See **OPTICS**.

CONVERGING SERIES. See **SERIES**.

CONVERSATION, or **DISCOURSE**, an interlocution between two, or among several persons. There is no part, perhaps, of social life which affords more real satisfaction than those hours which one passes in rational and unreserved conversation. To render conversation at all times agreeable, the following rules have been laid down: 1. The parties should meet together with a determined resolution to please, and to be pleased. 2. No one should be eager to interrupt others, or be uneasy at being interrupted. 3. All should have leave to speak in turn. 4. Inattention should be carefully avoided. 5. Private concerns should never be mentioned, unless particularly inquired into, and even then as briefly as possible. 6. Each person should, as far as propriety will admit, be afforded an opportunity of discoursing on the subject with which he is best acquainted. He will be pleased, and the company will be informed. By observing this rule, every one has it in his power to assist in rendering conversation agreeable; since, though he may not choose, or be qualified, to say much himself, he can propose questions to those who are able to answer them. 7. Stories should be avoided, unless short, pointed, and quite a-propos. He who deals in them, says Swift, must either have a very large stock, or a good memory, or must often change his company. 8. Each person should speak often, but not long. Haranguing in private company is insupportable. 9. If the majority of the company be naturally silent, or reserved, the conversation will flag, unless it be often renewed by one who can start new subjects. 10. It is improper to laugh at one's own wit and humour. This should be left to the company. 11. When the conversation is flowing in a serious and useful channel, never interrupt it by an ill-timed jest. 12. It is at all times extremely indelicate to whisper to one's next neighbour. It is, in some degree, a fraud, conversation being a kind of common property. 13. In speaking of absent people, the infallible rule is, to say no more than we should say, if they were present. "I resolve (said Bishop Beveridge) never to speak of a man's virtues to his face, nor of his faults behind his back." A golden rule; the observation of which would at once banish flattery and defamation from the world.

CONVERSE, in mathematics. One proposition is called the converse of another, when, after a conclusion is drawn from something supposed in the converse proposition, that conclusion is supposed; and then, that which in the other was supposed, is now drawn as a conclusion from it: thus, when two sides of a triangle are equal, the angles opposite to these sides are equal; and, on the converse, if these angles are equal, the two sides are equal.

CONVERSERA, an island in the Adriatic sea, on the coast of Istria.

CONVERSI, a title formerly given to Jews, who were converted to Christianity in England.

CONVERSION, [*conversio*, Lat.] change from one state to another; transmutation.

CONVERSION, in a moral sense, implies a repentance for a tem-

per and conduct unworthy our nature, and unbecoming our obligations to its author, and a resolution to act a wiser and a better part for the future.

CONVERSION, in a scripture sense is the turning, or total change, of a sinner from sin unto God. Psal. 51. 13. "And sinners shall be converted unto thee." It is equivalent to the new birth, and therefore essential to salvation.

CONVERSION, in rhetoric, &c. is understood of arguments which are returned, retorted, and shewn on opposite sides, by changing the subject into the attribute, and the attribute into the subject. See **ATTRIBUTE**, &c.

CONVERSION, in war, a military motion whereby the front of a battalion is turned where the flank was, in case the battalion is attacked in the flank. As this may often be the case in action, this motion is accounted a most useful and necessary one.

CONVERSION OF EQUATIONS, in algebra, is when the quantity sought, or any part or degree thereof, being in fractions, the whole is reduced to one common denomination, and then omitting the denominators, the equation is continued in the numerators only.

Thus suppose $a - b = \frac{aa + cc}{d} + h + b$; multiply all by d , and it will stand thus, $da - db = aa + cc + dh + db$. See **ALGEBRA**.

CONVERSION OF PROPOSITIONS, in logic, the changing of the subject into the place of the predicate, and the predicate into the place of the subject; and yet always retaining the same quality of both propositions: as, every right-lined triangle has the sum of its angles equal to two right ones: every right-lined figure, that has the sum of its angles equal to two right ones, is a triangle. Conversion is usually defined a due change of the order of the extremes: *i. e.* under such a habitude and coherence, with respect to each other, that the one is rightly inferred from the other.

CONVERT, a person who has undergone conversion. See **CONVERSION**. Convert is frequently used in respect of changes from one religion, or religious sect, to another. These, with regard to the religion they have relinquished, are denominated apostates, and converts only with relation to the religion turned to.

CONVERT, in a monastic sense, a lay friar, or brother, admitted for the service of the house; without orders, and not allowed to sing in the choir. The word was anciently used for persons who embraced the monkish life at the age of discretion.

CONVEX, [*convexus*, Lat.] an appellation given to the exterior surface of gibbous or globular bodies, in opposition to the hollow inner surface of such bodies, which is called concave: thus we say, a convex frieze, lens, mirror, superficies, &c.

CONVEX LENS, or **CONVEX MIRROR**. See **CONVEXITY**, and **OPTICS**.

CONVEXITY, in catoptrics and dioptrics; is applied to mirrors and lenses. A convex mirror represents its images smaller than the objects; as a concave one represents them larger: a convex mirror reflects the rays from it, diverging; and therefore disperses and weakens their effect: as a concave one reflects them converging, so as they concur in a point, and have their effect increased: and by how much the mirror is a portion of a smaller sphere, by so much does it diminish the objects, and disperse the rays the more. A convex lens is either convex on both sides, called a *convexo-convex*; or it is plain on one side and convex on the other, called a *plano-convex*; or concave on one side, and convex on the other, called a *convexo-concave*, or *concavo-convex*, as the one or the other surface prevails, *i. e.* as this or that is a portion of a smaller sphere. See **OPTICS**.

CONVEYANCE, in law, a deed which passes land from one to another. The most common conveyances now in use are, deeds of gift, bargain and sale, lease and release, fines and recoveries, settlements to uses, &c. A conveyance cannot be fraudulent in part, and good as to the rest; for if it be fraudulent and void in part, it is void in all, and it cannot be divided. Fraudulent conveyances to deceive creditors, defraud purchasers, &c. are void, by stat. 50 Ed. III. c. 6. 13 Eliz. c. 5. 27 Eliz. c. 4.

CONVICT, in common law, a person that is found guilty of an offence by the verdict of a jury. The law implies that there must be a conviction before punishment for any offence, though it be not mentioned in any statute. On a joint indictment, or information, some of the defendants may be convicted and others acquitted.

CONVIET

CONVICT RECUSANT, a person who has been legally presented, indicted, and convicted, for refusing to come to church to hear the common prayer, according to the statutes 1 and 23 Eliz. and 3 Jac. 1.

CONVICTION, in theology, expresses the first degree of repentance, wherein the sinner becomes sensible of his guilt, of the evil nature of sin, and of the danger of his ways.

CONVOCATION, an assembly of the clergy of England, by their representatives, to consult of ecclesiastical matters. It is held during the session of parliament, and consists of an upper and a lower house. In the upper sit the bishops, and in the lower the inferior clergy, who are represented by their proctors, consisting of all the deans and archdeacons, of one proctor for every chapter, and two for the clergy of every diocese, in all one hundred and forty-three divines, viz. twenty-two deans, fifty-three archdeacons, twenty-four prebendaries, and forty-four proctors of the diocesan clergy. The lower house chooses its prolocutor, whose business it is to take care that the members attend, to collect their debates and votes, and to carry their resolutions to the upper house. The convocation is summoned by the king's writ, directed to the archbishop of each province, requiring him to summon all bishops, deans, archdeacons, &c. The power of the convocation is limited by a statute of Henry VIII. They are not to make any canons or ecclesiastical laws without the king's licence; nor when permitted to make any, can they put them in execution but under several restrictions. They have the examining and censuring of all heretical and schismatical books and persons, &c. but there lies an appeal to the king in chancery, or to his delegates. The clergy in convocation, and their servants, have the same privileges as members of parliament. See PARLIAMENT.

CONVOLVULUS, BIND-WEED: a genus of the pentandria order, and monogynia class of plants: natural order, Campanaceæ. Corolla campanulated, plaited; stigmata two; capsule two-celled, having two seeds in each cell. There are 110 species of this very numerous genus, not more than thirteen species are natives of Europe; the others are mostly inhabitants of the warmer climates of Asia and America. Very few of them are cultivated in our gardens, except *C. purpureus*, purple bindweed; and *C. tricolor*, trailing bindweed, more commonly known by the names of convolvulus, major, and minor; the stems are herbaceous and milky, in the greater part twining; in a very few shrubby; leaves alternate; peduncles axillary or terminating, one-flowered, with two bracts. The jalappa, or jalap, used in medicine, is a native of the city of Aleppo in Spanish America, situated between La Vera Cruz, and Mexico. It has a large root of an oval form, full of a milky juice; from which come out many herbaceous twining stalks, rising eight or ten feet high, with variable leaves; some of them being heart-shaped, others angular, and some oblong and pointed. They are smooth, and stand upon long footstalks; the flowers are shaped like those of the common greater bindweed, each footstalk supporting only one flower. See Plate XXXV.

CONVOY, in marine affairs, one or more ships of war, employed to accompany and protect merchant ships, and prevent their being insulted by pirates, or the enemies of the state in time of war.

CONVOY, in military matters, a body of men that guard any supply of men, money, ammunition, or provisions, conveyed by land into a town, army, or the like, in time of war.

CONUS, in natural history, a genus of vermes testacea: animal a linax; shell univalve, convolute, turbinate; aperture effuse, longitudinal, linear without teeth, entire at the base; pillar smooth. This genus is divided into five distinct families, viz. A. spire or turban nearly truncate. B. pyriform with a rounded base; the cylinder half as long again as the spire. C. elongated, and rounded at the base; the cylinder as long again as the spire. D. ventricose in the middle, and contracted at each end. E. thin, ventricose, and making a tinkling sound when thrown on its back upon a table or board. There are upwards of 70 species. Many of the conus tribe are beautiful shells, and bear a high price on account of their rarity. We have no species of this genus upon the English coast. Some very curious kinds have been discovered in a fossil state in England, chiefly in the chalk cliffs of Hampshire. See Plate V.

CONVULSION, a disease attended with an irregular and unnatural contraction of the muscles without sleep. The causes

depend on a certain irritability of the nervous system.—Delicate hysteric women, and men disposed to hypochondriasis, are equally subject to this disorder. Frequently, however, convulsive symptoms take place in consequence of wounds, irritations of the stomach and intestines, worms, poisons, violent cathartics, emetics, &c. When infants are attacked with convulsions which threaten their lives, the safest expedient will be to immerse them into tepid or milk-warm water, and keep them in that situation, by adding gradually a little hot water, so as to preserve an equal temperature of 96 or 98 degrees, till medical assistance can be procured. Although we are not inclined to give implicit credit to anonymous authorities, yet we think the following particulars worthy of insertion. A correspondent in the 22d volume of the Gentleman's Magazine, justly observes, that convulsions in children, before dentition, generally proceed from acrid, irritating humors produced in the first passages, by living chiefly on accescent food; such fits being preceded by gripings, green-stools, &c. He therefore directs one ounce of white sugar-candy to be reduced to fine powder, and 120 drops, or two drams, of the best oil of aniseed, to be dropped upon it: these should be rubbed together in a mortar, then mixed with an ounce of spermaceti, in powder. The dose is twenty grains, to be given in a little milk drawn from the breast, and to be repeated every three or four hours, or oftener, if the uneasiness of the child should require it. See MEDICINE.

CONWAY, a market-town of N. Wales, in Caernarvonshire, called also Aberconway, situated 15 miles west of St. Asaph.

CONWAY, a river of N. Wales, which rises from a lake where the counties of Caernarvon, Denbigh, and Merioneth, meet; and falls into the Irish sea at Conway.

CONWAY, a township of the United States, in Stafford county, New Hampshire.

CONWAY, a township in Hampshire county, Massachusetts.

CONY. See LEPUS, and CAVIA.

CONYZA, FLEABANE: a genus of the polygamia superflua order, and syngenesia class of plants; natural order, Compositæ. Pappus simple; calyx imbricated, roundish, the corollula of the radius trifid. There are 43 species, herbaceous or shrubby plants with compound flowers.

CONZA, a town of Naples, on the river Offanto, 52 miles S. E. of Naples.

COOK, SIR ANTHONY, a descendant of Sir Thomas Cook, lord mayor of London, was born in 1506. He was so eminent for his learning, piety, and prudence, that the guardians of king Edward VI. appointed him his chief instructor. He had four daughters; and being resolved to have sons by education, lest he should have none by birth, he taught his daughters those lessons by night that he had instilled into the prince by day: he was happy in his endeavours, as they proved learned in Greek and Latin, and equally distinguished by virtue, piety, and good fortune. Mildred was married to the great lord Burleigh; Ann to Sir Nicholas Bacon, lord keeper of the great seal; Elizabeth to Sir John Russell, son and heir of Francis earl of Bedford; and Catherine to Sir Henry Killigrew. He lived in exile during the persecution under Q. Mary, and returning on the accession of Q. Elizabeth, spent the rest of his days in peace and honour, till he died, in 1576.

Cook, Captain JAMES, one of the most celebrated navigators that ever appeared, was the son of James Cook, a servant in husbandry. Captain Cook was born, at Marton in Yorkshire, Oct. 27, 1728. He was one of nine children, and was put to a day-school, by Mr. Skottow, his father's employer, where he was instructed in writing and the first rules in arithmetic. Before the age of 13, he was bound apprentice to a shopkeeper at Straiths, 10 miles from Whitby: but some disagreement occurring, he bound himself apprentice to Messrs. Walkers of Whitby, who had several vessels in the coal trade; and after serving a few years as a common sailor, he was raised to be mate of one of Mr. Walker's ships. On the breaking out of the war in 1755 he entered on board the Eagle man of war, and distinguishing himself by his sobriety and diligence, obtained, in 1759, a warrant as master. He served in that capacity at the reduction of Quebec, and while on that station was employed in taking the soundings of the river St. Lawrence; afterwards he was engaged in making a chart of the same river, which he executed with great accuracy. He was next with lord Colvil, in the Northumberland, at the retaking

of Newfoundland, of which coast he made a survey. On his return to England in 1762 he married a respectable young woman at Barking, in Essex, for whom he had always the tenderest regard. The year following he accompanied captain Graves, governor of Newfoundland, where he made many curious researches, and observed a solar eclipse, an account of which he transmitted to the Royal Society. It being resolved to send out persons to Otaheite, in the South sea, for the purpose of observing the transit of Venus, in 1769, Mr. Cook was selected for the command, and raised to the rank of lieutenant. In August 1768, he sailed in the Endeavour, accompanied by Mr. Green, as astronomer, Mr. now Sir Joseph Banks, and Doctor Solander. The transit was accurately observed, and July 13th our navigator left Otaheite on a voyage of discovery, in which he discovered a number of islands, to which he gave the name of Society islands. October 6th he anchored at New Zealand, which he circumnavigated. From thence he sailed to New Holland, his account of which occasioned a settlement there, named by him Botany Bay, and which colony will, in all probability, be attended with vast effects in those regions. He arrived, after many dangers, June 12, 1771, and in August following was appointed a commander in the navy. An account of this voyage was published from the captain's journals and those of Mr. Banks by Dr. Hawkesworth. The existence of a southern continent being still an undecided question, captain Cook was employed in another voyage to ascertain the point, and he accordingly sailed with two ships, the Resolution, commanded by himself, and the Adventure, by captain Furneaux, July 13, 1772. In this voyage they explored the southern hemisphere as high as latitude $71^{\circ} 10'$, amidst immense fields and mountains of ice, where a ship had never been; but in the course of it the two vessels parted, and never joined each other again. Captain Cook, after refreshing at Otaheite, sailed to the westward, and discovered a groupe, which he called the Friendly isles. He next fell in with the islands discovered by Quiros, and having surveyed them all, denominated them the New Hebrides. He next discovered a large island, which he called New Caledonia; and another, named by him Norfolk island, which has since been colonized. After many other additions to our geographical knowledge, but without attaining the main object, he arrived safe at Spithead, July 30, 1775, during which perilous voyage, only one man had died out of 118 on board the Resolution, owing to the excellent means adopted by him for preserving the health of his crew: Of these he gave an account in a paper transmitted to the Royal Society, of which body he was chosen a member, and had the gold medal awarded him in 1776. He was now raised to the rank of post Captain, and appointed to a post in Greenwich hospital. The admiralty having resolved to determine the disputed question, whether there be a northern communication between the Atlantic and Pacific oceans, captain Cook willingly volunteered his services on the occasion, and July 12, 1776, sailed from Plymouth in the Resolution, accompanied by another vessel called the Discovery. He carried out with him a native of the Society islands, named Omai, whom he had brought to England at his own request. After touching at Otaheite, the captain's favourite spot, he sailed to Huaheine, where Omai was landed with his presents, which he had received in England. Sailing from thence our navigators fell in with a groupe of islands, to which, out of compliment to the first lord of the admiralty, was given the appellation of the Sandwich islands. Then steering for the north-west coast of America, they arrived at a place called Nootka Sound. On this coast they discovered a vast inlet, which at first seemed to indicate the opening of the communication they were in search of, but it proved to be only a large river, which was called Cook's river. After sailing as high as lat. $74^{\circ} 44' N.$ and being opposed by an impenetrable mass of ice, the ships were obliged to shift their course to the south, and November 26, 1778, reached the Sandwich islands. Here they met at first with a kind reception from the natives, but the daring thefts committed by the savages produced quarrels, and threatened hostilities. At length the islanders proceeded so far as to steal the cutter belonging to the Resolution, which being a serious object, captain Cook armed two boats, and went on shore with a design of seizing the person of the king, which had been his custom on these occasions. But in the present instance it proved fatal, for the natives armed themselves, and gathered in such numbers, that the captain renounced his purpose, and hastened to his boats. The

savages, however, pressed on, throwing stones; the marines then fired, but four of them were knocked down and killed. In this scene of confusion captain Cook preserved his wonted coolness, and remained the last man on shore; but just as he reached the water side he received a blow from a club, which brought him down on one knee, and as he was rising he received a stab with a dagger, and fell prostrate. He was soon dispatched by the savages, who carried off his body in triumph. Some of his bones were afterwards recovered, the flesh in all probability having been feasted on by the savages who are known to eat the dead bodies of their enemies. Such was the melancholy fate of this great man, February 14, 1779. He left a widow and several children who were provided for by the royal bounty. Captain Cook was a tall robust man, of placid temper; modest, affable, and persevering; and a father to his crew, by whom he was regarded with veneration. His name is revered for having enlarged the stock of valuable knowledge, and he will ever be regarded as a honour to his country. We must not conclude this article without taking notice of the honours paid to our celebrated navigator after his death, both by his own countrymen and those of other nations. Perhaps indeed it may be said with justice, that foreigners hold his memory in an estimation unequalled even in this country; a remarkable proof of which occurs in the eulogy upon him by Michael Angelo Gianetti, read in the Florentine academy on the ninth June, 1785, and published at Florence. One of the French literary academies, too, proposed a prize for the best eulogium on captain Cook; but the most striking evidence of the esteem in which he and his important discoveries were held by foreigners, was given by the French court itself, at the very time when France was at war with Britain. This happened in 1779, after his death, but before it was known in Europe; when a letter was issued by M. de Sartine, secretary to the marine department of France, and sent to all the commanders of French ships, importing, that captain Cook should be treated as the commander of a neutral and allied power; and that all captains of armed vessels who might meet with him, should make him acquainted with the king's orders, but at the same time let him know, that, on his part, he must refrain from hostilities. This humane and generous proceeding, with regard to France, originated from M. Turgot; but the thought seems first to have struck Dr. Franklin. This at least is certain, that the doctor, while ambassador from the United States, wrote a circular letter to the American naval commanders to the same purport. The Royal Society of London resolved to testify their respect to him by a medal, for which purpose a voluntary subscription was opened. A gold medal was given to such of the fellows as subscribed 20 guineas, and a silver one for those who subscribed smaller sums; and each of the other members received one of bronze. Those who subscribed 20 guineas, were, Sir Joseph Banks, president, the Prince of Anspach, the D. of Montague, Lord Mulgrave, and Messrs. Cavendish, Peachy, Perrin, Poli, and Shuttleworth. Many designs were proposed on the occasion; but the following was preferred, and struck. On one side was the head of captain Cook in profile, with this inscription round it, JAC. COOK OCEANI INVESTIGATOR ACERRIMUS; and on the exergue, REG. SOC. LOND. SOCIO SUO. On the reverse is a representation of Britannia holding a globe, with this inscription round her, NIL INTENTATUM NOSTRI LIQUERE; and on the exergue AUSPICHS GEORGH III. One of the gold medals struck on this occasion was presented to the king, another to the queen, and a third to the prince of Wales. A 4th was sent to the French king on account of the protection he had granted to the ships; and a 5th to the Empress of Russia, in whose dominions they had been treated with every expression of friendship and kindness. Both these great personages accepted of the presents with marks of satisfaction. Lewis XVI. wrote a handsome letter to the Society, signed by himself, and undersigned by the Marquis de Vergennes; and Catharine II. commissioned Count Osterman to signify to Mr. Fitzherbert the sense she had of the value of the present, and that she had caused it to be deposited in the museum of the Imperial Academy of Sciences. She also presented to the Royal Society a large and beautiful gold medal, containing on one side her own effigies, and on the other a representation of the statue of Peter the Great. After the general assignment of the medals, which took place in 1784, there being a surplus of money still remaining, it was resolved by the president and council, that an additional number

of medals should be thrown off, to be disposed of in presents to Mrs. Cook, the E. of Sandwich, Dr. Benjamin Franklin, Dr. Cooke, provost of King's College Cambridge, and Mr. Planta. Mr. Aubert was also allowed to have a gold medal of captain Cook on his paying for the gold and the expence of striking it, to present to the king of Poland. During the two visits of the ships at Kamtschatka, Colonel Behm, commandant of that province, had bestowed every kind of assistance in his power; and such was the sense entertained by the lords of the admiralty of the kindness he had shewed, that they determined to make him a present of a magnificent piece of plate, with an inscription, expressive of his humane and generous conduct, which was drawn up by Dr. Cooke. Sir H. Palliser, who had all along an uncommon respect and kindness for captain Cook, likewise displayed his regard for his memory, by erecting, on his estate in Buckinghamshire, a small building with a pillar, containing the character of captain Cook, which was drawn up by Admiral Forbes, to whom he was known only by his merit. Amidst all these expressions of unavailing praise, it was not forgotten to do essential service to the widow and family of our celebrated navigator. A memorial for a pension was given in to the king from the commissioners of the admiralty, and a grant was passed, by which 200*l.* per. annum were settled on the widow during life; and 25*l.* year on each of her three sons. After her death the 200*l.* was to be divided between her children; a fourth was allotted to captain King, and the remaining fourth to Mr. Bligh and the representatives of captain Clerke. The last honour paid to the memory of captain Cook, was the granting of a coat of arms to the family, which was done by patent on 3d of September, 1785.

COOK'S RIVER, a large river of N. America, which runs into the N. Pacific Ocean.

COOK'S STRAIT, a strait in the S. Pacific Ocean, which divides the two islands of New Zealand.

COOKIÆ, in botany, a genus of the class and order decandria monogynia. Calyx five-cleft, inferior; corolla five-petaled, equal, inferior; pome five-celled; the cells one seeded. One species found in China.

COOKING, COOKERY, the art of dressing or preparing food. It is effected by various methods, of which boiling is the most common, but also the most objectionable; as it deprives flesh of its nutritious juice. A better mode of dressing animal food is roasting, by which its strength is less dissipated; because a crust is soon formed on its surface, that more effectually preserves the nutritive particles from evaporation. Hence, one pound of roasted meat is, in real nourishment, equal to double that quantity of boiled animal food. Many substances, though naturally possessed of salubrious qualities, are rendered unwholesome, by the refinements of cookery. By compounding several incongruous ingredients, to produce a poignant sauce, or rich soup, the cook frequently forms compositions that are almost poisonous. Thus, high-seasoning of every kind, pickles, and the like, merely stimulate the palate, and cannot fail to injure the stomach. Hence the plainest dishes are uniformly the most conducive to health, while they are most easily digested. This self-evident proposition is acknowledged by every reflecting person, but gives the least satisfaction to the epicure who consults his taste before he appeals to his warped understanding. Animal food is generally boiled in half-open vessels, instead of which close utensils only ought to be employed for that purpose. We therefore preferably recommend the process called stewing; as it is not only the most wholesome mode of dressing meat, but at the same time well adapted to retain and concentrate the most substantial parts of animal food. The utility of preparing victuals after this method, having been generally acknowledged, various patents have been granted to persons for the invention of machinery, by which that object may be attained, at the smallest expence. Of these, we shall communicate the following; for the better illustration of which we shall give the figures. A patent was granted, in December 1793, to Mr. Stanley Howard, of St. Paul's Church-yard, iron-monger, for his invention of a machine which he calls a Pneumatic Kitchen, for cooking provisions by steam; in such a way, that no complex machinery is required for supplying the boiler with water, to replace the quantity dissipated by evaporation, nor any pump (the boiler being constantly supplied during the evaporation, without the aid of a cistern); which apparatus may be fixed at a small

expence, without any alteration of the chimney; and, when once arranged, requires no repair. The steam-boiler, and cooking-vessels, being made in the usual way, the former is to be supplied with water by a fountain-reservoir, marked A, Plate XLVII. fig. 12, which is to be placed at a convenient distance from it, with its discharging tube, marked B, inserted in a cistern, or pipe, marked C; in which the surface of the water will, by means of the fountain, be preserved always at one height, pointed out by the letter D: and by a communication marked E, from the said cistern or pipe, with the steam-boiler, marked F, the water therein will, during the evaporation, be preserved at a height corresponding with such cistern or pipe, and always at the same level, marked G. By means of the fountain above-mentioned, the necessity of cocks and pipes, or pumps, for supplying the boiler, is obviated; and the supply rendered more immediate, more certain, and at the same time more simple, than by any method hitherto contrived. The fountain may be made of any materials, or in any form, suited to the purpose. A patent was likewise granted, in December 1796, to Mr. James Tate, of Tottenham court-road, iron-monger, for a portable cooking machine, for the use of officers in the army or navy, which is provided with lamps. The patentee directs a lamp to be made with any number of burners, or wicks, according to the size of the machine, and they should be placed in one or more straight lines. To one side of this lamp he fixes an oven, for the purpose of washing, or baking; one side of the former is applied to one of the latter, in an inclined direction, so as to come in contact with the flame of the wicks. On the other side of the lamp, he places another oven, which may be either with a straight side next the lamp, or may incline in the same direction as the former; but, if this latter oven incline from the flame, it will serve only to keep any fluid, or solid substances in a hot state. The two sides of the ovens will form a flue, or chimney, and convey the remainder of the heat upwards to a vessel of any shape, which may be put over them, for the purpose of raising steam, either to turn a jack, or boil water for tea, &c.; and on the top of which, another steaming vessel may be placed. A frying, or boiling pan may also be occasionally substituted for that last mentioned. Any of these utensils can be used separately with, or over, the lamp; and, if baking or roasting only be required, that purpose will be better effected, by having an oven so constructed as to receive the whole heat of the lamp, or lamps, which ought to be surrounded with a case, for confining the flame, with an open space at the bottom to admit the heat, and another at the top to give it vent. The following is a description of the different articles, as they are combined to form this machine, when made portable. R, Plate XLVII. fig. 13, is the lamp for the machine. Fig. 14 is the lamp, in combination with the two ovens, and the boiler or vessel for raising steam, and boiling any substance in water. P, is the baking oven. Q, is the heating oven. R, is the end of the lamp; and S, is the vessel for boiling in, and raising steam for other purposes. This machine, and its various component parts, may be constructed of any of the different metals, of which similar articles are usually made. And, though it is at present described only as operating with a lamp and oil, yet the patentee proposes to construct such as may be used with common fuel.

COOLER, among brewers, distillers, &c. a large vessel where-in certain liquors are cooled, after having been boiled.

COOMB, or **COMB**, [*comble*, Fr. *cumulus*, Lat. a heap,] a measure of corn containing four bushels.

COOMTAH, a town of Hindostan, in Berar, 45 miles N. E. of Nagpour.

COOP, in husbandry, a tumbrel or cart inclosed with boards, and used to carry dung, grains, &c.

COOPER, ANTHONY-ASHLEY, first earl of Shaftesbury, was the son of Sir John Cooper, Bart. of Rockborn in Hampshire, and was born in 1621. He was elected M. P. for Tewkesbury at 19 years of age, in the short parliament that met April 13, 1640. He seems to have been well affected to the king's service at the beginning of the civil wars; for he repaired to the king at Oxford with offers of assistance: but prince Maurice breaking articles with a town in Dorsetshire, that he had got to receive him, he went over to the parliament, from which he accepted a commission. When Richard Cromwell was deposed, and the Rump parliament came again into power, they nominated Sir Anthony one of their council,

council of state, and a commissioner for managing the army. At that very time he had engaged in a secret correspondence for restoring Charles II. and, upon the king's coming over, was sworn of his privy council. He was one of the commissioners for the trial of the regicides; and was soon after made chancellor of the exchequer, then a commissioner of the treasury; in 1672 was created earl of Shaftesbury; and soon after was raised to the post of lord chancellor. He filled this office with great ability, and though the short time he was at the helm was in a tempestuous season, nothing could either distract or affright him. The great seal was taken from him in 1673, twelve months after his receiving it; but, though out of office, he still made a distinguished figure in parliament. He drew upon himself the implacable hatred of the duke of York, by steadily promoting, if not originally inventing, the famous exclusion bill. When his enemies came to power, he retired into Holland, where he died six weeks after his arrival, in 1683. His great abilities are confessed by all, though Butler has given a very severe character of him in his "Hudibras."

COOPER, ANTHONY-ASHLEY, third earl of Shaftesbury, was son of Anthony the second, and grandson of Anthony the first earl. He was born in 1671, at Exeter house in London, where his grandfather lived, who from his birth conceived so great an affection for him, that he undertook the care of his education; wherein he made such progress that he could read with ease both Latin and Greek, when only eleven years old. In 1683, his father carried him to Winchester school, where being insulted on his grandfather's account, by the zealots for despotism, he prevailed with his father to consent to his going abroad, in 1686. He returned to England in 1689, and was offered a seat in parliament, but did not accept it, that he might not be interrupted in the course of his studies, which he prosecuted five years with great success; till, on Sir John Trenchard's death, he was elected M. P. for Pool. Soon after his coming into parliament, he had an opportunity of expressing that spirit of liberty, which uniformly directed his conduct, by bringing in "the bill for regulating trials in cases of high treason." After the dissolution of parliament in 1698, he went to Holland, where the conversation of Mr. Bayle, M. le Clerc, and several other learned men, induced him to reside a year. During this time, there was printed at London, in 8vo. an imperfect edition of lord Ashley's "Inquiry concerning Virtue." It had been surreptitiously taken (by Mr. Toland, it is said,) from a rough draught, sketched when he was only twenty years of age. His lordship immediately bought up the impression before many books were sold, and completed the treatise, as it afterwards appeared in the second volume of his "Characteristics." In 1703, he made a second journey to Holland, and returned to England in 1704. His "Letter concerning Enthusiasm," was published in 1708. His "Moralist, a philosophical Rhapsody, being a recital of certain Conversations on natural and moral Subjects," appeared in Jan. 1709; and in May following, his "Sensus Communis, an Essay upon the Freedom of Wit and Humour, in a Letter to a Friend." In 1710, his "Soliloquy, or Advice to an Author," was published at London in 8vo. While he was thus employing himself in literary composition, his health declined so fast, that he was advised to go to a warmer climate. Accordingly, in July 1711, he set out for Naples, and took his journey by way of France. After having resided at Naples about a year and a half, he died the 4th Feb. O. S. 1712-13, aged 42. The only pieces which he finished at Naples, were "The Judgement of Hercules," and the "Letter concerning Design." In 1711, the first edition was published of all the characteristics together, and in the order in which they now stand. But a more elegant edition was given to the world in 1713, soon after his decease. The several prints that were then first interspersed through the volumes were all invented by himself, and designed under his immediate inspection; and for this purpose he drew up a most accurate set of instructions, the MS. of which is still preserved in the family. To prevent mistakes, the earl corrected the press himself. In the three volumes of the "Characteristics of Men, Manners, Opinions, and Times," he completed the whole of his works which he intended for the public eye. He had a fine taste in painting and sculpture, and had thoughts of writing on these subjects; which his premature decease prevented. By many authors lord Shaftesbury is ranked among the deists, while others think that he ought not to be reckoned among the deistical writers.

In support of his Lordship's having been a believer in our holy religion, have been urged his "Preface to Whichcot's Sermons," and his "Letters to a Student at the University;" in both which works he expresses himself in such language as seems to indicate that he believed the sacred scriptures. Nevertheless, there are in the "Characteristics" so many sceptical passages, that he must be considered as having been a doubter at least, if not an absolute disbeliever, with respect to revelation.

COOPER, JOHN GILBERT, a polite writer, born in 1723. After studying at Westminster school under Dr. John Nicoll, he became in 1743, a Fellow Commoner of Trinity college, Cambridge; but quitted the university on his marriage with Susanna the daughter of William Wright, Esq. Recorder of Leicester. In 1745 he published "The Power of Harmony," a poem in 4to. and in 1746 and 1747, several Essays and Poems, signed Philalethes, in Mr. Dodsley's "Museum." With the assistance of the Rev. John Jackson of Leicester, he published with his name, "The Life of Socrates, collected from the Memorabilia of Xenophon and the Dialogues of Plato," and illustrated by Aristotle, Diodorus Siculus, Cicero, Proclus, Apuleius, Maximus Tyrinus, Boethius, Diogenes, Laertius Aulus, Gellius, and others, 1749, 8vo. In this work Mr. Cooper gave evident marks of superior genius. In 1754, he published his "Letters on Taste," 8vo.; an elegant volume, on which no small share of his reputation is founded; and in 1755, "The Tomb of Shakespeare, a Vision," 4to. In 1756, he assisted Mr. Moore, by writing some numbers of "The World;" and attempted to rouse the indignation of his countrymen against the Hessians, then brought over to defend the nation, in a poem called "The Genius of Britain," addressed to Mr. Pitt. In 1758, he published "Epistles to the Great, from Aristippus in Retirement," 4to.; and "The Call of Aristippus," Epistle IV. to Mark Akenside, M. D. Also, "A Father's Advice to his Son," in 4to. In the Annual Register of 1758, is his Translation of an Epistle from the King of Prussia to Monsieur Voltaire. In 1759, he published "Ver Vert; or, the Nunnery Parrot," an Heroic Poem, in four cantos; inscribed to the Abbess of D***, 4to.; and, in 1764, "Poems on several Subjects, by the Author of the Life of Socrates;" with a prefatory Advertisement by Mr. Dodsley. He died at his father's house in May-Fair, after a long and excruciating illness arising from the stone, April 14, 1769.

COOPER, in geography, a large navigable river of the United States, which unites the Ashley below Charleston city, in South Carolina.

COOPER, one who manufactures casks, tubs, pails, and some other similar articles used in domestic concerns. These are made generally of oak timber; a great part of which comes from America, cut up into narrow pieces or staves; they are sometimes bent and sometimes straight, according to the purposes for which they are wanted. The staves are kept together by means of hoops, made from hazel or ash, or of iron. To make them hold water or other liquids, split flags are inserted, which swell by moisture, and effectually prevent the vessels from leaking. Coopers, by 23 Hen. VIII. c. 4, shall make their vessels of seasonable wood; and make them with their own marks, on forfeiture of 3s. 4d.: and the contents of vessels are appointed to be observed under a like penalty.

COOPER, KING's, an officer in every custom-house and excise office.

COOPER, on board a ship, he that looks to the casks, and all other vessels for beer, water, or any other liquor. He has a mate under him.

COOPER'S ISLAND, an island on the N. coast of the isle of Java, near Batavia.

COOPER'S ISLAND, an island in the South Pacific Ocean, near South Georgia.

COOPER'S ISLAND, one of the lesser Virgin Isles in the West Indies.

COOPER'S TOWN, a post town of New York, in Otsego county.

COOPER'S TOWN, a town of Pennsylvania, situated on the Susquehanna.

COOS, or COS, an island in the Archipelago, 56 miles N. W. of Rhodes.

COOS, or COHOS, a territory of New Hampshire, on the Connecticut.

COOSACTEES,

COOSACTEES, a tribe of the Creek, or Muskogulge Indians in North America. See **MUSKOGULGE**.

COOSY, or **COSA**, a river of Asia, which rises in the mountains of Thibet.

COOTS, or **COOTSTOWN**, a town of Pennsylvania, in Berks county.

COPAIBA, or **BALSAM OF COPAIBA**, a liquid resinous juice, flowing from incisions made in the trunk of the *copaifera* officialis. It is transparent, of a whitish or pale yellowish colour, an agreeable smell, and a bitterish pungent taste. It is usually about the consistence of oil, or a little thicker: when long kept, it becomes nearly as thick as honey, retaining its clearness; but does not grow dry or solid, as most other resinous juices do. The balsam of copaiba is an useful corroborating detergent medicine, accompanied with a degree of irritation. It strengthens the nervous system, tends to loosen the belly, in large doses proves purgative, promotes urine, and cleanses and heals exulcerations in the urinary passages, which it is supposed to perform more effectually than any other balsams. The dose rarely exceeds twenty or thirty drops, though some direct sixty or more. It may be taken in the form of an eleosaccharum, or in that of an emulsion, into which it may be reduced by triturating it with almonds, or rather with a thick mucilage of gum-arabic, till they are well incorporated, and then gradually adding a proper quantity of water.

COPAIFERA, in botany, a genus of the monogynia order, and decandria class of plants. No calyx; petals four; legumen ovate; seed one, with an arillus. One species, viz.

C. OFFICINALIS. This tree grows near a village called Ayapel, in the province of Antiochi, in the Spanish West Indies, about ten days journey from Carthagena. Great numbers of these trees grow to the height of fifty or sixty feet. Some of them do not yield any balsam; those which do, are distinguished by a ridge which runs along the trunks. They are wounded in the centre, and calabash shells, or other vessels, are placed at the wounded part to receive the balsam, which flows wholly out in a short time. One of these trees will yield five or six gallons of balsam: but though they will thrive well after being tapped, yet they never afford any more balsam.

COPAL, a substance of great use as a varnish, which is obtained from the *rhus copalinum*, a tree in North America. It is a beautiful transparent resinous-like substance. When heated it melts like other resins; but it differs from them in not being soluble in alcohol, nor in oil of turpentine without peculiar management. Neither does it dissolve in the fixed oils like other resins. The specific gravity of copal varies from 1,045 to 1,139. Mr. Hatchett found it soluble in alkalies and nitric acid with the usual phenomena; so that in this respect it agrees with the other resins. The solution of copal in alkalies he found indeed opalescent, but it is nevertheless permanent. It deserves attention, that he found resin when dissolved in nitric acid, and then thrown down by an alkali, to acquire a smell resembling that of copal. When copal is dissolved in any volatile liquid, and spread thin upon wood, metal, paper, &c. so that the volatile menstruum may evaporate, the copal remains perfectly transparent, and forms one of the most beautiful and perfect varnishes that can well be conceived. The varnish thus formed is called copal varnish, from the chief ingredient in it. This varnish was first discovered in France, and was long known by the name of vernis martin. Copal varnished used by the English jannpers is made as follows: Four parts by weight of copal in powder are put into a glass matrass and melted: The liquid is kept boiling till the fumes, condensed upon the point of a tube thrust into the matrass, drop to the bottom of the liquid without occasioning any hissing noise as water does. This is a proof that all the water is dissipated, and the copal has been long enough melted. One part of boiling hot linseed oil (previously boiled in a retort without any litharge) is now poured into it, and well mixed. The matrass is then taken off the fire, and the liquid, while still hot, is mixed with about its own weight of oil of turpentine. The varnish thus made is transparent, but it has a tint of yellow, which the jannpers endeavour to conceal by giving the white ground on which they apply a shade of blue. It is with this varnish that the dial plates of clocks are covered after having been painted white. Mr. Sheldrake has lately favoured the public with another and easier method of dissolving copal. This method is as follows: "Provide a strong vessel made of tin or other metal; it should be shaped like a wine bottle, and capable of

holding two quarts; it will be convenient to have a handle strongly riveted to the neck; the neck should be long and have a cork fitted to the mouth, but a notch or small hole should be made in the cork, that, when the spirit is expanded by heat, a small portion may force its way through the hole, and thus prevent the vessel from bursting. Dissolve half an ounce of camphor in a quart of spirit of turpentine, and put it into the vessel; take a piece of copal the size of a large walnut, reduce it to a coarse powder or very small pieces, put them into the tin bottle, fasten the cork down with a wire, and set it, as quick as possible, upon a fire so brisk as to make the spirit boil almost immediately; then keep it boiling very gently for about an hour, when so much of the copal will be dissolved as will make a very good varnish; or, if the operation has been properly begun, but enough of copal has not been dissolved, it may be again put on the fire, and by boiling it slowly for a longer time, it may be at last brought to the consistence desired.

COPARCENARY. An estate held in coparcenary, is where lands of inheritance descend from the ancestor to two or more persons. It arises either by common law, or particular custom. By common law, as where a person seised in fee-simple, or fee-tail dies, and his next heirs are two or more females, his daughters, sisters, aunts, cousins, or their representatives; in this case they shall all inherit. And these co-heirs are then called coparceners; or for brevity sake parceners. Parceners, by particular custom, are where lands descend, as in gavel-kind, to all the males in equal degree, as sons, brothers, uncles, or other kindred; and in either of these cases, all the parceners put together make but one heir, and have but one estate among them.

COPE, in Doomsday Book, as Mr. Hager has interpreted it, signifies a hill.

COPE is also the name of an ancient tribute paid to the king or lord of the soil, out of the lead mines in Derbyshire.

COPELAND ISLANDS, three islands, in the Irish Sea, on the coast of Down; near Carrickfergus Bay. Their names are Big, Cross, and Mew. Lon. 5. 53. W. Lat. 54. 33. N.

COPENHAGEN, anciently called Kiobmandshaven, the capital of the kingdom of Denmark, situated on the E. shore of the island of Zealand, upon a fine bay of the Baltic sea, near the strait called the Sound. Copenhagen lies 300 miles S.W. of Stockholm, and 500 N. E. of London. Lon. 12. 40. E. Lat. 55. 41. N.

COPERNICAN SYSTEM, that system of the world, wherein the sun is supposed to rest in the centre, and the planets, with the earth, to move in ellipses round him. See **ASTRONOMY**.

COPERNICUS, NICOLAUS, an eminent astronomer, born at Thorn in Prussia, Jan. 10, 1472. He was taught the Latin and Greek languages at home; and afterwards studied philosophy and physic at Crotovia. His genius being naturally turned to mathematics, he pursued that science through all its various branches. He set out for Italy when he was 23 years of age; but staid at Bononia some time, with the celebrated astronomer Dominicus Maria; whom he assisted in making his observations. From thence he passed to Rome, where he soon acquired so great reputation, that he was chosen professor of mathematics. He also made some astronomical observations about A. D. 1500. Returning to his own country some years after, he began to apply his vast knowledge in mathematics, to correct the system of astronomy which then prevailed. He collected all the books which had been written by astronomers, and examined the various hypotheses invented for the solution of the celestial phenomena. Of all these, none pleased him so well as the Pythagorean, which made the sun to be the centre of the system, and supposed the earth to move not only round the sun, but round its own axis also. He discerned much beautiful order and proportion in this; and that all that embarrassment and perplexity from the epicycles and eccentrics, which attended the Ptolemaic hypothesis, were here entirely removed. This system, then, he began to write upon, when he was about 35; and after more than twenty years, he brought his scheme to perfection, and established that system of the world which is now universally received. See **ASTRONOMY**. His system, however, was then looked upon as a most dangerous heresy; for which he was thrown into prison by Pope Urban VIII. and not suffered to come out till he had recanted his opinion, and thus renounced the testimony of his senses. He died May 24, 1543, aged 70. This extraordinary man had been made canon of Worms

by his mother's brother, Lucas Wazelerodius, who was bishop of that place. He was not only the greatest of astronomers, but a perfect master of the Greek and Latin tongues, and a man of the greatest piety and innocence of manners.

COPITI, the **COPHTS**, a name given to the Christians of Egypt, who are of the sect of Jacobites. The critics differ much about the orthography, as well as the etymology, of this word. Some write it Cophiti; others Copti, Cophitæ, Cophitæ, Copts, &c. Scaliger derives the name from Coptos, an anciently celebrated town of Egypt, the metropolis of the Thebaid. Kircher maintains, that the word originally signifies cut or circumscribed; and was given them on account of their practising circumcision; Scaliger afterwards derived the word from *Agyptos*, the ancient name of Egypt, by retrenching the first syllable: but P. Sollier disputes both these opinions. John de Leo and others say, that the Egyptians anciently called their country Elchibth or Cibth, from Cibth their king, whence Cophitæ, &c. others say from Coptim second king of Egypt. Vansleb derives Cophit from Copt, or Capthorim, the son of Misraim, grandson of Noah. All these etymologies P. Sollier rejects, on this principle, that were they true, the Egyptians ought all equally to be called Cophiti; whereas, in effect, none but the Christians, and among those none but the Jacobites, bear the name, the Melchites not being comprehended under it. Hence he derived the word from the name Jacobite, retrenching the first syllable; whence Cobite, Cobea, Copta, and Cophita. The Cophits have a patriarch who resides at Cairo, but he takes his title from Alexandria: he has under him eleven or twelve bishops. The rest of the clergy, whether secular or regular, is composed of the orders of St. Antony, St. Paul, and St. Macarius, who have each their monasteries.

COPHTIC, or **COPTIC**, the language of the Cophits, the ancient language of the Egyptians, mixed with a deal of Greek, the characters it is written in being all Greek. It has a form and construction peculiar to itself: it has no inflections of the nouns or verbs; but expresses number, case, gender, person, mood, tense, and possessive pronouns, by letters and particles prefixed. F. Kircher was the first who published a grammar and vocabulary of the Coptic. There is not known any book extant in the Coptic, except translations of the Holy Scriptures, or of ecclesiastical offices; or others that have relation thereto, as dictionaries, &c. The ancient Coptic is now no longer found but in books; the language now used throughout the country being Arabic. The old Coptic, which Kircher maintains to be a mother tongue, and independent of all others, had been much altered by the Greek; for besides that it has borrowed all its characters from the Greek, with a very little variation, a great number of words are pure Greek. Vossius, indeed, asserts, that there was no Coptic language till after Egypt became subject to the Arabs. The language, according to him, is a mixture of Greek and Arabic: the very name thereof not being in the world till after the Arabs were masters of the country. But this, M. Simon observes, proves nothing; except that what was anciently called Egyptian, has since by the Arabs been called Coptic, by a corruption of speech. There are, it is true, Arabic words in the Coptic; yet this by no means proves but that there was a language before that time, either Coptic or Egyptian.

COPIAPO, a district of South America, in the N. of Chili, which abounds in minerals of all kinds.

COPIATA, [from *κοπω*, to cut,] a grave-digger. In the first ages of the church, clerks were destined for this employment. A. D. 357, Constantine made a law in favour of the priests *copiata*, i. e. of those who had the care of interments; whereby he exempted them from the lustral contributions.

COPILOWATS, a town of European Turkey in Bulgaria. Lon. 27. 30. E. Lat. 43. 40. N.

COPING OVER, in carpentry, a sort of hanging over, not square to its upright, but bevelling on its under side, till it ends in an edge.

COPORIA, a town and river of Russia, in the province of Ingria.

COPPA, in law, a cop or cock of grass, hay, or corn, divided into titheable portions; as the tenth cock, &c. This word denotes laying up the corn in cops or heaps, not bound up, that it may be the more fairly tithed: and in Kent they still retain the word, a cop or cap of hay, straw, &c.

COPPEL, **COPEL**, **CUPEL**, or **CUPPEL**, a chemical vessel made of earth, pretty thick, and of the form of a platter or dish. See **CUPEL**.

COPPER, a very useful metal, which is found in the bowels of the earth, in the following states:

I. Native or pure copper, which possesses the red colour, the malleability, and all the other properties of this metal, and is discovered in various parts of England and Wales, but more particularly in the county of Cornwall. It is formed into threads of branches, and lies in veins of considerable thickness, contained in blackish serpentine stone, mixed with a brownish red, and covered externally with a greenish nephrites.

II. Mineralized by fixed air; of which there are several varieties: 1. Red copper, or hepatic ore of copper, which is known by its dusky colour. It is generally mixed with native copper and mountain green. 2. Earthy copper, or mountain green, which is mostly found in a loose friable state, and frequently blended with calcareous earth, iron, and sometimes with arsenic.

III. Mineralized by sulphur, with a small proportion of iron. This is of a deep violet grey, or liver colour, melts with a gentle heat, is ponderous, flexible, and yields to the knife. When broken, it appears of a bright golden colour, and is the richest of all the copper ores, affording from 80 to 90 per cent. of copper, 10 or 12 of sulphur, and a small proportion of iron.

IV. Mineralized by sulphur, with a large proportion of iron, or azure copper ore; it varies from the preceding sort only in the quantity of iron it contains, which sometimes amounts to 50 per cent. It yields 50 or 60 pounds of copper per cwt. the rest being sulphur. The principal parts of Great Britain, which afford copper, are the counties of Cardigan, Chester, Cornwall, Cumberland, Derby, Devon, Northumberland, Lancaster, Salop, Somerset, Stafford, York, Warwick, Westmoreland; in the Islands of Man and Anglesey; and also in Scotland. Copper is a very brilliant metal, of a fine red colour, differing from every other metallic substance. The specific gravity of copper is 8.58. When it is hammered it acquires a greater density. It possesses a considerable degree of hardness, and some elasticity. It is extremely malleable, and may be reduced to leaves so fine, that they may be carried about by the wind. It has also a considerable degree of ductility, intermediate, according to Guyton, between tin and lead. The tenacity of copper is also very great. A wire .078 of an inch in diameter will support a weight without breaking equal to more than 300lbs. avoirdupois. Copper has a peculiarly astringent and disagreeable taste. Copper does not melt till the temperature is elevated to a red heat, which is about 27° Wedgwood, or by estimation 1450° Fahrenheit. When it is rapidly cooled after fusion, it assumes a granulated and porous texture: but if it be cooled slowly, it affords crystals in quadrangular pyramids, or in octahedrons, which proceed from the cube, its primitive form. When the temperature is raised beyond what is necessary for its fusion, it is sublimed in the form of visible fumes. Copper soon tarnishes, and exposed to the air, especially if it be humid, is deprived of its lustre, and at last is covered with a shining green crust, which is well known under the name of verdigris. This effect is produced by the absorption of oxygen from the atmosphere, by which the metal is oxygenated. As this oxide is formed, the carbonic acid of the atmosphere combines with it, so that it is to be considered as a mixture of oxide and carbonate of copper. But when copper is subjected to a strong heat, the oxidation proceeds more rapidly. If a plate of copper be made red-hot in the open air, it loses its brilliancy, becomes of a deep brown colour, and the external layer, which is of this colour, may be detached from the metal. This is the brown oxide of copper. This oxide may be obtained by immersing a plate of red-hot copper into cold water. The scales which are formed on the surface fall off by the sudden contraction of the heated copper. This may be repeated till the whole is converted into the oxide. The copper in this state is in the highest degree of oxidation. The component parts of this oxide are,

Oxygen,.....	25
Copper	75
	100

There are, however, different oxides; copper combines with a smaller

smaller proportion of oxygen, forming an oxide of an orange colour. This is the oxide of copper with the smaller proportion of oxygen. The component parts of this oxide, according to Mr. Chevreux, are.

Oxygen.....	11,5
Copper.....	88,5
	100,0

This oxide changes colour the moment it is exposed to the air, by the absorption of oxygen, for which it has a very strong affinity. There is no action between azote, hydrogen, or carbon, and copper. Phosphorus readily combines with copper, and forms with it a phosphuret, which is prepared by fusing equal parts of copper and phosphoric gas, with $\frac{1}{2}$ th of the whole of charcoal in powder. Copper combines with sulphur by different processes. If sulphur in powder and filings of copper are mixed together, and formed into a paste with a little water, when they are exposed to the air, the mass swells up, becomes hot, and is converted into a brown matter, which effloresces slowly in the air, and is converted into sulphate of copper. The alloys of copper (that is, those in which this metal predominates) are more numerous and more important in the arts than those of any other metal. Many of them are perfectly well known, and have been in use from very ancient times; of many the exact composition, and particularly the mode of preparing, are kept as secret as possible; for even when the precise composition of an alloy is found by chemical analysis, it may often be extremely difficult to produce a mixture by common methods, which shall have exactly the same shade of colour, the same malleability, texture, susceptibility of polish, or some other excellence, which, perhaps, a mere accident has discovered to the possessor. The principal objects of alloying copper appears to be to render it less liable to tarnish, and especially to be acted on by common animal or vegetable substances, to make it more fusible, and harder, and able to take a higher polish, and to alter its colour either to a golden yellow or silvery white. All these objects are attainable by different alloys. Copper alloyed with gold, silver, and platina, is seldom, if ever, used in the proportions in which it would be reckoned as alloy of copper, being much too costly for any purpose of manufacture; with this exception, however, that a very small portion of silver much improves the composition of the alloy of copper and tin, when used as bell-metal or speculum-metal. Copper is used largely as an alloy of gold and silver, and it is often plated with one or the other. Copper nearly saturated with zinc, forms brass, the most important of all the alloys of this metal. See BRASS. With a much less proportion of zinc the colour of the alloy approaches very nearly to that of gold, and the malleability increases. Mixtures chiefly of these two metals are used to form a variety of yellow or gold-coloured alloys, known by the names of tombac, Manheim, or Dutch gold, tinsel, similor, Prince Rupert's metal, Pinchbeck, &c.; but the precise composition varies according to the fancy or the experience of different manufacturers. The alloys of copper and tin are extremely important in the arts, and curious as chemical mixtures. They form, in different proportions, mixtures which have a distinct and appropriate use. Tin added to copper makes it more fusible; much less liable to rust or corrosion by common substances; harder, denser, and more sonorous. In these respects the alloy has a real advantage over unmixed copper; but this is in many cases more than counterbalanced by the extreme brittleness which even a moderate portion of tin imparts, and which is a singular circumstance, considering how very malleable both metals are before mixture, and the remarkable softness and ductility of tin. Copper, or sometimes copper with a little zinc, alloyed with as much tin as will make from about $\frac{1}{12}$ th to about $\frac{1}{4}$ th of the whole, forms an alloy which is the principal, and often the only composition for bells, brass cannon (so called,) bronze statues, and several smaller purposes, and hence it is called bronze, or bell-metal; and it is excellently fitted for these purposes, by its hardness, density, sonorousness, and fusibility, whereby the minute parts of hollow moulds may be readily filled before it fixes in cooling. For cannon a lower portion of tin seems to be used. Bronze cannon are much less liable to rust than those of iron; but in large pieces of ordnance, by very rapid firing, the touch-hole is apt to melt down, and spoil the piece; of which there is a remarkable instance at the Tower of London, of a mortar of the largest calibre thus spoiled at

the siege of Nemur. On account of the sonorousness of bronze, these cannon give a much sharper report than those of iron, which for a time impairs the hearing of the people that work them. A common alloy for bell-metal is about 80 of copper to 20 of tin; or where copper, brass, and tin, are used, the copper is from 70 to 80 per cent. including the portion contained in the brass, and the remainder is tin and zinc. The zinc certainly makes it more sonorous. Antimony is also often found in small quantities in bell-metal. Some of the finer kinds used for small articles contain also a little silver, which much improves the sound. When the tin is nearly one-third of the alloy, it is then most beautifully white with a lustre almost like that of mercury, extremely hard, very close-grained, and perfectly brittle. In this state it takes a most beautiful polish, and is admirably fitted for the reflection of light for all optical purposes. It is then called speculum metal, which, however, for the extreme perfection required in modern astronomical instruments, is better mixed with a very small proportion of other metals, particularly arsenic, brass, and silver. When taken into the human body, copper acts as a violent emetic, and is generally considered as poisonous: and, though it has occasionally been prescribed by physicians, it is always an unsafe and hazardous remedy. Hence, the greatest precaution is necessary in using this metal, of which so many kitchen utensils are manufactured. Besides the most scrupulous attention to cleanliness, it is extremely improper to leave any liquid to cool in a copper vessel; for this metal is more easily decomposed by liquids, when cold, than in a heated state. In order to prevent the deleterious effects of copper, the vessels made of it are usually covered with tin, on the inside. It is nevertheless justly complained, that the tinning of copper vessels is not sufficient to defend them from the action of the air, moisture, and saline substances; because, even when strongly coated, they are liable to rust. This may be remedied by a thicker covering of tin; and a manufacture of this kind was established a few years since at Edinburgh; in which the following method is adopted: The surface of the copper is made very rough, by means of a machine contrived for that purpose; then a thick coat of tin is laid on, and the copper hammered smooth as before. To prevent the tin from being melted, and the surface of the copper from being left uncovered, in consequence of a degree of heat superior to that of boiling water, the tin is alloyed with iron, silver, or platina, in order to diminish its fusibility, and render it capable of being applied in thicker layers on the copper.

COPPERAS, sulphate of iron, it is commonly called green-vitriol. It is purified and prepared in the same manner as alum and saltpetre, being passed through several lixivia, till it is wholly reduced to crystal. It is used in dyeing wool and hats black, in making ink, tanning leather, and in preparing a kind of Spanish brown for painters. A patent was granted in May 1791 to Mr. Wm. Murdock, of Redruth, Cornwall, for a method of making (from the same materials, and from processes entirely new) copperas, vitriol, and different sorts of dye, or dying stuff, paints, and colours. The patentee directs any quantity of what remains after the calcination of mundic, or such other ores as contain sulphur, arsenic, and zinc, to be taken, and washed in water; which is to be placed on the top, or on any other part of the kiln, house, or oven, while the mundic or other ores are burning; the heat of which will cause the water to evaporate; or the water may be evaporated to a crystallizing point, by exposing it to the heat of the sun, after which it should be suffered to stand for 24 hours, or longer, when crystals of copperas, or green vitriol, will be produced. From this process arises a considerable saving; as the ores remaining after fusion, may be applied to various chemical purposes.

COPPER-PLATE. See ENGRAVING.

COPROCRITICA, purgative medicines.

COPROSMA, in botany, a genus of the class and order, polygamia monœcia. Natural order Stellatæ. Calyx one-leaved, five-toothed; corolla five or six cleft; stamina five, six, or seven. Hermaphrodite styles two, long; berry containing two flattish seeds. There are two species, viz. *C. foetidissima*, and *C. lucida*, both shrubs; leaves opposite, with a stipule interposing. These are natives of New Zealand.

COPULA, in logic, the verb that connects any two terms in an affirmative or negative; as virtue makes a man happy; where makes is the copula; no weakness is any virtue; where is is the copula.

COPULATIVE PROPOSITIONS, in logic, those where the subject

ject and predicate are so linked together, by copulative conjunctions, that they may be all severally affirmed or denied one of another. *Example*, Riches and honours are apt to elate the mind, and increase the number of our desires.

COPY, [*copie*, Fr. *copla*, low Latin,] in a law sense, signifies the transcript of any original writing, as the copy of a patent, charter, deed, &c. A common deed cannot be proved by a copy or counterpart, where the original may be procured. But if the deed be enrolled, certifying an attested copy, is proof of the enrolment, and such copy may be given in evidence.

Copy is also used for the imitation of an original work, more particularly in painting, draught, figure, &c.

Copy, among printers, denotes the manuscript, or original of a book, given to be printed.

COPY-HOLD, [*copy* and *hold*,] a tenure, for which the tenant hath nothing to shew but the copy of the rolls made by the steward of his lord's court: for the steward, as he enrolls other things done in the lord's court, so he registers such tenants as are admitted in the court, to any parcel of land or tenement belonging to the manor; and the transcript of this is called the court roll, the copy of which the tenant takes from him, and keeps as his only evidence. This is called a base tenure, because it holds at the will of the lord; yet not simply, but according to the custom of the manor: so that if a copy-holder break not the custom of the manor, and thereby forfeit his tenure, he cannot be turned out at the lord's pleasure. These customs of manors vary in one point or other almost in every manor. Some copy-holds are finable, and some certain; that which is finable, the lord rates at what fine or income he pleases, when the tenant is admitted into it: that which is certain is a kind of inheritance, and called in many places customary: because the tenant dying, and the hold being void, the next of blood paying the customary fine, as two shillings for an acre, or so, cannot be denied his admission. Some copy-holders have, by custom, the wood growing upon their own land, which by law they could not have. Some hold by the verge in ancient demesne; and though they hold by copy, yet are they, in account, a kind of freeholder; for, if such a one commit felony, the king hath annum, diem, et vastum, as in case of freehold. Some others hold by common tenure, called mere copy-hold; and they committing felony, their land escheats to the lord of the manor. See **TENURE** and **VILLENAGE**.

COPY-HOLDER, one who is admitted tenant of lands or tenements within a manor, which time out of mind, by use and custom of the manor, have been demisable, and demised to such as will take them in fee-simple or fee-tail, for life, years, or at will, according to the custom of the manor by copy of court-roll; but is generally where the tenant has such estate either in fee or for three lives.

COPY-RIGHT, the right which an author has in his own compositions. See **LITERARY PROPERTY**.

COQUET, a river in Northumberland, which runs into the sea, seven miles S. of Alnwick.

COQUET, a small island of England, near the coast of Northumberland.

COQUIMBO, a port town of South America in Chili. Lon. 71. 11. W. Lat 29. 54. S.

COQUIMBO, a river of Chili, which falls into the Pacific Ocean.

COR CAROLI, in astronomy, an extraconstellated star in the northern hemisphere, situated between the coma Berenices, and ursa major; so called by Dr. Halley in honour of king Charles.

COR HYDRÆ, a fixed star of the first magnitude, in the constellation Hydra.

COR LEONIS, a fixed star of the first magnitude, in the constellation Leo.

CORACE, a river of Italy in Naples.

CORACIAS, the **ROLLER**, a genus of birds, order picæ. Bill straight, bending towards the tip, with the edges cultrated; nostrils narrow, naked; legs for the most part short; toes placed three before and one behind, and divided to their origin. One or other of the different species may be met with in all quarters of the globe. There are 16 species.

C. CYANÆA, the **BLUE-STRIPED ROLLER**, is in length 8 inches; the bill $\frac{1}{2}$ of an inch long, bent at the tip, and of a black colour; the irides are red: the general colour of the plumage deep blue black, dashed with streaks of greenish blue: the tails and legs are black. It inhabits New Caledonia. See **Plate XXXVIII**.

C. GARRULA, the **GARRULOUS ROLLER**, is about the size of a jay; the bill black; and at the base beset with bristles; the head, neck, breast, and belly, are of a light bluish green; back and scapulars reddish brown, coverts on the ridge of the wing rich blue, beneath pale green; upper part and tips of the quills dusky; the lower parts and rump of a fine deep blue; tail forked of a light blue. They are found in Sweden and Denmark on the one hand, and as far as Africa on the other.

CORACO BRACHIALIS, a muscle of the arm. See **ANATOMY**.

CORACOIDES, a small sharp process of the scapula. See **ANATOMY**.

CORACOMANTES, [*κοραες*, crows, and *μαντεια*, divination, Gr.] in antiquity, persons who foretold events from their observations on crows.

CORAH, or **CORAH-JEHENEHAD**, a city of Hindostan Proper, in the territory of Doab, 60 miles S. S. W. of Lucknow.

CORAL. See **CORALLINA**. There are properly but three kinds of coral; red, white, and black: the black is the rarest, and most esteemed. The red was formerly used in medicine, but is now scarce ever prescribed by any intelligent practitioner, having no virtues superior to the common testacea. When coral is newly taken up out of the sea, the small protuberances on its surface are soft, and yield, on being pressed, a milky juice which effervesces with acids. The cortical part with which the coral is all over covered, is not near so compact as the internal, and may easily be taken off whilst fresh; and from this part it is usually freed before it comes to the market. The greatest coral trade is in Genoa and Leghorn. Coral is often imitated by artificial compositions, some of which are made to resemble it exactly; but the fraud may be discovered by fire, the counterfeit not affording alkaline earth like the genuine coral. The colouring ingredients in the artificial coral are cinnabar and minium, which are easily discovered. The natural coral seems to receive its colour with iron; for spirit of vitriol acquires from it a ferruginous taste; and on calcining the coral, some particles are found among the ashes that are attracted by the magnet. According to Neumann, 16 oz. of coral, distilled in an open fire, yield about 6 $\frac{1}{2}$ scruples of volatile alkaline spirit, with two or three grains of an empyreumatic oil: from the caput mortuum calcined, 5 $\frac{1}{2}$ scruples of fixed salt may be extracted.

CORAL FISHERY. Red coral is found in the Mediterranean, on the coast of the late Provence, from Cape de la Couronne to that of St. Tropez; about the isles of Majorca and Minorca: on the S. of Sicily; on the coasts of Africa; and in the Ethiopic ocean, about cape Negro. The divers say, that the little branches are found only in the caverns whose situation is parallel to the earth's surface, and open to the south. The manner of fishing is nearly the same wherever coral is found. The method used at the bastion of France, under the direction of the company established at Marseilles, is to send out seven or eight men in a boat, and when the net is thrown by the castor, the rest work the vessel, and help to draw the net in. The net is composed of two rafters of wood tied cross-wise, with leads fixed to them: to these they fasten a quantity of hemp twisted loosely round, and intermingled with some large netting. This instrument is let down where they think there is coral, and pulled up again when the coral is strongly intangled in the hemp and netting. For this purpose, six boats are sometimes required; and if in hauling in, the rope happens to break, the fishermen run the hazard of being lost.

CORALLINA, or **CORAL**, in zoology, a genus belonging to the order of vermes zoophyta. The trunk is radicated, jointed, and calcareous. The species are 8, distinguished by the form of their branches, and are found in the ocean, adhering to stones, bones, shells, &c. The corals were formerly believed to be vegetable substances hardened by the air; but are now known to be composed of congeries of animals, which are even endowed with the faculty of moving spontaneously. The islands in the South Sea are mostly coral rocks covered over with earth. The little creatures, which have scarce sensation enough to distinguish them from plants, build up a rocky structure from the bottom of that sea, too deep to be measured by human art, till it reaches the surface. Some of these coralline islands appear to be of a much older date than others; particularly the Friendly Islands: and it is probable that as these submarine works are still going on, new islands may by that means frequently be produced. M. De Pyssonnel of Marseilles, in consequence of a series of experiments, from 1720 to 1750, seems to have been the first who threw a proper light upon



upon the nature and production of coral and similar marine substances. Those bodies, which the count de Marsigli imagined to be flowers, this ingenious naturalist discovered to be insects inhabiting the coral; for upon taking branches of it out of the water, the flowers, which proceeded from a number of white points answering to the holes that pierced the bark, and the radiation of which resembled the flower of the olive-tree, entered into the bark and disappeared; but upon being again restored to the water, they were some hours after perceptible. These flowers spread on white paper lost their transparency, and became red as they dried. The holes in the bark corresponded to small cavities upon the substance of the coral; and when the bark is removed, there may be seen an infinite quantity of little tubes connecting the bark with the inner substance, besides a great number of small glands adhering to them; and from these tubes and glands the milky juice of coral issues forth: the holes in the bark are the openings through which the insects that form the substances for their habitation come forth; and those cavities which are partly in the bark, and partly in the substance, are the cells which they inhabit. The organs of the animal are contained in the tubes, and the glandules are the extremities of its feet, and the milky liquor is the blood and juice of the animal, which are more or less abundant in proportion to its health and vigour. When the insects are dead, they corrupt, and communicate to the water the smell of putrid fish. This juice or liquor runs along the furrows perceived upon the proper substance or body of coral, and stopping by little and little becomes fixed and hard, and is changed into stone; and being stopped in the bark, causes the coral to increase proportionably, and in every direction. In forming coral, and other marine productions of this class, the animal labours like those of the testaceous kind, each according to his species; and their productions vary according to their several forms, magnitudes, and colours. The coral insect, or polype, M. Peyssonnel observes, expands itself in water, and contracts itself in air, or when it is touched with the hand in water, or acid liquors are poured upon it: and he actually saw these insects move their claws or legs, and expand themselves, when the sea-water containing coral was placed near the fire, and keep them in their expanded state when separated from the coral in boiling water. Broken branches of coral have been observed to fasten themselves to their branches, and have continued to grow; and this is the case when they are connected with detached pieces of rock and other substances, from which no nourishment could be derived. The coral insects in their cells, not having been injured, continue their operations; and as they draw no nourishment from the stone of the coral, they are able to increase in a detached and separate state.

CORALLINES, in natural history, were formerly reckoned a genus of plants, and Mr. Tournefort enumerates 36 species of them; but in the Linnæan system they belong to the class of the zoophytes. They are defined by modern naturalists, submarine plant-like bodies, that consist of many slender finely divided and jointed branches, resembling some species of moss; or animals growing in the form of plants, having their stems fixed to other bodies. These stems are composed of capillary tubes, whose extremities pass through a calcareous crust, and open into pores on the surface. The branches are often jointed, and always subdivided into smaller branches, which are either loose and unconnected, or joined as if they were glued together. They are distinguished from plants by their texture and hardness: they also yield in distillation a considerable quantity of volatile salt; and their smell, in burning, resembles that of burnt horns and other animal substances. Many of the corallines seem to consist of a single tube, containing a single parent animal. Every branch emitted contains an offspring of this parent dependent upon it, and yet capable of producing its like in the emission of a new branch. Others consist of many such tubes united, rising up together, and encircling the deserted tubes of their progenitors, whose exuvie become the substratum of a rising generation. The common coralline is only used in medicine, as a vermifuge. It is given in powder, from 10 grains to a scruple or half a dram, twice a day. Mr. Ellis distributes corallines into four kinds; viz.

1. CORALLINES, ARTICULATED, consisting of short pieces of a stony or cretaceous brittle matter, whose surface is covered with pores or cells, which are joined by a tough, membranous, flexible substance, composed of many small tubes of the like nature com-

pacted together. The stony part is soluble in vinegar, and the other parts remain entire. Fig. 1, Plate LII. represents the coralline of the shops; and fig. 2, a branch of it magnified. It is fixed to rocks and shells by stony joints, which, as they rise, are united to others by extremely fine and slender tubes: these may be discovered by a good eye, or a common magnifier. As the stems extend themselves, they become pennated by side-branches which come out opposite to each other, and are jointed in the same manner; the joints of this species are like the upper part of an inverted cone, but a little compressed: the whole surface is covered over with very minute circular-shaped cells like pores: see fig. 3, and 4, where they are higher magnified. Fig. 5, shews a cross section highly magnified. If a branch of this coralline is put into vinegar, these cells are dissolved with the whole cretaceous surface; instead of which there appear rows of minute ramifications, which seem to have communicated with each of these cells. Upon some specimens of this coralline, are seen small figures like seed-vessels, with which the branches frequently terminate. We frequently find these corallines of different colours, as red, green, ash, and white; but all of them, when exposed to the sun and air on the shore, become white.

2. CORALLINES, CELLIFEROUS, those which appear, when magnified, to be fine thin cells, the habitations of small animals connected together, and disposed in a variety of elegant forms like branches. These effervesce with acids. See fig. 6; with parts magnified, fig. 7, 8, and 9.

3. CORALLINES, TUBULAR, are composed of a number of simple tubes, growing up nearly together; or of such branched ones as have neither denticles nor vesicles. These are horny and elastic, and recover their original form in water. Some of them appear wrinkled like the wind-pipe, and others like the intestines of small animals. See fig. 10.

4. CORALLINES, VESICULATED, are distinguished by their horny hollow ramifications; most of them are furnished with little denticles on their branches, like leaves and mosses; and at certain seasons of the year they have small bodies like bladders proceeding from their stems and branches, and differing in form according to the different species. Their colour, when dry, is of a yellowish or pale brown, and their nature is elastic. They are found adhering to rocks, shells, and fucuses, by small root-like tubes: they recover their form in water, after having been dried; and when put into vinegar, they cause no effervescence. Fig. 11, represents the sea tamarisk in its natural size, and fig. 12, the denticles magnified; fig. 13, the sea-cypress; fig. 14, a part magnified; and fig. 15, and 16, the small climbing coralline, with well-shaped cups. Besides the above, Mr. Ellis enumerates other genera of marine productions; as the keratophyta eschara, fig. 17, sponges, and alyconium; all which are the nests or matrices of sea-animals. This class of marine bodies is formed like fungi of various figures, and with different sorts of covering; some consisting of a spongy, and others of a fleshy substance; the skin being in some gritty, and in others callous; and fig. 19, 20, are views of one of the warts magnified; fig. 21, is the appearance of the polype, when the cretaceous matter was dissolved: fig. 22, represents the particles that compose the incrustation, magnified; fig. 18, is a sea-willow, or keratophyton dichotomum.

CORAL RIVER, a river in New Mexico, which falls into the gulf of California.

CORAL-STONE, a kind of red and white agate, found in Italy and some parts of Saxony, which breaks in veins.

CORANICH, among the Scotch and Irish, the custom of singing at funerals, anciently prevalent in those countries, and still practised in several parts. See ULOGHONE.

CORBACH, a town of Germany, in the circle of the Upper Rhine, 12 miles N. N. W. of Waldeck.

CORBAN, [קרבן] an alms-basket; a receptacle of charity; a gift; an alms.

CORBAN, in Jewish antiquity, stands for an offering or gift made to God, or his temple. The Jews sometimes swore by corban, or the gifts offered unto God. If a man made all his fortune corban, or devoted it to God, he was forbidden to use it. If all that he was to give his wife, or his father and mother, was declared corban, he was no longer permitted to allow them necessary subsistence. Even debtors were permitted to defraud their creditors, by consecrating their debt to God. Our Saviour reproaches the Jews, in

the Gospel, with these uncharitable and irreligious vows. By this word such persons were likewise meant as devoted themselves to the service of God and his temple. Corban signifies also the treasury of the temple, where the offerings, which were made in money, were deposited.

CORBAN was also applied to those offerings which had life, in opposition to the minchah, or those which had not. It is derived from the word *karab*, which signifies to approach; because the victims were brought to the door of the tabernacle.

CORBAN is likewise a ceremony which the Mohammedans perform at the foot of mount Ararat in Arabia, near Mecca. It consists in killing a great number of sheep, and distributing them among the poor.

CORBECK, a town of France, in the department of Dyle, three miles S. of Louvain.

CORBEIL, a town of France, in the department of Seine and Oise, 17 miles S. of Paris.

CORBEILS, in fortification, little baskets about a foot and a half high, eight inches wide at the bottom, and twelve at the top; which being filled with earth, are frequently set one against another upon the parapet, or elsewhere, leaving certain port-holes, whence to fire upon the enemy under covert, without being seen by them.

CORBEL, in architecture, the representation of a basket, sometimes seen on the heads of caryatides. The word is also used, in building, for a short piece of timber placed in a wall, with its end sticking out six or eight inches, as occasion serves, in manner of a shouldering-piece.

CORBELIN, a town of France in the department of Isere, 30 miles E. S. E. of Lyons.

CORBENY, a town of France, in the department of Aisne, 15 miles N. N. W. of Rheims.

CORBEY, or CORBIE, a town of France, in the department of Somme, 10 miles E. of Amiens.

CORBIERES, a town of the Helvetic republic, in the Canton of Friburg; 10 miles S. of Friburg.

CORBY, a town of Germany, on the confines of Westphalia, with a famous abbey, 36 miles E. of Paderborn.

CORCAS, an island in the Atlantic, N. of St. Domingo, resembling a crescent in form. Lon. 70. 55. W. Lat. 21. 55. N.

CORCHORUS, in botany, a genus of the monogynia order, and polyandria class of plants; natural order, Columnææ. Corolla pentapetalous, calyx pentaphyllous, deciduous; capsule many-valved, many-celled. It has sixteen species, natives of both the Indies.

CORCULUM, in botany, a term used by Linnæus for the heart, or more properly embryo, of a seed, alluding to its shape, which in the walnut, and many other seeds, resembles the animal heart in miniature. It is the most important, and even essential part of a perfect seed, to which all the rest are subservient, being the point whence the future plant originates. In unimpregnated seeds it is deficient, or rather abortive; in fertile ones it is closely connected with the cotyledons, on which it depends for the first supplies of nutriment, and other exciting causes of its evolution. The corculum consists of the radicle, which descends to become a root, and the plumula or feather which ascends and becomes the stem and leaves.

CORCYRA, in ancient geography, an island in the Ionian sea, opposite to Thesprotia, a district of Epirus, called Scheria and Phæacia by Homer. It is now called Corfu.

CORCYRA, a town in the above island, now Corfu, from the *Korvufu* of the middle age, the name of the citadel. It was a colony of Corinthians.

CORCYRA NIGRA, an island in the Adriatic, on the coast of Dalmatia; now Curzola.

CORD, or CHORD. See CORDAGE. The word comes from the Greek *χορδή*, which properly signifies an intestine or gut, of which cords may be made.

CORD, MAGICAL, an instrument in great use among the Laplanders, and by them supposed to be endued with a number of virtues. It is a cord or rope with three knots tied in it. They use many magical rites and ceremonies in the tying of this cord; and, when thus prepared, it is supposed to have power over the winds; and they will sell, by means of it, a good wind, or at least the promise of one, to a ship. If they untie only one of these

knots, a moderate gale succeeds; if two, it is much stronger; and if three, a storm is sure to follow.

CORD OF WOOD, a certain quantity of wood for burning, so called because formerly measured with a cord. The dimensions of a statute cord of wood are eight feet long, four feet high, and four feet broad.

CORDAGE, a term used, in general, for all sorts of cord, whether small, middling, or great, made use of in the rigging of ships.

CORDAGE, CABLE-LAID, as the seamen term it, is made with nine strands, *i. e.* the first three strands are laid slack, and then three of them being closed together, make a cable. See CABLE. The same for tacks, but they are laid tapering.

CORDAGE, HAWSER-LAID, is made only with three strands. Cordage-stays are cable-laid, but made with four strands, as cables are with three; with the addition of a heart, which goes through the centre of them.

CORDAGE, WHITE, is that which has not yet been tarred.

CORDAGE, TARRED, in spinning is that which is made of rope-yarn ready tarred.

CORDAGE, TARRED IN THE STOVE, is that which has passed through hot tar, in coming out of the stove. Every quintal of cordage may take about twenty pounds of tar. Cordage re-made is that which is made of ropes used before. Cordage, when very old, is used for oakum to caulk the seams of ships. When a rope is said to be six inches it is understood of its circumference. A rope of sixty threads is one composed of so many rope-yarns. The naval cordage of the earlier ages was in all probability only thongs of leather. These primitive ropes were retained by the Caledonians in the 3d century. The nations N. of the Baltic had them in the 9th or 10th centuries: and the inhabitants of the western isles of Scotland still use them; cutting the skin of a seal, or the raw and salted hide of a cow, into long pieces, and fastening the plough to their horses with them, or even twisting them into strong ropes of 20 or 30 fathoms in length. But these, in the south of our island, and on the continent, were early superseded by the use of iron chains. The Veneti, who were so intimately connected with the Belgæ of Britain, used iron chains for their cables in the days of Cæsar. But in the more refined countries of the south, both thongs and these had long given place to vegetable threads. The Greeks appear to have used the common rushes of their country, and the Carthaginians the spartium or broom of Spain. And as all the cordage of the Romans was made of these materials at their last descent on our island, so the art of manufacturing them would necessarily be introduced with the Roman settlements among the Britons. Under the direction of Roman artists their thongs of leather would naturally be laid aside, and the junci, or rushes of the plains, worked up into cordage. And what remarkably coincides with this opinion is, that the remains of old cables and ropes are still distinguished among the British sailors by the name of old junk. The Roman sails, which were composed of flax in the days of Agricola, were afterwards made of hemp; and our own are therefore denominated cannabis or canvas by our mariners at present. And doubtless about the same period did the junk of the British cordage give way to the same materials; the use of hempen ropes upon land, and of hempen nets for hunting, being very common among the Romans in the first century. See ROPE-MAKING.

CORDEAU, [Fr.] a measuring line used for marking out the ground for a camp or fortification.

CORDED, in heraldry, a cross corded: some authors take it for a cross wound or wrenched about with cords; others, with more probability, take it for a cross made of two pieces of cord.

• CORDILLERAS, mountains of South America, otherwise called Andes.

CORDELIER, in church history, a Franciscan, or religious of the order of St. Francis. The cordeliers are enjoined to live in common: those who are admitted into the order, are first to sell all they have and give it to the poor. The priests are to fast from the feast of All Saints till the Nativity.

CORDES, two towns of France, viz. 1. in the department of Tarn, 10 miles N. of Gaillac. 2. In that of Upper Garonne, 20 miles N. W. of Thoulouse.

CORDIA, in botany, a genus of the monogynia order, and pentandria class of plants; natural order, Asperifolia. Corolla, funnel-

funnel-shaped; style dichotomous or divided into two threads, and each of these divided into other two. It has twelve species.

C. MYXA, the **ASSYRIAN PLUM**, is a native of Assyria, Egypt, and the coast of Malabar. The leaves of this tree are about three inches long, opposite, flat, entire, on a round petiole half an inch in length; peduncles paniced, terminating, subcorymbed; petals white, revolute; fruit inferior, red, nearly an inch in diameter. The timber of this tree is tough and solid; it is used for procuring fire by friction.

CORDIAL, [from *cor*, the heart, Lat.] reviving, invigorating, restorative.

CORDIALS. See **CARDIAC**.

CORDIAL, in medicine, whatever raises the spirits, and gives them a sudden strength and cheerfulness. See **MEDICINE**.

CORDON, in fortification, a row of stones, made round on the outside, and set between the wall of the fortress, which lies aslope, and the parapet which stands perpendicular, after such a manner, that this difference may not be offensive to the eye: whence the cordons serve only as an ornament, ranging round about the place, being only used in fortification of stone-work. For in those made with earth, the void space is filled up with pointed stakes.

CORDONNIERS, FRERES, [Fr. *i. e.* Brothers, Shoemakers,] the title of two pious societies, which existed in Paris before the revolution. They were established by authority about the middle of the 17th century; the one under the protection of St. Crispin, the other of St. Crispianus, two saints who had formerly honoured the profession. They lived in community, and under fixed statutes and officers; by which they were directed both in their spiritual and secular concerns.

CORDOVA, a province of Spain, in Andalusia, and formerly an independent kingdom.

CORDOVA, or **CORDOUA**, the capital of the above province, anciently called Corduba, and seated on the Guadalquivir, 75 miles N. E. of Seville. Lon. 4. 4. W. Lat. 37. 52. N.

CORDOVA, a province of South America in the government of Buenos Ayres.

CORDOVA, a city of Peru, in S. America, in the jurisdiction of Charcas, 80 leagues S. of St. Jago. From indisputable evidence, a negress, in this city, named Louisa Truxo, was alive in 1774, aged one hundred and seventy-five years! Lon. 63. 30. W. Lat. 32. 30. S.

CORDWAINER, [from *Cordovan*, Spanish leather,] a term whereby shoemakers are denominated in statutes. By a statute of Jac. I. the master and wardens of the cordwainers company, &c. are to appoint searchers and triers of leather; and no leather is to be sold, before searched, sealed, &c.

CORDWAINERS, or **CORDINERS**, is still the title of the incorporation of shoe-makers in Edinburgh. The French workmen who prepare the corduas are still called *corduanniers*.

CORDYLOCARPUS, in botany, a genus of the tetrady-namia siliquosa class and order. Silique cylindrical, swelling into knobs, jointed, the uppermost joint distinct; calyx closed. Two species, natives of the Archipelago.

CORE, a sound in N. Carolina, lying S. of Pimlico, with which it communicates.

COREA, a peninsula lying N. E. of China, between 99 and 109 degrees of E. Lon. and between 32 and 46 of N. Lat. It is divided into 8 provinces, which contain 40 cities of the 1st rank, 51 of the 2d, and 70 of the 3d. The capital is Hanching, where the king resides. Corea chiefly produces wheat, rice, and ginseng, with a kind of palm-tree which yields a gum capable of producing a yellow varnish little inferior to gilding. Hence also are exported castor and sable skins; also gold, silver, iron, and fossil salt; a kind of small brushes for painting, made of the hair of a wolf's tail, are likewise manufactured here, which are exported to China, and highly esteemed there. The sea-coasts abound in fish, and very great numbers of whales are found there year towards the N. E.

COREIA, in antiquity, a festival in honour of Proserpine, named *Core*, *Kógr*, which in the Molossian dialect signifies a beautiful woman.

CORELLI, **ARCHANGELO**, a famous Italian musician and composer, born at Fusignano, in Bologna, in 1633. He entertained an early propensity to the violin. About 1672, his curiosity led him to visit Paris, but notwithstanding the character which he

brought with him, he was driven back to Rome by Lully, whose jealous temper could not brook so formidable a rival. In 1680 he visited Germany, and met with a reception suitable to his merit from most of the German princes, particularly the elector of Bavaria; in whose service he was retained, and continued for some time. After about five years stay abroad, he returned to Rome. His proficiency on the violin was so great, that his fame soon spread throughout Europe. The style of his performance was learned, elegant, and pathetic; and his tone firm and even. Mr. Geminiani, who was well acquainted with it, used to resemble it to a sweet trumpet. It is said, that, whilst he was playing on the violin, it was usual for his countenance to be distorted, his eyes to become as red as fire, and his eye-balls to roll as in an agony. Corelli was highly favoured by that great patron of poetry and music, cardinal Ottoboni; and regulated the musical academy held at his palace. Here Mr. Handel became acquainted with him; and a serenata of Handel's entitled, *Il Triomfo del Tempo*, being performed, the overture was in a style so new and singular, that Corelli was confounded in his first attempt to play it. While Corelli resided at Rome, many persons from other countries were ambitious of becoming his disciples. Of these it is said the late lord Edgcombe was one. Corelli died at Rome in 1713; and was buried in the church of the Rotunda. A monument with a marble bust was erected to his memory by Philip William, count palatine of the Rhine, under the direction of cardinal Ottoboni. For many years after his death, he was commemorated by a solemn musical performance in the Pantheon; where some of his concertos were performed by those who had been his pupils, in the same slow, distinct, and firm manner, without graces, in which they were played by the author himself. He was a passionate admirer of pictures, and lived in an uninterrupted friendship with Cignani and Carlo Marat; who presented him at times with pictures, both of their own painting and by other masters: whereby he became possessed of a valuable collection of original paintings; all which, together with about 6000*l.* sterling, he left to his friend Ottoboni; who, reserving the pictures to himself, generously distributed the rest among the relations of the testator. Corelli was remarkable for the mildness of his temper, and the modesty of his deportment; though not insensible of the respect due to his skill and exquisite performance. His compositions are equally celebrated for the harmony resulting from the union of all the parts, and for the fineness of the airs. His music is the language of nature, and, for a series of years, all that heard it were sensible of its effects. Amidst all the innovations which the love of change had introduced, it continued to be performed, and was heard with delight in churches, in theatres, at public solemnities and festivals, in all the cities of Europe for near 40 years. And even at this day, the masters of the science allow that, of fine harmony and elegant modulation, the most perfect exemplars are the compositions of Corelli.

COREOPSIS, TICK-SEEDED SUNFLOWER; a genus of the polygamia frustranea order, and syngenesia class of plants; natural order, Compositæ. Receptacle paleaceous; pappus two-horned; calyx erect, polyphyllous, surrounded with patent radiated leaflets at the base. Twenty species, most of them herbaceous perennials.

CORFE CASTLE, a town in Dorsetshire, so named from a strong castle, now in ruins. It is 21 miles E. of Dorchester, and 120 W. by S. of London. This town was built by king Edgar, and was the scene of the murder of Edward the martyr.

CORFU, an island in the Ionian sea, at the mouth of the gulph of Venice, formerly called *Coreyra* and *Phæacia*, famous for the gardens of Alcinoüs. It was long considered as the bulwark of Christendom against the Turks, who often attempted to reduce it, but in vain. It is well fortified, having 50 castles; and the number of the inhabitants is said to be about 50,000, who are of the Greek church. The soil is very fruitful, and produces a great deal of wine, olives, and other fruits, particularly excellent figs.

CORFU, the capital of the above island. It is four miles in circumference, and is seated on the E. coast. Lon. 19. 48. E. Lat. 39. 40. N.

CORGA, a country of India on the coast of Malabar, bounded on the N. and E. by Mysore.

CORIA, a town of Spain, in the kingdom of Leon, and province of Estremadura.

CORIA, a town of Spain, in the province of Seville, on the Guadalquivir, seven miles from Seville.

CORIANDRUM, CORIANDER: a genus of the digynia order, and pentandria class of plants; natural order, Umbellatæ. Corolla radiated; petals inflexed, emarginated; involucre universal monophyllous; partial involucre halved; fruit spherical. There are two species, both herbaceous annuals, the leaves of which are useful for the kitchen, and the seeds for medicine. Both species have divided small leaves, somewhat resembling parsley.

CORIARIA, the TANNER'S, or MYRTLE-LEAFED SUMACH: a genus of the decandria order, and diœcia class of plants; natural order, Miscellanæ. Male calyx pentaphyllous; corolla pentapetalous, very like the calyx, and united with it; antheræ bipartite; female calyx pentaphyllous; corolla like that of the male; styles five; seeds five, covered with five succulent petals, forming altogether the resemblance of a berry. It has three species.

CORIDOR, [Ital. and Span.] in architecture, a gallery or long isle around a building, leading to several chambers at a distance from each other, sometimes wholly inclosed, and sometimes open on one side.

CORIDOR, or CORRIDOR, in fortification, a road or way along the edge of the ditch, without side, about twenty yards broad, encompassing the whole fortification. It is also called the covert way; because covered with a glacis, or esplanade, serving it as a parapet.

CORIENTES, a cape of Mexico, or New Spain, on the N. Pacific ocean.

CORIENTES, a small city of S. America, in the government of Buenos Ayres, at the confluence of the Parana and Paraguay.

CORINNA, a celebrated Theban poetess, who is said to have gained the prize in competition with Pindar himself, five different times. She flourished about B. C. 450, and wrote 50 books of Epigrams.

CORINTH, a celebrated city of antiquity, for some time the most illustrious of all the Greek cities. It is said to have been founded 1514 years before Christ, by Sisyphus the son of Æolus, and Grandfather of Ulysses. Various reasons are given for its name, but most authors derive it from Corinthus, the son of Pelops. It was situated in the S. part of the Isthmus which joins the Peloponnesus to the continent. Lon. 23. 3. E. Lat 38. 14. N. As the genius of the Corinthians led them to commerce rather than martial exploits, their city became the finest in all Greece. It was adorned with the most sumptuous buildings, as temples, palaces, theatres, porticoes, &c. all enriched with a beautiful kind of columns, which from the city were called Corinthian.

CORINTH, THE ISTHMUS OF, is a neck of land in the Morea, which joins the Morea to Greece; and reaches from the gulph of Lepanto to that of Egina.

CORINTHIAN ORDER, is generally reckoned the fourth, but by some the fifth, of the five orders of architecture; and is the most noble, rich, and delicate, of them all. Vitruvius ascribes it to Callimachus, a Corinthian sculptor, who is said to have taken the hint by passing by the tomb of a young lady, over which a basket with some of her playthings had been placed by her nurse, and covered with a tile; the whole having been placed over a root of acanthus. As it sprung up, the branches encompassed the basket; but arriving at the tile, bent downwards under the corners of it, forming a kind of volute. Hence Callimachus imitated the basket by the vase of his capital, the tile in the abacus, and the leaves in the volute. Villalpandus imagines the Corinthian capital to have taken its original from an order in the temple of Solomon, whose leaves were those of the palm-tree. The capital is adorned with two rows of leaves, between which little stalks arise, of which the 16 volutes are formed, which support the abacus. See ARCHITECTURE.

CORINTHIANS, the people of Corinth. Christianity was early planted among them, and St. Paul wrote them three letters, the first of which is lost. See 1 Cor. v. 9.

CORIS, in botany, a genus of the monogynia order, and pentandria class of plants. Corolla monopetalous, irregular; calyx prickly; capsule quinquevalved, superior. There is only one species, viz. the

C. Monspelienensis, or blue maritime coris of Montpellier.

CORISPERMUM, TICKSEED, a genus of the digynia order, and monandria class of plants: natural order, Holoracæ. No calyx; petals two; seed one, oval, naked. There are two species; neither of them remarkable for beauty or any other quality. Natives of Russia.

CORITANI, an ancient people of Britain who possessed the

inland parts now called Northampton, Leicester, Rutland, Lincoln, Nottingham, and Derby shires.

CORK, a county of Ireland, in the province of Munster; containing near a million of acres, and divided into 15 baronies. It is bounded on the N. E. by the county of Waterford. Next to Dublin, it is the most populous county in the kingdom.

CORK, a city of Ireland, and capital of the county. It is an episcopal see; and is the second in the kingdom, in point of size, trade, and population. The harbour called the Cove, seven miles below the town, is one of the best in the world, the entrance is safe, and the whole navy of England might ride in it, secure from every wind that blows. Ships of burden, however, are obliged to unload at Passage, $5\frac{1}{2}$ miles from Cork, the channel not admitting vessels of above 150 tons. Cork lies 50 miles S. of Limerick. Lon. 8. 23. W. Lat. 51. 54. N.

CORK, [cortex, Latin; korck, Dutch,] is the bark of a species of quercus. See QUERCUS. To take off the bark an incision is made from the top to the bottom of the tree, and at each extremity another round the tree, perpendicular to the first. When stripped from the tree, which does not therefore die, the bark is piled up in a pond or ditch, and loaded with heavy stones to flatten it, and reduce it into tables: hence it is taken to be dried; and when sufficiently dry, put in bales for carriage. If care be not taken to strip the bark, it splits and peels off itself; being pushed up by another bark formed underneath. The bark of cork, as well as the acorn, are of some use in medicine; being both reputed astringents, after being burnt and powdered when used externally; but the chief use of the former is, to put in shoes, slippers, &c. and to stop bottles. The Spaniards burn it to make that kind of light black we call Spanish black, used by painters. Cups made of cork, are said by some to be good for hectic persons to drink out of. The Egyptians made coffins of cork; which being lined with a resinous composition, preserved dead bodies uncorrupted. The Spaniards line stone walls with it, which not only renders them very warm, but corrects the moisture of the air.

CORK-WAISTCOAT, in the Gentleman's Magazine for 1758, we met with the following curious contrivance of a cork-waistcoat, for the purpose of preventing accidents by drowning. It was invented by Mr. Dubourg, and is composed of four pieces of cork, two for the breasts, and two for the back, each being nearly of the same length and breadth as the quarters of a common waistcoat, without flaps; the whole is covered with coarse canvas, having two holes to put the arms through. There are spaces left between the two back pieces and each back and breast piece, that they may the more easily be adjusted to the body. Thus, the waistcoat is open only in front, and may be fastened on the wearer with strings; or, if it should be thought more secure, with buckles and leather straps. The weight of this cork-waistcoat does not exceed twelve ounces, and may be made at a very moderate expence. It is more simple in its form than any other contrivance for a similar purpose. Mr. Dubourg has made trial of its efficacy in the Thames, and found that it not only supported him on the water, but that even two men, with their utmost efforts, were not able to sink him. Hence it is eminently calculated for mariners, passengers at sea in general, and likewise for all those who resort to bathing-places for the benefit of their health; as the most timorous and delicate person may, with perfect safety, boldly venture with one of these waistcoats into a rough sea. See BAMBOO-HABIT.

CORLIN, or CORLING, a town of Germany, in Pomerania, eight miles S. E. of Colberg.

CORMANTIN, GREAT, a town of Africa, on the Gold Coast, in the territory of Fantin. It contains about 1200 men, who are either traders or fishermen.

CORMANTIN, LITTLE, a town on the Gold Coast, four miles W. S. W. of Great Cormantin.

CORMERY, a town of France, in the department of Indre and Loire, eight miles S. E. of Tours.

CORN, [corn, Sax. korn, Germ.] in rural economy, the grains or seeds of plants, which are separated from the ear, and used chiefly for making bread. There are several species of corn, such as wheat, rye, barley, oats, millet, and rice, maize, or Indian corn, &c. each of which will be mentioned in its alphabetical order. We cannot but animadvert upon the injudicious practice of cutting corn in cold autumns, before it is perfectly ripe; as experience has proved, that, if left standing, the ears will continue to fill, and become heavier, even during the autumnal frosts. Were this lat-

ter method adopted, a much greater proportion of flour might be produced; and the grain would neither shrink, nor shrivel, in barns or granaries: it might, at the same time, be prevented from rotting, on account of its immaturity, and the softness or moisture which are the necessary consequence. Notwithstanding the great care and attention which the husbandman may bestow on the cultivation of corn, his expectations of a plentiful harvest are often frustrated by a variety of disorders, and accidents, to which corn is peculiarly liable. The first and most formidable is the smut, which is caused by vermin breeding in the grain, and thus destroying its substance. Their propagation, beside other causes, is evidently facilitated by laying on the soil too large a quantity of crude dung: which, becoming mouldy, promotes the generation of the smut-animal. Various experiments have been accordingly tried, to eradicate this noxious distemper, with different degrees of success; a few of which, we shall enumerate. In the greater part of the counties of Devon and Cornwall, on the evening before the wheat is intended to be sown, it is laid on the floor in a heap, on which is poured a solution of lime, slacked with boiling water, and reduced to the consistence of cream: both are then mixed, and left together till morning, by which time the wheat is dry, and fit to be sown. In other parts of the same counties, the wheat is steeped either in fresh or salt water, for 12, 18, or 24 hours, when it is put to drain for an hour or two, after which, powdered lime is sifted over it, the whole being well mixed with a shovel: it is then thrown together in a heap, to dry previously to its being sown. Few farmers, however, soak it in brine, and a still smaller number of them, substitute animal urine, soap-boiler's lye, &c. In several other counties, there prevails a general practice of employing brine, strong enough to bear an egg, to which powdered lime is added, till it acquires an unctuous consistence. This composition is mixed with the wheat, the evening before it is committed to the ground. In Yorkshire, and several of the adjoining counties, arsenic is substituted for salt: some farmers render the solution thicker, by the addition of lime, while others either sprinkle the wheat with it, or steep and wash the former, then sift the lime over it, and mix them as before. Another method is, to put 70 gallons of water into a tub, at the bottom of which is a hole provided with a staff and tap hose, as in brewing; to this is to be added half a hundred weight of lime-stone, and the whole well stirred for half an hour, when it is suffered to stand about 30 hours. It should then be drawn off into another tub, and three pecks (42lbs.) of salt added, which, when dissolved, will make a strong pickle, fit for immediate use. But, if sea-water can be procured, half the quantity of salt will be sufficient. A basket of about two feet in diameter at the bottom, and twenty inches deep, should then be placed in the pickle, and the corn gradually immersed, in small quantities from one to two bushels; care being taken to skim off the light grains, which ought not to be sown, because many of them are infected with the smut. As soon as this operation is completed, the basket should be drawn up, and drained for a few minutes over the liquor, when it may be repeated, as often as the quantity of grain to be sown may require. This seed will be fit for the ground in 24 hours; but, where it is to be drilled, it should stand for 48: and, if the driller meet with any difficulty in performing his work, it will be necessary to make the pickle more astringent, by adding lime. Seed, thus prepared, may be kept for five, six, seven, eight, or even ten days above ground, without any injury or inconvenience. Another mode of preventing the smut in corn, was discovered by Mr. R. Treffrey, of Beer, in Flintshire: who, in a communication to Mr. Young, in the 21st vol. of "Annals of Agriculture," states, that having rubbed out a quantity of corn, he sowed part of it, unwashed. The remainder, about two bushels, was well winnowed, taken to a brook, and washed in the following manner: A gallon was put into a wire sieve, that had eight bars to an inch; it was first gently immersed a few times in the water, by which means every smut-ball, or animal, was easily discovered, and taken away; next the sieve was briskly agitated, for about a minute, when the whole, after being washed, and thrown into a tub with some water, was stirred round with a broom. It was then again put into the sieve, in the same proportion as before, and immersed in the brook, that the remaining particles might sink through the bottom of the sieve, and be carried away by the stream. This wheat was sown in the same field with the former, where no kind of manure could have the least tendency to produce smut-balls among either. The result at harvest proved, that

the unwashed corn produced as many smut-balls as grains of wheat, while that which had been immersed in the brook, was almost entirely exempt from the disorder. We venture to recommend the last-mentioned expedient; for the superiority of gradual washing over that of throwing the whole into a vessel and stirring it, is manifest. By this method, the infectious matter is not only loosened from the grains, but is carried away with the stream, while that, which is only washed in a tub, &c. cannot be totally cleared; for the more ponderous particles sink to the bottom, and remain among the seed-corn after the water is poured off. Corn is also liable to be grown, or sprouted, when it has partly begun to vegetate; for, if the whole of the grain were to bud, it would become unfit for being converted into bread. Hence it is very difficult to preserve sprouted corn, as the opening of the bud occasions it to heat, and the moisture it retains, disposes it still more to undergo the process of fermentation. It is also more subject to be attacked by insects, on account of its being sweeter, more tender, and susceptible of heat, consequently more liable to receive their eggs. If left to itself, sprouted corn heats, ferments, and contracts an unpleasant smell, and a bad colour: it also acquires a disagreeably sharp taste, which is communicated to the flour and bread; and, finally, grows mouldy and sour; in this state, it is fit only for the manufacture of starch. Farther, it is ground with difficulty, clogs the mill-stones, chokes the bolting-cloths, and yields but little flour; which is soft and moist, and will not keep for any length of time, especially during warm weather. Sprouted corn should by no means be stacked, but housed and threshed with the greatest expedition. Nor should it be put in a granary together with dry grain, as the latter will thus become moist. Care should also be taken to keep the place well aired; for, in the contrary case, even the latter cannot be preserved. As soon as sprouted corn is threshed, it should be spread upon the floor, and frequently turned; a door, or window, being left open to give vent to the steam. Sometimes it will be necessary to dry the corn in an oven, after the bread is removed; leaving the door half open, and turning the grain every ten minutes, to facilitate the evaporation of the moisture. When it is thus dried, it should be sifted, and not put into sacks, or in heaps, till it is properly cooled; as it will otherwise become mouldy. Although some fastidious persons may object to the trouble occasioned by this mode of curing sprouted corn, yet as eight or ten days continual drying will preserve it for a whole year, and render both the bread and flour of a better quality, it surely merits the attention of every diligent husbandman, and will amply compensate his trouble and labour. There is another disease that frequently attacks corn, which is usually termed burnt grain, which is like the smut, and is to be treated in a similar manner. To these may be added, what is called the spur, which affects both wheat and rye, but more especially the latter. The grains infested with it, are thicker and longer than the sound ones; their outsides are either brown or black, and their surface rough. If a spurred grain be opened, a white flour is perceivable in it, which is covered with another of a reddish or brown colour. The latter has some degree of consistence, but may be easily crumbled between the fingers. Naturalists are unable to ascertain, with precision, the cause of this distemper; but it is supposed to be occasioned by the bite or sting of an insect, that turns the corn into a kind of gall; a conjecture which is partly confirmed by the taste left on the tongue, after eating such grain. The effects arising from the use of corn thus damaged, are said to be malignant fevers and gangrenes, in consequence of which the extremities of the body sometimes mortify, and spontaneously separate, without any pain or effusion of blood. Among the various insects which prey upon corn, none is more destructive than the corn-butterfly, which is generated in a manner similar to that of the common butterflies. It settles on one grain, and after having totally consumed it, its existence is supposed to be prolonged by eating its own excrement. When it has attained its full growth, it is about one-quarter of an inch in length, and half the thickness of the grain it has devoured. To exterminate this noxious insect, it has been recommended to prepare a very strong lye of wood-ashes, to which, when it becomes yellow, as much quick-lime should be added, as will make it of a dusky white: while it is as hot as the hand can well bear it, the grosser part of the lye should be suffered to subside, and the lye poured off into a proper vessel; into which the corn is to be immersed by means of a basket, and quickly agitated; skimming off

those grains which float on the surface. In the course of two or three minutes, it may be taken out, and the basket with its contents suspended on two poles to drain; after which it should be spread on the floor of a granary to dry, while a second basket undergoes a similar immersion. This simple process not only preserves the grain from rotting, but at the same time destroys all those insects that may have penetrated its substance. An oven is also employed for drying the seed; but, as it is difficult to ascertain the proper degree of heat, without injuring vegetation, and yet not always sufficient to extirpate the vermin, it is seldom practised. When corn has been kept a long time, it frequently happens that mites reduce the greater part of the grain to dust. This serious damage may be prevented by rubbing the adjacent places with fetid oils and herbs, such as garlic and dwarf-elder, the strong smell of which tends to expel them: besides, they may be exposed to the rays of the sun, which immediately destroy them. In order to ascertain the relative value of different species of grain, corn-dealers avail themselves chiefly of the combined criterion of weight and measure. In a commercial point of view, such a method is doubtless the most accurate; however, an attention to the following practical directions, will be of considerable advantage in the sale or purchase of corn in general: 1. Take a handful of grain from a heap, or sack, and compress it closely for a minute; then pass it from one hand into the other, and attentively examine its flavour, whether it possess any peculiar smell, different from that which is natural to the species: in which case you may conclude that it has been repeatedly exposed to moisture, and undergone a slight degree of fermentation. The flour obtained from such corn, is deficient in measure, of an indifferent quality, and affords neither nourishing, nor wholesome bread. 2. If, on pressure by the hand, the grains appear so solid and smooth that they in a manner glide through the fingers, without having any foreign smell or colour, in this case it may be pronounced perfectly dry, and in a good state of preservation. 3. Should, on the contrary, the corn feel rough, or, if a number of grains, after compressing them by the dry hand, clog together and adhere to the fingers, it may be justly apprehended that such wheat, rye, &c. is damp, and possessed of all the bad properties before specified. Every attentive observer will find, that frequently some species of grain bears a price in the market, far exceeding its relative value, or proportion to other kinds of grain, which, in many instances, may serve as excellent substitutes. From the prices which have prevailed in different countries, during a long series of years, we have derived the following result of numbers:

Wheat.....	41
Rye.....	32
Barley.....	23
Oats.....	14

TABLE OF PROPORTIONS.

	Wheat.	Rye.	Barley.	Oats.
Wheat.....	1 : 1	5 : 4	7 : 4	3 : 1
Rye.....	4 : 5	1 : 1	3 : 2	16 : 7
Barley.....	4 : 7	2 : 3	1 : 1	8 : 5
Oats.....	1 : 3	7 : 16	5 : 8	1 : 1

It deserves, however, to be remarked, that these proportions occasionally vary, accordingly as the soil of different countries is more favourable to the production of one species of grain than to the other; and likewise as there is a greater or less demand for particular kinds of corn in the market, especially in barren or unproductive seasons. Thus, in Britain, the price of barley and oats is almost constantly disproportionate to that of wheat, and especially to rye, which may, consequently, be considered as the cheapest bread-corn. The immense quantities of malt liquors brewed in this country, and the great number of horses kept for pleasure, are sufficient reasons why barley and oats are sold at prices comparatively higher than their intrinsic value, in relation to wheat and rye. But if the rates stated in the preceding table be adopted in the computation of prices, and the farmer, or corn-dealer, be desirous to know what proportion, for instance, the price of oats bears to that of rye, let him search in the horizontal line for oats, and in front of the perpendicular line for rye: the field, or partition where both meet, contains the numbers 7 : 16, namely, that the price of oats is in proportion to that of rye, as se-

ven to sixteen; and so forth, with respect to the other species of corn here exhibited.

CORN, in medicine and surgery, a hard tumour like a flat wart, growing in several parts of the feet, especially upon the joints of the toes. This disorder is attributed to the wearing of too strait or narrow-toed shoes, which never fail to produce these tubercles, especially if the person is obliged to stand or walk much, and in the summer time. The uneasiness occasioned by the pressure of corns may be prevented in the following manner: take a piece of linen, spread with any emollient plaster; lay one piece over another, eight, or ten, or more times, and cut a hole in the middle of them, exactly the same size and circumference as the corn, then apply it in such a way that the corn enters the hole in the plaster, and is thus defended against the contact of shoes and stockings. Such a plaster, properly applied, will frequently cure in a few weeks, without any other remedy. If the corn is at the bottom of the foot, a hole cut in a felt sole, so as to fit the corn, is sufficient. When this method is found inefficient, rub the corn with the volatile liniment, two or three times, in the twenty-four hours, keeping it covered in the intervals with an emollient plaster. Every morning and evening the foot must be kept in warm water for half an hour, and the corn well rubbed with soap. When softened with the water, it should be scraped with a blunt knife till the soft part is removed, and till the operation begin to give pain. This treatment is to be continued till the corn is entirely extirpated.

CORNAGE, [from *corne*, Fr. *cornu*, Lat.] a tenure which obliges the landholder to give notice of an invasion by blowing a horn.

CORNARO, HELENA LUCRETIA, a learned Venetian lady, daughter of John Baptist Cornaro. She not only acquired a complete knowledge of the languages and sciences, but went through the philosophy of the schools; and at last took her degrees at Padua, being the first lady that ever was made a doctor. She made a vow of perpetual virginity, and devoted her time entirely to study. The fame of her learning attracted the attention of Lewis XIV. who ordered the cardinals Bouillon and D'Etrees to call on her; and they reported that her talents had not been exaggerated. She died in 1685.

CORNE, an island in the gulf of Mexico, ten miles long, and one broad.

CORNEA TUNICA, in anatomy, the second coat of the eye. See ANATOMY, and EYE.

CORNEL TREE, in botany. See CORNUS.

CORNELIA LEX, the CORNELIAN LAW, in antiquity, a name given to 16 Roman laws: viz. 1. De civitate, enacted A.U.C. 670, by Sylla; confirming the Sulpician law, and requiring the citizens of the eight newly elected tribes to be divided among the 35 ancient tribes. 2. De judiciis, in 673, ordaining, that the prætor should always observe the same invariable method in judicial proceedings, and that the process should not depend upon will. 3. De sumptibus, limiting the expences of funerals. 4. De religione, in 677, restoring to the college of priests the privilege of choosing the priests, which by the Domitian law had been lodged in the hands of the people. 5. De municipiis, revoking all the privileges which had been granted to the towns that had assisted Marius and Cinna in the civil war. 6. De magistratibus, giving the power of bearing honours, and being promoted before the legal age, to those who had followed the interest of Sylla; while the sons and partizans of his enemies, who had been proscribed, were deprived of the privilege of standing for any office in the state. 7. De magistratibus, in 673, ordaining that no person should exercise the same office within ten years distance, or be invested with two different magistracies in one year. 8. De magistratibus, in 673, divesting the tribunes of the privilege of making laws, interfering, holding assemblies, and receiving appeals. All such as had been tribunes were incapable of holding any office in the state by that law. 9. De majestate, in 670, making it treason to lend an army out of a province, or engage in a war without orders, to influence the soldiers to spare or ransom a captive general of the enemy, to pardon the leaders of robbers or pirates, or for the absence of a Roman citizen to a foreign court without previous leave. The punishment was aquæ et ignis interdictio. 10. Giving the power to a man accused of murder, either by poison, weapons, or false accusations, and the setting fire

to buildings, to choose whether the jury that tried him should give their verdict clam or palam, viva voce, or by ballot. 11. Making it aquæ et ignis interdictio to such as were guilty of forgery, concealing and altering of wills, corruption, false accusations, and the debasing or counterfeiting of the public oath. All who were necessary to this offence were deemed as guilty as the offender. 12. De pecuniis repetundis; by which a man convicted of peculation or extortion in the provinces, was condemned to suffer the aquæ et ignis interdictio. 13. A law giving power to such as were sent into the provinces with any government, of retaining their command and appointment without a renewal of it by the senate. 14. Another ordaining that the lands of proscribed persons should be common, especially those about Volaterræ and Fesula in Etruria, which Sylla divided among his soldiers. All the above were enacted by Sylla. 15. A law by C. Cornelius tribune of the people, in 686; it ordains that no person should be exempted from any law according to the general custom, unless 200 senators were present in the senate; and no person thus exempted could hinder the bill of his exemption from being carried to the people for their concurrence. 16. Another by Nasica, in 582, to make war against Perseus, son of Philip, King of Macedonia, if he did not give proper satisfaction to the Roman people.

CORNER-STONES, among builders, the two stones which stand one in each jamb of a chimney. The breadth of each stone ought to be equal to that of the jamb, and its face to be hollowed in the sweep of a circle; their height ought to reach from the hearth to the mantle-tree: they are commonly made of Ryegate or fire-stone.

CORNET, [*cornette*, Fr.] in the military art of the ancients, an instrument much in the nature of a trumpet: when only it sounded, the ensigns were to march alone without the soldiers: whereas when the trumpet only sounded, the soldiers were to move without the ensigns. The cornets and buccinæ sounded the charge and retreat, and the cornets and trumpets sounded during the course of the battle.

CORNET, in the modern military æconomy, is the third officer in the company, and commands in the absence of the captain and lieutenant. He takes his title from his ensign, which is square; and is supposed to be called by that name from *cornu*, because placed on the wings, which form a kind of points or horns of the army. Others derive the name from coronet; alleging, that it was the ancient custom for these officers to wear coronets or garlands on their heads.

CORNETO, a town of the late Roman republic, in the department of Cimino, 37 miles N.W. of Rome.

CORNEUS, the name given by Linnaeus to a kind of tin ore, found in black columns, with irregular sides, and terminating in prisms.

CORN-FLAG. See **GLADIOLUS**.

CORN-FLOWER. See **CENTAUREA**.

CORNICE, **CORNICHE**, or **CORNISH**. See **ARCHITECTURE**. The word is used, in general, for all little projectures in masonry or joinery, even where there are no columns, as the cornice of a chimney, beaufet, &c.

CORNICE RING, in gunnery, the next ring from the muzzle backwards.

CORNICULARIUS, in antiquity, an officer in the Roman army, whose business was to assist the military tribune in quality of a lieutenant. The cornicularii went the rounds in lieu of the tribune, visited the watch, and were nearly what the aids major were in the French army, before the revolution.

CORNICULUM, in ancient geography, a town of the Sabines, E. of Crustumetum, towards the Anio.

CORNISH DIAMONDS, crystals found in digging the tin-mines of Cornwall.

CORN-MARIGOLD. See **CHRYSANTHEMUM**.

CORN-MILL. See **MECHANICS**.

CORNOGAL, a town in the island of Ceylon, 30 miles N.W. of Candi.

CORN-PARSLEY. See **SISON**.

CORN-ROCKET, is a species of **Bunias**.

CORN-ROSE. See **PAPAVER**.

CORN-SALLAD, a species of **Valeriana**.

CORNU-CERVI. See **HARTSHORN**.

CORNUBIA, the ancient name of Cornwall.

CORNUCOPIÆ, among the ancient poets, a horn out of which

proceeded plenty of all things; by a particular privilege which Jupiter granted his nurse, the goat Amalthea.

CORNUCOPIÆ, in architecture and sculpture, is represented under the figure of a large horn, out of which issue fruits, flowers, &c. On medals, F. Joubert observes, the cornucopia is given to all deities.

CORNUCOPIÆ, in botany, a genus of the digynia order, and triandria class of plants; natural order, Gramina. Involucrum monophyllous, funnel-shaped, crenated, and multiflorous; calyx bivalved; corolla one-valved. There are two species.

CORNUS, **CORNEL-TREE**, **CORNELIAN CHERRY**, or **DOG-WOOD**, a genus of the monogynia order, and tetrandria class of plants; natural order, Stellatæ. Involucrum most frequently tetraphyllous; petals four, above the receptacle of the fruit; fruit a bilocular kernel. Twelve species are enumerated.

C. FLORIDA, or **VIRGINIAN DOG-WOOD**, has a tree-stem branching 12 or 15 feet high, and fine red shoots garnished with large heart-shaped leaves; and the branches terminated by umbellate white flowers, having a large involucrum succeeded by dark red berries.

CORNUTIA, in botany, a genus of the angiospermia order and didynamia class of plants; natural order, Personatæ. Calyx quinque-dentated; stamina larger than the corolla; style very long; berry monospermous. It has two species, *C. pyramidata*, with a blue pyramidal flower, and hoary leaves, it grows plentifully in several islands in the West Indies, at Campeachy, and La Vera Cruz. It rises to the height of 10 or 12 feet, with rude branches, the leaves being placed opposite. *C. quinata*, is a native of China, in the woods near Canton.

CORNWALL, a county of England, which forms the S.W. extremity of Great Britain. It is bounded by the English channel on the S. St. George's channel on the N.W. the Bristol channel on the N. and on the E. by the river Tamar, which separates it from Devonshire. Its name is supposed by some to be compounded of *corn*, signifying a rock in the British language, and *Gauls* or *Waules*, the name the Saxons gave to the Britons. Others think it is derived from the Latin *cornu*, or the British *kern*, a horn; on account of its running out into the sea somewhat in the form of a horn. Its chief rivers are the Tamar, Fale, Cober, Looe, Camel, Fowey, Haile, Lemara, Kense, and Aire. Its principal head-lands are the Land's-end, the Lizard, Cape Cornwall, Deadman's-head, Rame-head, &c. and a cluster of islands, 145 in number, called the Scilly isles, supposed formerly to have been joined to the main land, though now 30 miles distant; abounding with antiquities, particularly druidical. This county abounds in mines of different metals and semi-metals; but the principal produce is tin. The Phenicians visited these coasts for this article, about 400 or 450 years before Christ; and the mines continued to be wrought with various success at different periods. Mundie, a scarce mineral ore, of a white brassy or brown colour, is found in large quantities, intermixed with tin, copper, and lead, and sometimes by itself. Iron ore is found at Cornwall, but the working of it does not answer. There is no richer copper, nor a greater variety any where, than in this county. Silver has been rarely found, nor do the lead mines answer. Very late discoveries have proved that Cornwall has more gold than was formerly imagined. The cornish diamond is a figured crystal, generally hexagonal and pyramidal, or columnar, or both, of a fine clear water. Of all our bastard diamonds, it is esteemed the best. They are of different colours, black, yellow, &c. The clearer they are, the better they will bear engraving for seals.

CORNWALL, a township of Connecticut, in Litchfield county.

CORNWALLIS, a river of Nova Scotia.

CORNWALLIS, a town of Nova Scotia, in King's county.

COROLLA, among botanists, the most conspicuous part of a flower, surrounding the organs of generation, and composed of one or more flower-leaves, most commonly called petals, to distinguish them from the leaves of the plant: according as there is one, two, or three of these petals, the corolla is said to be monopetalous, dipetalous, tripetalous, &c. See **BOTANY**.

COROLLARY, [*corollarium*, Lat. from *corolla*; *finis coronat opus*; *corollair*, Fr.] is an useful consequence drawn from something already advanced, or demonstrated: thus it being demonstrated that a triangle which has two equal sides, has also two angles equal; this corollary will follow, that a triangle which has three sides equal, has also its three angles equal.

COROMANDEL, the eastern coast of the peninsula on this side

side the Ganges in Asia. It is bounded by the N. by Golconda, on the E. by the bay of Bengal, on the S. by Madura, and on the W. by Bisanagar. This coast so much resembles that of Orixá, that the Abbé Raynal considers them as one, and gives to both the general name of Coromandel. An excessive heat reigns from the beginning of May to the end of October. It begins at nine in the morning, and continues till nine in the evening. During the night it is allayed by a sea breeze from the S.E. The British have formed on it several settlements.

CORON, a town of Turkey in Europe, in the territory of Belvidere, 80 miles S. S. W. of Corinth.

CORONA, [Latin,] in architecture, a large flat member of the cornice, so called because it crowns the entablature and the whole order. It is called by workmen the drip. See **ARCHITECTURE**.

CORONA, in botany, a name given by some to the circumference or margin of a radiated compound flower.

CORONA, in natural history and optics, a luminous circle surrounding the sun, moon, planets, and stars. See **HALO**, and **PARHELION**.

CORONA BOREALIS, the northern crown or garland, in astronomy, a constellation of the northern hemisphere, whose stars in Ptolemy's catalogue are eight, in Tycho's as many, and in Mr. Flamsteed's thirty-one.

CORONALE OS, the os frontis. See **ANATOMY**.

CORONARIE, in botany, the tenth order of plants in Linnaeus's Fragments of a Natural Method. Under this name Linnaeus gives a great number of genera, most of which furnish very beautiful flowers, as the hyacinthus, agave, polyanthus, &c.

CORONARY ARTERIES. See **ANATOMY**.

CORONARY, STOMACHIC, a vein inserted into the trunk of the splenic vein, which, by uniting with the mesenteric, forms the vena porta.

CORONARY VEIN, a vein diffused over the exterior surface of the heart.

CORONARY VESSELS, vessels which furnish the substance of the heart with blood.

CORONATION, [from *corona*, Lat.] the public and solemn confirming of the title, and acknowledging of the right of governing, to a king or queen; at which time the prince swears reciprocally to the people, to observe the laws, customs, and privileges of the kingdom, and to act and do all things conformable thereto.

CORONATOR, in old records, a coroner.

CORONDA AL REIG, a town of Persia, in Irak, 35 miles N. W. of Ispahan.

CORONE, in ancient geography, a town of Messenia, situated on the sea. Pausanias takes it to be the *Æpea* of Homer; but Strabo Thuria, and Pliny, Pedassus. It is now called Coron.

CORONER, [from *corona*, Lat.] an officer whose duty it is to inquire, on the part of the king, how any violent death was occasioned; for which purpose a jury is empannelled. Coroner is an ancient officer in England, so called because he hath principally to do with pleas of the crown, or such wherein the king is more immediately concerned. And in this light, the lord chief justice of the king's bench is the principal coroner in the kingdom; and may, if he please, exercise the jurisdiction of a coroner in any part of the realm. But there are also particular coroners for every county of England; usually four, sometimes six, and sometimes fewer. This officer is of equal authority with the sheriff; and was ordained, together with him, to keep the peace when the earls gave up the wardship of the county. He is chosen by all the freeholders of the county court; and by the statute of Westminster, 1. it was enacted that none but lawful and discreet knights should be chosen: but it seems now sufficient if a man have lands enough to be made a knight, whether he be really knighted or not: for the coroner ought to have an estate sufficient to maintain the dignity of his office, and answer any fines that may be made upon him for his misbehaviour; and, if he hath not enough to answer, his fine shall be levied upon the county, as a punishment for electing an insufficient officer. Now, indeed, through the culpable neglect of gentlemen of property, this office has been suffered to fall into disrepute, and get into low and indigent hands; so that although formerly no coroners would be paid for serving their country, and they were by the aforesaid statute of Westminster, 1. expressly forbidden to take a reward under pain of great forfeiture to the king; yet for many years past they have only desired to be chosen for

the sake of their perquisites; being allowed fees for their attendance by the statute 3 Hen. VII. c. 1. which Sir Edward Coke complains of heavily, though since his time those fees have been much enlarged. The coroner is chosen for life; but may be removed, either by being made sheriff, or chosen verderor, which are offices incompatible with the other; and by the statute 25 Geo. II. c. 29, extortion, neglect, or misbehaviour, are also made causes of removal.

CORONERS, OFFICE AND POWERS OF. These are like those of the sheriff, either judicial or ministerial; but principally judicial. This is in great measure ascertained by statute 4 Edw. I. De Officio Coronatoris; and consists, first, in inquiring, when any person is slain, or dies suddenly, or in prison, concerning the manner of his death. And this must be super visum corporis; for if the body is not found, the coroner cannot sit. He must also sit at the very place where the death happened. And his inquiry is made by a jury from four, five, or six of the neighbouring towns, over whom he is to preside. If any be found guilty by this inquest of murder, he is to commit to prison for farther trial, and is also to inquire concerning their lands, goods, and chattels, which are forfeited thereby; but whether it be murder or not, he must inquire whether any deodand has accrued to the king, or the lord of the franchise, by this death; and must certify the whole of this inquisition to the court of King's Bench, or the next assizes. Another branch of his office is to inquire concerning shipwrecks; and certify whether wreck or not, and who is in possession of the goods. Concerning treasure trove, he is also to inquire concerning the finders, and where it is, and whether any one be suspected of having found and concealed a treasure; "and that may well be perceived (saith the old statute of Edw. I.) where one liveth riotously, haunting taverns; and hath done so of long time; whereupon he might be attached and held to bail upon this suspicion only. The ministerial office of the coroner is only as the sheriff's substitute. For when just exception can be taken to the sheriff, for suspicion of partiality (as that he is interested in the suit, or of kindred or either plaintiff or defendant), the process must then be awarded to the coroner, instead of the sheriff, for execution of the king's writs. The coroner shall have for his fee, upon every inquisition taken upon the view of the body slain, 13s. 4d. of the goods and chattels of him that is the slayer and murderer, if he have any goods; and if he have no goods, of such amerciaments, as any township should happen to be amerced for the escape of the murderer, 3 Hen. VII. But as the said fee of 13s. 4d. is not an adequate reward for the general execution of the said office, therefore for every inquisition taken upon view of a body dying in gaol the coroner shall have 20s. and also 9d. for every mile he shall be compelled to travel from his usual place of abode to take such inquisition, to be paid by order of the justices in sessions, out of the country rates, 25 Geo. II. c. 29. s. 1.

CORONET. See **CROWN**.

CORONILLA, JOINTED PODDED COLUTEA: a genus of the decandria order, and diadelphia class of plants; natural order papilionaceae. Calyx bilabiated; vexillum scarce any longer than the alae; legumen contracted between the seeds. Fourteen species, mostly natives of France, Switzerland, and Italy, are enumerated.

CORONIS, in the heathen mythology, a nymph, the mother of Esculapius.

CORONOID PROCESS. See **ANATOMY**.

COROORAA, one of the Pelew islands.

COROPA, a province of South America, situated between the river Amazon and lake Parime.

CORPORA PYRAMIDALIA, are two protuberances of the under part of the cerebellum, about an inch long; so called from their resemblance to a pyramid.

CORPORAL, an inferior officer under a serjeant in a company of foot, who has charge over one of the divisions, places and relieves centinels, and keeps good order in the corps de garde: he also receives the word from the inferior rounds, which passes by his corps de garde. This officer carries a fusée, and is commonly an old soldier: there are generally three corporals in each company.

CORPORAL, CORPORALE, is also an ancient church-term, signifying the sacred linen spread under the chalice in the eucharist and mass, to receive the fragments of the bread.

CORPORAL OF A SHIP, an officer that has the charge of setting the watches and sentries, and relieving them; who sees that all

the soldiers and sailors keep their arms neat and clean, and teaches them how to use them. He has a mate under him.

CORPORAL OF A SHIP OF WAR is under the master at arms, and is employed to teach the officers the exercise of small arms, or of musketry; to attend at the gang way, on entering ports, and observe that no spirituous liquors are brought into the ship, unless by express leave from the officers. He is also to extinguish the fires and candles at eight o'clock in winter and nine in summer, when the evening gun is fired; and to walk frequently down in the lower decks in his watch, to see that there are no lights but such as are under the charge of proper centinels.

CORPORATION, [*corpus*, Lat.] A corporation is a body politic, authorised by the king's charter to have a common seal, one head officer or more, and members, able, by their common consent, to grant or receive, in law, any thing within the compass of their charter: even as one man may do by law all things, that by law he is not forbidden; and bindeth his successors, as a single man binds his executor or heir.

CORPORATION ACT is that which prevents any person being legally elected into any office relating to the government of any city or corporation, unless within a twelvemonth before he has received the sacrament of the Lord's supper, according to the rites of the church of England; and which enjoins him to take the oaths of allegiance and supremacy when he takes the oath of office; otherwise his election is void.

CORPORATIONS, AGGREGATE, consist of many persons united together into one society, and are kept up by a perpetual succession of members, so as to continue for ever; of which kind are the mayor and commonalty of a city: the head and fellows of a college; the dean and chapter of a cathedral church.

CORPORATIONS, ECCLESIASTICAL, are where the members that compose it are entirely spiritual persons; such as bishops; certain deans and prebendaries; all archdeacons, parsons, and vicars: which are sole corporations: deans and chapters at present, and formerly prior and convent, abbot and monks, and the like, bodies aggregate. These are erected for the furtherance of religion, and perpetuating the rights of the church.

CORPORATION, LAY, are of two kinds, civil and eleemosynary.

1. **CORPORATIONS, CIVIL**, are such as are erected for a variety of temporal purposes. The king, for instance, is made a corporation to prevent the possibility of an interregnum or vacancy of the throne, and to preserve the possessions of the crown entire; for, immediately upon the demise of one king, his successor is in full possession of the regal rights and dignity. Other lay corporations are erected for the good government of a town or particular district, as a mayor and commonalty, bailiff and burgesses, or the like: some for the advancement and regulation of manufactures and commerce; as the trading companies of London, Edinburgh, &c. and some for the better carrying on of divers special purposes; as churchwardens, for conservation of the goods of the parish; the college of physicians and company of surgeons in London, for the improvement of the medical science; the royal society for the advancement of natural knowledge; and the society of antiquarians for promoting the study of antiquities.

2. **CORPORATIONS, ELEEMOSYNARY**, are such as are constituted for the perpetual distribution of the free alms, or bounty, of the founder, to such persons as he has directed. Of this kind are all hospitals for the maintenance of the poor, sick, and impotent; and all colleges; which last are founded for two purposes: 1. For the promotion of piety and learning by proper regulations and ordinances. 2. For imparting assistance to the members of those bodies, in order to enable them to prosecute their devotion and studies with greater ease and assiduity.

CORPORATIONS, SOLE, consist of one person only and his successors, in some particular station, who are incorporated by law, to give them some legal capacities and advantages, particularly that of perpetuity, which in their natural persons they could not have had. In this sense the king is a sole corporation: so is a bishop: so are some deans and prebendaries, distinct from their several chapters; and so is every parson and vicar. And the use of this institution will be apparent, if we consider the case of a parson of a church. At the original endowment of parish churches, the freehold of the church, the church-yard, the parsonage house, the glebe, and the tithes of the parish, were vested in the then parson by the bounty of the donor, as a temporal recompence to him for his spiritual care of the inhabitants, and with intent that the same

emoluments should ever afterwards continue as a recompence for the same care. But how was this to be effected? The freehold was vested in the parson; and, if we suppose it vested in his natural capacity, on his death, it might descend to his heir, and would be liable to his debts and incumbrances; or at best the heir might be compellable, at some trouble and expence, to convey those rights to the succeeding incumbent. The law therefore has wisely ordained, that the parson, quatenus parson, shall never die, any more than the king; by making him and his successors a corporation. By which means all the original rights of the parsonage are preserved entire to the successor: for the present incumbent, and his predecessor who lived seven centuries ago, are in law one and the same person; and what was given to the one, was given to the other also.

CORPOREITY, [from *corporeus*, Lat.] materiality; the quality of being embodied; the state of having a body; bodiliness.

CORPOREITY is the quality of that which is corporeal, or is body; or that which constitutes or denominates it such. The corporeity of God was the capital error of the Anthropomorphites. Some authors reproach Tertullian with admitting a corporeity in the Deity; but it is manifest that by the body he means no more than subsistence. The Mohammedans reproach the Samaritans to this day, with a belief of the corporeity of God. Many of the ancients believed the corporeity of angels.

CORPS, in architecture, a term borrowed from the French, signifying any part that projects or advances beyond the naked of a wall; and which serves as a ground for some decorations, or the like.

CORPS, in geography, a town of France, in the department of Isere, 20 miles S. E. of Grenoble.

CORPS DE BATAILLE, is the main body of an army drawn up for battle.

CORPS DE GARDE, a post in an army, sometimes under covert, sometimes in the open air, to receive a body of soldiery, who are relieved from time to time, and are to watch in their turns, for the security of a quarter, a camp station, &c. The word is also used for the men who watch therein. It is usual to have also a little corps de garde, at a good distance before the lines, to be the more readily advertised of the approach of the enemy.

CORPSES, LAWS RESPECTING. If any one, in taking up a dead body, steals the shroud, or other apparel, it is felony. Stealing only the corpse itself is not felony; but it is punishable as a misdemeanor by indictment at common law.

CORPULENCY, or OBESITY, in physiology, is the accumulation of too great a quantity of fat or animal oil, which distends the solids to an unnatural degree, by the abundance of granulated matter collected in the cellular membrane. Corpulency arises from a variety of causes, which may operate separately, or conjointly in the same constitution. It may, however, be principally ascribed, 1. To the introduction of too much oil into the habit, through the channels of nourishment, by which means it is retained in too large a quantity. 2. An over laxity, or perhaps too large a structure of the cells in which it is deposited, so as to admit and retain an immoderate proportion of unctuous matter. 3. To a peculiar disposition of the blood, which renders it liable to separate too easily from its oleaginous particles, and to admit of their being strained off too plentifully by the secretory vessels; or, lastly, to defective evacuation or expulsion of oil already absorbed, separated from the blood, and deposited in its cells, instead of being discharged through the different excretories of the body. Corpulency is the occasion of various diseases, and particularly of the apoplexy. It was held infamous among the ancient Lacedæmonians. Sennertus mentions a man that weighed 600lbs, and a maid 36 years of age who weighed 450. Bright of Malden, who died at the age of 29, in 1750, weighed 616lbs. Obesity is promoted by whatever tends to soften the blood, and render it less sharp and saline; such as want of exercise and motion, an indolent life, indulgence in too much sleep, &c. It may be removed or prevented by the contrary causes, and particularly by the use of saline and acid food and drink. Chiapin Vitelli, marquis of Cerona, a noted Spanish general in his time, from an excessive corpulency, is said to have reduced himself, by drinking vinegar, to such a degree of leanness, that he could fold his skin several times round him. Castile soap, in the form of a bolus, an electuary, pills, or dissolved in a gill or more of soft water, from one to four drachms, taken at bed-time, is strongly recommended

with a view of reducing corpulency, in a discourse on its nature, causes, and cure, by Malcolm Fleming, M.D. Lond. 1760. See MEDICINE.

CORPUSCLE, in physics, signifies a minute particle, or physical atom, being such as a natural body is made up of; that is such particles, whether of a simple or compound nature, whose parts will not be dissolved nor dissipated by ordinary degrees of heat. See PHYSICS.

CORPUSCULARIAN PHILOSOPHY, is that way of philosophising which endeavours to explain things, and to account for the phenomena of nature, by the motion, figure, rest, position, &c. of the corpuscles, or the minute particles of matter. Mr. Boyle sums up the chief principles of the corpuscular hypothesis, which now flourishes under the mechanical philosophy, in these particulars: 1. They suppose that there is but one catholic or universal matter, which is an extended, impenetrable, and divisible substance, common to all bodies, and capable of all forms. 2. That this matter, in order to form the vast variety of natural bodies, must have motion in some or all its assignable parts; and that this motion was given to matter by God, the Creator of all things, and has all manner of directions and tendencies. 3. Matter must also be actually divided into parts, and each of these primitive particles, fragments, or atoms of matter, must have its proper magnitude or size, as also its peculiar figure or shape. 4. They suppose also, these differently sized and shaped particles may have as different orders and positions, whereof great variety may arise in the composition of bodies. See PHYSICS.

CORREA, in botany, a genus of the class and order octandria monogynia: calyx campanulate, four-toothed; petals four, reflected at the ends; capsule four-celled, four-valved, with a single seed in each. One species, the alba, a shrub of Port Jackson.

CORRECTION, in printing, the act of retrenching the faults in a work; or the reading which the corrector gives the proofs, to point out and amend the faults, to be rectified by the compositor. The corrections are placed on the margin of every page, against the line in which the faults are found; and there are different characters used to express different corrections: thus § is put for dele, to intimate that something, as a point, letter, word, &c. dashed in that line is to be taken out. If any thing is to be inserted, the place is to be marked thus A, and the thing to be inserted added in the margin. When there are two or more corrections in the same line, then they are all separated in the margin by little bars, thus |. If a space is omitted, its place is marked with a caret, and in the margin thus †. When a letter is inverted, it is expressed in the margin thus 9. When any thing is to be transposed, it is directed thus, Extraordinary scarce ever fail of attainments exciting envy, for Extraordinary attainments scarce ever fail of exciting envy, and in the margin is added *tr.* If Italic characters are to be changed for Roman, or vice versa, a line is drawn thus — under the letters, and Rom. or Ital. is written in the margin. If a space, or an m or n quadrat, stick up, and print black, it is marked in the margin with a dash, thus |. If a word, sentence, or paragraph is entirely omitted, the place is marked with a caret, and in the margin is put the word *out*. If the letters of a word stand too far asunder, a line is drawn under them, and in the margin is put a crooked line or hook, thus 7. There are many other marks used in correcting, *sup.* for superior, *cap.* for capital, *l. c.* for lower-case, &c.

CORRECTOR OF THE STAPLE, a clerk belonging to the staple, who records the bargains made by the merchants.

CORREGIDOR, an officer of justice in Spain; the chief judge of a town or province.

CORREGIO, a late principality of Italy, united to the duchy of Modena.

CORREGIO, a town of the Cisalpine republic, in the late duchy of Modena, 25 miles S. of Mantua.

CORREGIO, ANTONIO, an eminent historical painter, born in 1494, and whose original name was Allegri, which was changed to that of his birth-place. Being descended of poor parents, and educated in an obscure village, he enjoyed none of those advantages which contributed to form the other great painters of that illustrious age. He saw none of the statues of ancient Greece or Rome; nor any of the works of the established schools of Rome and Venice. But Nature was his guide; and Corregio was one of her favorite pupils. To express the facility with which he paint-

ed, he used to say that he always had his thoughts ready at the end of his pencil. The agreeable smile, and the profusion of graces which he gave to his madonnas, saints, and children, have been said to be sometimes unnatural; but still they are amiable and seducing: an easy and flowing pencil, an union and harmony of colours, and a perfect intelligence of light and shade, give an astonishing relief to all his pictures, and have been the admiration both of his contemporaries and his successors. Annibal Caracci, who flourished 50 years after him, studied and adopted his manner in preference to that of any other master. From want of curiosity or of patronage, Corregio never visited Rome, but remained his whole life at Parma, where the art of painting was little esteemed, and poorly rewarded. This concurrence of unfavourable circumstances occasioned at last his premature death at the age of 40. He was employed to paint the cupola of the cathedral at Parma, the subject of which is an assumption of the Virgin; and having executed it in a manner that has long been the admiration of every person of good taste, for the grandeur of design, and especially for the boldness of the fore-shortenings (an art which he first and at once brought to the utmost perfection), he went to receive his payment. The canons of the church, either through ignorance or baseness, found fault with his work; and although the price originally agreed upon had been very moderate, they alledged that it was far above the merit of the artist, and forced him to accept of the poultry sum of 200 livres, which, to add to the indignity, they paid him in copper money. To carry home this unworthy load to his indignant wife and children, poor Corregio had to travel six or eight miles from Parma. The weight of his burden, the heat of the weather, and his chagrin at this villanous treatment, immediately threw him into a pleurisy, which in three days put an end to his life and his misfortunes, in 1534. For the preservation of this magnificent work, the world is indebted to Titian. As he passed through Parma, in the suite of Charles V. he run instantly to see the chief d'œuvre of Corregio. While he was attentively viewing it, one of the principal canons of the church told him that such a grotesque performance did not merit his notice, and that they intended soon to have the whole defaced. "Have a care of what you do," (replied the other,) "if I were not Titian, I would certainly wish to be Corregio."

CORREZE, a department of France, bounded by those of Upper Vienne and Creuse on the N. Puy de Dome on the E. Cantal on the S. E. Lot on the S. and Dordogne on the W. It includes the late province of Limosin. Tulle is the capital.

CORREZE, a river of France, which rises about 20 miles N. E. of Tulle, and joins the Vezere, three miles below Brives.

CORREZE, a town in the department of Correze, 8 miles N. E. of Tulle.

CORRIGIOLA, in botany, a genus of the trigynia order, and pentandria class of plants; natural order Holoraceæ. Calyx five-leaved; petals five; seed one, three-sided. There is but one species, viz. *C. litoralis*, bastard knot-grass, a native of France, Germany, Switzerland, and Piedmont, in sandy soils, usually near the sea or rivers.

CORRIRA, the **COURIER**, in natural history, a genus of birds of the order grallæ. Bill short and straight, and without teeth; legs long; thighs longer than the body; feet palmated, with a back toe. One species, is a native of Italy, remarkable for the extreme length of its neck as well as legs; it runs with peculiar speed, and derives, unquestionably, from this circumstance its popular designation of courier.

CORROSION, [*corrodo*, Latin,] in a general sense, the action of gnawing away, by degrees, the continuity of the parts of bodies. Acids corrode most natural bodies.

CORROSIVE SUBLIMATE, an old name for the oxymuriate of mercury, or as it is called in the shops muriated mercury. If muriatic acid be added to the yellow sulphate of mercury, or to the nitrate of mercury, muriate of mercury is formed, which is soluble in water, and which on account of its properties was formerly called corrosive sublimate, or corrosive muriate of mercury.

CORROSIVES, in surgery, are chiefly burnt alum, red and white precipitates of mercury, white vitriol, butter of antimony, lapis infernalis, &c.

CORRUPTICOLÆ, a sect who rose out of the Monophysites in Egypt, about A. D. 519, under their chief Severus, the pretended patriarch of Alexandria. Their distinguishing doctrine

was, that the body of Jesus Christ was corruptible; and that to deny it was to deny the truth of our Saviour's passion.

CORRUPTION, [*corruptio*, Lat.] the destruction of the proper mode of existence of any natural body.

CORRUPTION OF BLOOD, in law, an infection accruing to a man's state, attainted of felony and treason, and to his issue; for as he loses all to the prince, &c. his issue cannot be heirs to him, or to any other ancestor by him; and if he were noble his heirs are rendered ignoble.

CORSAIR, [French,] a private; one who professes to scour the sea, and seize merchants. Corsair is derived from the Italian *corsare*, of *corso* or *a cursibus*, courses, or excursions. The name is commonly given to the piratical cruisers of Barbary, who had their rise about the beginning of the 16th century. A corsair is distinguished from a privateer in this, that the latter has a commission, and only attacks the vessels of those at war with the state whence his commission is derived. The punishment of a corsair is to be hanged, without remission; whereas privateers are to be treated as prisoners of war.

CORSELET, a little cuirass, or, according to others, an armour or coats made to cover the whole body, anciently worn by the pike-men, usually placed in the front and flanks of the battle, for the better resisting of the enemy's assaults, and guarding of the soldiers placed behind them.

CORSIARA, a town of Persia, in the province of Farlistan; 100 miles S. W. of Schiras.

CORSICA, an island, in that part of the Mediterranean, anciently called the Sea of Liguria, between 8° and 10° Lon. E. and between 41° and 43° Lat. N. On the S. side it is separated from Sardinia, by a narrow strait, anciently called *τρωγος* by the Greeks, and Fossa by the Romans; 60 stadia, or about seven miles broad. It is now called *Boccardia Bonifacio*.

CORSNED, or **MORSEL OF EXECRATION**, a species of trial, or purgation, anciently in use among us, and which probably arose from an abuse of revelation, in the dark ages of superstition. It consisted of a piece of cheese or bread, about an ounce in weight, which was consecrated with a form of exorcism; desiring of the Almighty that it might cause convulsions and paleness, and find no passage if the man were really guilty; but might turn to health and nourishment if he were innocent; as the water of jealousy among the Jews was, by God's especial appointment, to cause the belly to swell, and the thigh to rot, if the woman were guilty of adultery. This corsned was given to the suspected person, who at the same time received the sacrament. Historians assure us, that Godwin, earl of Kent, in the reign of king Edward the Confessor, abjuring the death of the king's brother, at last appealed to his corsned, which stuck in his throat and killed him. This custom has been long abolished, but the remembrance of it still subsists in certain phrases of abjuration; as "I will take the sacrament upon it; May this morsel be my last," &c.

CORSOER, a town of Denmark, on the W. coast of Zealand, 52 miles S. W. of Copenhagen. Lon. 11. 12. E. Lat. 55. 12. N.

CORTATE, a town of Hindostan, N. of Cape Comorin.

CORTE, a territory of Corsica, near the centre of the island.

CORTE, a town in the above territory, 27 miles S. W. of Bastia.

CORTES, or **CÓRTEZ**, **FERDINAND**, a Spanish general, famous for the conquest of Mexico, and other victories over the natives of S. America; but exceedingly infamous for the cruelties he committed upon the vanquished, without regard to rank, age, or sex. It probably was on this account he was coolly received on his return to Europe, by his master Charles V. It is even said, that the emperor asked him who he was? to which Cortez replied, "I am the man who has given you more provinces, than your ancestors left you towns." He died in 1554, aged 65.

CORTIS, a town of Germany, in the bishopric of Liege, 10 miles N. E. of Ramillies.

CORTONA, a town of Italy, in Tuscany, 32 miles E. of Sienna. Lon. 11. 52. E. Lat. 43. 14. N.

CORTULA, in botany, a genus of the syngenesia polygamia superflua class and order. Natural order Composite Discoidea, or compound radiated flowers. Receptacle almost naked; down margined; corollules of the disk four-cleft; in the ray scarcely any. There are fifteen species, mostly natives of the Cape.

CORTUSA, **BEAR'S EARSANICLE**: a genus of the monogynia order, and pentandria class of plants, natural order, Preciæ. Corolla wheel-shaped, with its throat like an elevated ring; capsule unilocular, oval, quinquevalved at the top. There are two species, both very low, flowery, herbaceous perennials, crowned by umbels of monopetalous wheel-shaped flowers, of a fine red colour, natives of mountainous rocky parts abroad.

CORVEY, a town and small principality of Germany, in the circle of Westphalia, 12 miles long, and 12 broad.

CORUNDUM, a mineral, of which there are two species, the perfect and imperfect. Perfect corundum or sapphire is found in the East Indies, especially in Pegu and the island of Ceylon; and it is most commonly crystallized. The crystals are not large; their primitive form is a rhomboid whose angles are 86° and 94°, and which therefore is nearly rectangular. Sometimes it occurs in this form, though but seldom. Bournon has described no less than eight modifications of it. The texture of the sapphire is foliated; but in the more perfect specimens the plates are separated with difficulty. Fracture conchoidal. Specific gravity from 3.207 to 4.161. Colour most frequently blue; sometimes red, purple, yellow, and green; and sometimes colourless: imperfect corundum is usually crystallized; sometimes found in amorphous masses. The figures of the crystals are the same as those of the last species; opaque, except when in very thin pieces; specific gravity from 3.710 to 4.180; colour grey, often with various shades of blue and green. Mr. Chenevix obtained the following constituents from different specimens of corundum subjected to chemical analysis.

Imperfect corundum.

	From the Carnatic.	From Malabar.	From China.	From Ava.
Silica	5.0	7.0	5.25	6.5
Alumina	91.0	86.5	86.50	87.0
Iron	1.5	4.0	6.50	4.5
Loss	2.5	2.5	1.75	2.0
	100.0	100.0	100.0	100.0

Perfect corundum.

	Blue, or sapphire.	Red, or oriental ruby.
Silica	5.25	7.0
Alumina	92.00	90.0
Iron	1.00	1.2
Loss	1.75	1.8
	100.00	100.0

CORUNNA, a port town of Galicia in Spain, situated on a fine bay of the Atlantic, about 32 miles N. of Compostella.

CORVO, the smallest and most northern island of the Azores, being only 12 miles in circumference. It abounds in crows, whence the name. Lon. 31° 4' 56" W. Lat. 39° 43' 38" N.

CORUS, **OMER**, **HOMER**, or **CHOMER**, in the Jewish antiquities, a measure containing 10 baths, or 75 gallons and 5 pints, as a measure for things liquid, and 32 pecks and one pint, as a measure for things dry.

CORUS, in old records, eight bushels.

CORUSCATION, [*coruscatio*, Lat.] flash; quick vibration of light. Coruscation is chiefly used for a flash of lightning darting from the clouds in time of thunder. See **METEOROLOGY**.

CORVUS, in antiquity, a military engine, or rather gallery, moveable at pleasure by means of pulleys; chiefly used by the Romans, in boarding the enemy's ships to cover the men.

CORVUS, in ornithology, the **RAVEN** or **CROW**; a genus of birds of the order picæ. Beak convex, cultrated; nostrils covered with bristly feathers; tongue forked, cartilaginous; toes three. There are above 40 species. The following are the most remarkable:

C. CANADENSIS is nine inches long and weighs two ounces. The bill is blackish, and not quite an inch long; the irides are black: the forehead and throat a dirty yellowish white; the hind head and sides blackish. brown: the upper parts of the body brown;

brown; beneath pale ash; palest on the breast; the quills and tail are brown, tipped with white; the tail is a little wedged: the legs and claws are blackish. These birds inhabit Canada; and are common near Hudson's Bay, where they are called Whiskie-john.

C. CARYOCATACTES, the **NUTCRACKER**, is somewhat less than the jack-daw: the bill is strong, straight, and black; the colour of the whole head and neck, breast and body, of a rusty brown: the crown of the head and rump are plain; the other parts marked with triangular white spots; the wings black; the coverts spotted like the body; the tail rounded at the end, black tipped with white; the vent feathers are white; the legs dusky. These birds are scattered in many parts of Europe, but no where so numerous as in Germany.

C. CORAX, the **RAVEN** of English authors, weighs three lb. and is about two feet in length: the colour is black, finely glossed with a rich blue; the belly excepted, which is of a dusky colour. They are very docile, and may be trained up to fowling like hawks; to fetch and carry like spaniels; they may be taught to speak like parrots; and, what is the most extraordinary of all, they may be taught to imitate the human voice in singing. They have a great propensity to pilfer, often hiding things of value. They frequent the neighbourhood of great towns, where they are used in devouring the carcases and filth which would otherwise prove a nuisance. They also destroy many living animals; such as, rabbits, ducks, chickens, and even lambs which have been dropped in a weak state. In clear weather they fly in pairs to a great height, making a deep loud noise, different from the common croaking. See Plate XXXVIII.

CORVUS CORNIX, the **ROYSTON CROW**, pretty much resembles the rook, feeding on insects, and flying together in great flocks. In England it is a bird of passage, visiting it in the beginning of winter, and leaving it with the woodcocks.

C. CORONE, the **CARRION CROW**, agrees with the raven, in the form of its body, as well as in its food. It also eats grain and insects; and like the raven picks out the eyes of animals; whence it was formerly distinguished from the rook, (which feeds entirely on grain and insects) by the name of the gor, or gor crow.

C. FRUGILEGUS, the **ROOK**, is the *corvus* of Virgil; no other species of this genus being gregarious. It differs not greatly in its form from the carrion crow; the most remarkable difference is in the nostrils and root of the bill; which in the crow are well clothed with feathers, but in the rook are bare, or covered only with some bristly hairs. This arises from its thrusting the bill into the earth, after the worms and erucæ of insects, on which it feeds; for it does not live on carrion. It feeds on all sorts of grain, with some loss to the husbandman, but which is doubly repaid by the good done him in extirpating the maggots of the chafer beetle, which in some seasons destroy whole crops of corn by feeding on the roots. The rook is a gregarious bird, sometimes being seen in immense flocks, so as almost to darken the air. These flights they regularly perform morning and evening, except in breeding time, when the daily attendance of both male and female is required for the use of incubation, or feeding the young; for they do both by turns. As they form themselves into societies, such places as they frequent during the breeding time are called rookeries; and they generally choose a large clump of the tallest trees for this purpose; but make so great a litter, and such a perpetual chattering that nothing but habit can reconcile one to the noise. The young birds are accounted good eating, especially if put in a pie.

C. GLANDARIUS, the **JAY**, is one of the most beautiful of British birds. The weight is between six and seven ounces: the length 13 inches. The forehead is white streaked with black: the head is covered with very long feathers, which it can erect at pleasure into the form of a crest; the whole neck, back, breast, belly, and covert feathers of the wings, are faint purple dashed with grey. See Plate XXXVIII.

C. MONEDULA, the **JACK-DAW**, weighs nine ounces; and is thirteen inches long and twenty-eight broad. The head is large in proportion to its body. The irides are white; the breast and belly are of a dusky hue inclining to ash colour; the rest of the plumage is black, slightly glossed with blue; the claws are very strong and hooked. It is docile and loquacious. Jack-daws breed in steeples, old castles, and high rocks, laying five or six eggs. Sometimes they breed in hollow trees near a rookery, and join those birds in their foraging parties.

C. PICA, the **MAGPIE**, is in length above eighteen inches, and weighs eight or nine ounces. The bill is black; the irides are hazel; the scapulars, and all the under parts from the breast, white; the rest of the plumage, wings, and tail, black, glossed with green, purple, and blue, in different lights. They are uncommonly beautiful birds. Mr. Latham has been able to trace this bird no farther S. than Italy, or N. than Sweden and Denmark. It is a crafty bird in every state, and if brought up young becomes exceedingly familiar, and will talk many sentences, as well as imitate every noise within hearing, like a parrot, but not so plain.

CORYBANTES, in antiquity, priests of Cybele, who danced and capered to the sound of flutes, drums, &c. See **CROTALUM**. Catullus, in his poem called *Atys*, gives a beautiful description of them, respecting them as madmen. Maximus Tyrius says, that those possessed with the spirit of the Corybantes, as soon as they heard the sound of a flute, were seized with an enthusiasm, and lost the use of their reason. And hence the Greeks used the word *κορυβαντεν*, to corybantize, to signify a person's being possessed with a devil.

CORYBANTICA, a festival held in Crete, in memory of the Corybantes, who educated Jupiter when he was concealed in that island from his father Saturn.

CORYCEUM, in antiquity, that part of the gymnasium where people undressed; called also *Apodyterium*.

CORYCOMACHIA, among the ancients, was a sort of exercise in which they pushed forwards a ball, suspended from the ceiling, and at its return either caught it with their hands, or suffered it to meet their body.

CORYLUS, the **HAZEL**: a genus of the polyandria order, and monoccia class of plants; natural order, Amentaceæ. Male calyx monophyllous, scale-like, trifid, and uniflorous; no corolla; stamina eight: female calyx diphyllous, lacerated; no corolla; two styles; an egg-shaped nut. Three species. They are all of the large shrub kind, hardy and deciduous; and have several varieties valuable for their nuts, as also for their variety in large wildernesses and shrubby work.

CORYMBIUM, in antiquity, an ornament of hair worn by the women. Its form was that of a corymbus.

CORYMBUM, in botany, a genus of the monogamia order, and syngenesia class of plants; natural order, Compositæ. Calyx diphyllous, uniflorous, prismatical; corolla monopetalous, regular. Four species are found, natives of the Cape.

CORYMBUS, [Latin,] among the ancient botanists, was used to express the bunches or clusters of berries of ivy: amongst modern botanists it is used for a compound discous flower, whose seeds are not pappous, or do not fly away in down; such are the flowers of daisies, and common marigold.

CORYNOCARPUS, in botany, a genus of the monogynia order, and pentandria class of plants. Calyx a pentaphyllous perianthium; corolla five-petaled, roundish, erect; antheræ erect, oblong; pericarpium a monospermous turbinate clavated nut. One species only is known, a native of New Zealand.

CORYPHA, **MOUNTAIN PALM**, or **UMBRELLA TREE**, in botany, a genus of plants of the order Palmæ. Corolla tripetalous; stamina six, with one pistil; fruit a monospermous plum. There are two species.

CORYPHÆNA, in ichthyology, a genus belonging to the order of thoracici. Head sloping suddenly downwards, gill-membrane with five rays; dorsal fin as long as the back. There are nineteen species, of which the principal is *C. hippuris*, the common coryphene. These fishes are commonly known by the name of dolphin, and appear in the Indian and Atlantic seas in immense numbers, frequently following in the wake of ships, and seizing with extreme rapacity whatever is thrown from them at all applicable for food. Indeed, occasionally, on their being opened, their stomachs have been found to contain hard and indigestible substances. These fish are more esteemed for beauty than delicacy of taste. They are taken on the coast of Hispaniola, Cuba, and the Bahama Islands. See Plate LV.

CORYPHÆUS, [from *κορυφή*, the top of the head,] in the ancient tragedy, was the chief or leader of the company that composed the chorus.

CORZOLA, or **CURSOLA**, an island in the gulph of Venice, divided from Ragusa in Dalmatia by a narrow strait.

COS, or **COOS**, in ancient geography, an island and town on the

the coast of Caria, in Asia, 15 miles W. of Halicarnassus, and 100 in compass, called also Meropis.

COSCINOMANCY, [from *τὸ κόσκινον*, a sieve, and *μαντεία*, divination,] the art of divination by means of a sieve.

COSCINOMANCY was used, as appears from Theocritus, to discover the secrets of known persons, as well as to find out the unknown. The sieve being suspended, after rehearsing a formula of words, it was taken between two fingers only; and the names of the parties suspected repeated: he at whose name the sieve turned, trembled, or shook, was reputed guilty of the evil in question.

COSECANT, in geometry, the secant of an arch, which is the complement of another to 90 degrees. See **TRIGONOMETRY**.

COSEIR, a town of Egypt on the coast of the Red Sea, 100 miles S. S. E. of Suez.

COSENAGE, in law, a writ that lies where the tresail, that is, the tritavus, the father of the besail, or great grandfather, being seised in fee at his death of certain lands or tenements, dies; a stranger enters, and abates; then shall his heir have this writ of cosenage; the form of which see in Fitzh. Nat. Br. folio 221.

COSENING, in law, an offence whereby any thing is done deceitfully, in or out of contracts, which cannot be fitly termed by any especial name. In the civil law it is called *stellionatus*. See **STELLIONATE**.

COSENZA, a town of Naples, the capital of Calabria Citra, 11 miles from the sea-coast.

COSEUS, a town of Asiatic Turkey, in the Arabian Irak, 80 miles S. of Bagdad.

COSIA DI DONNA, a small island near the W. coast of Sardinia.

COSINE, in geometry, the right sine of an arch, which is the complement of another to 90°. See **TRIGONOMETRY**.

COSINISSA, a small island in the Grecian Archipelago.

COSLIACO, a town of Istria, 12 miles W. of St. Veit.

COSLIN, a town of Germany, in Prussian Pomerania, 12 miles E. of Colberg.

COSMEA, in botany, a genus of the syngenesia frustranea class and order. Receptacle chaffy; seeds four-sided, with a two or four-awned crown; calyx double, each of them of one eight-parted leaf.

COSMETIC, [from *κοσμεῖν*,] any medicine or preparation which renders the skin soft and white, or helps to beautify and improve the complexion, as lip-salves, cold creams, ceruss, &c.

COSMICAL, [*κοσμικός*,] a term in astronomy, expressing one of the poetical risings of a star: thus, a star is said to rise cosmically, when it rises with the sun, or with that point of the ecliptic in which the sun is at that time: and the cosmical setting is when a star sets at the same time that the sun rises.

COSMOGONY, [*κόσμος*, and *γένεσις*,] the rise or birth of the world; the creation. A word frequently used to denote the science of the formation of the universe. In our conjectures about the formation of the world there are two principles which we ought never to lose sight of. 1. That of creation; for certainly matter could not give itself existence; it must have received it. 2. That of a supreme intelligence directing this creation, and the arrangement of the parts of matter, in consequence of which this world was formed. See **CREATION** and **EARTH**.

COSMOGRAPHY, [*κόσμος*, and *γραφία*,] the description of the world: or the science which teaches the construction, figure, disposition, and relation of all the parts of the world, with the manner of representing them on a plain. Cosmography consists chiefly of two parts: Astronomy, which shews the structure of the heavens, and the disposition of the stars; and Geography, which shews those of the earth. See these articles.

COSMOLABE, [from *κόσμος*, world, and *λαμβάνω*, I take,] an ancient mathematical instrument, serving to measure distances, both in the heavens and on earth. The cosmolabe is in great measure the same with the astrolabe.

COSMOLOGY, [from *κόσμος*, world, and *λόγος*, discourse,] the science of the world in general. This Wolfius calls general, or transcendental cosmology, and has written a treatise on the subject, wherein he endeavours to explain how the world arises from simple substances; and treats of the general principles of the mo-

difications of material things, of the elements of bodies, of the laws of motion, of the perfection of the world, and of the order and course of nature.

COSMOPOLITAN, or **COSMOPOLITE**, [*κόσμος*, and *πολίτης*,] a citizen of the world; one who is at home in every place, or who has no fixed living or place of abode.

COSNE, a town of France, in the department of Nièvre, 88 miles S. of Paris.

COSPOUR, a town of Asia, in the kingdom of Affam. Lon. 92. 57. E. Lat. 24. 56. N.

COSSACKS, a name given the people inhabiting the banks of the rivers Dnieper and Don, near the Black Sea and borders of Turkey. The word implies irregular troops of horse. These people are divided into European and Asiatic Cossacks. The first consist of the Zaporogs, who dwell below the cataract of the Dnieper, some on the side next to Russia, and others on the opposite side of the river; the lower and upper Cossacks; the Bielogorod Cossacks; and a part of the Don Cossacks. The Asiatic Cossacks are composed of the rest of the Don Cossacks, the Grebin Cossacks, the Yaik Cossacks, and the western Calmucks, who retiring from those that inhabited the south borders of Siberia under Yaiuki Can, settled upon the Wolga, and are dependent upon Russia. The Cossacks were known by that name ever since A. D. 948. They dwelt upon mount Caucasus, in the place now called Cabardy; and were reduced to the Russian dominion by prince Mastislav in the year 1021.

COSSAY, a province of Asia, in the N. of Aya.

COSSE DE GENISTE, an order of knighthood instituted in 1234, by Louis IX. at his marriage with Margaret of Provence. The motto on the collar was, *exaltat humilis*.

COSSERANS, a late province of France, forming with Foix the department of Arriege.

COSSIMBAZAR, a small city of Hindostan Proper, in Bengal, 5 miles S. of Moorshedabad. Lon. 85. 22. E. Lat. 23. 40. N.

COSTS, in law, imply the expences of a suit recovered by the plaintiff, together with damages. Costs were not allowed by the common law, the amercement of the vanquished party being his only punishment; but they are given by statute. Costs are allowed in chancery for failing to make answer to a bill exhibited, or making an insufficient answer: and if a first answer be certified by a master to be sufficient, the defendant is to pay 40s.; 3*l.* for a second insufficient answer; 4*l.* for a third, &c. But if the answer be reported good, the plaintiff shall pay the defendant 40s. costs.

COSTARD, GEORGE, a clergyman of the church of England and author of several learned works, was born about 1710; educated at Wadham college, Oxford; and took the degree of M. A. in 1733. He was first appointed curate of Islip, in Oxfordshire. He published, in 1747, some "Observations on the Book of Job," 8vo. In 1750, Two Dissertations: 1. On the meaning of the Word Kesitah, mentioned in Job, chap. xlii. ver. 11. 2. On the Signification of the Word Hermes. In 1752, he published, in 8vo. at Oxford, "Dissertationes II. Critico-Sacræ, quarum prima explicatur, Ezek. xiii. 18. Altera vero, 2 Reg. x. 22." In 1755, he wrote a letter to Dr. Birch, which is preserved in the British Museum, respecting the meaning of the phrased *sphæra barbarica*. Some time after, he published a second edition of Dr. Hyde's "Historia Religionis veterum Persarum, eorumque Magorum;" which was printed, under his inspection, and with his corrections, at the Clarendon Press at Oxford, 4to. in 1760. Mr. Costard's extensive learning having now recommended him to the notice of Lord Chancellor Northampton, he obtained, in June 1764, the vicarage of Twickenham in Middlesex; in which situation he continued till his death. In 1667, he published in one vol. 4to. "The History of Astronomy," with its application to Geography, History, and Chronology; occasionally exemplified by the Globes. This work shews, "by a gradual deduction, at what time, and by whom, the principal discoveries have been made in geography and astronomy; how each discovery has paved the way to what followed; and by what easy steps, through the revolution of many ages, these very useful sciences have advanced towards their present state of perfection." In 1778, he published in 8vo. "A Letter to Nathaniel Brassey Halhed, Esq. containing some Remarks on his Preface to the Code of Gentoo Laws."

This appears to have been the last of his publications. It contains some criticisms to invalidate the opinion which Mr. Halhed had conceived concerning the great antiquity of the Gentoo laws; and some arguments against a notion drawn from the observation of natural phenomena, that the world is far more ancient than it is represented to be by the Hebrew chronology. Mr. Costard died Jan. 10, 1782. He was a man of uncommon learning, and eminently skilled in Grecian and oriental literature. His private character was amiable, and he was much respected for his humanity and benevolence. He wrote some other works, besides several learned papers, inserted in the Philosophical Transactions, on astronomical and chronological subjects.

COSTA RICA, [*i. e.* the rich coast,] a province of New Spain, in the audience of Guatemala, so called from its rich mines of gold and silver; those of Tinsigal being preferred by the Spaniards to the mines of Potosi; but in other respects, it is mountainous and barren. It is bounded by the province of Veragua on the S. E. and that of the Nicaragua on the N. E.

COSTIVENESS, in medicine, a retention of the excrements, accompanied with an unusual hardness and dryness, so as to render the evacuations difficult, and sometimes painful. Sedentary persons are peculiarly liable to this complaint, especially those of sanguineous and choleric temperaments; or who are subject to hypochondriac affections, the gout, acute fevers, and bilious disorders. See **MEDICINE**.

COSTUME, a rule in painting, by which the artist is enjoined to make every person and thing sustain its proper character, and not only observes the story, but the circumstances, the scene of action, the country or place; and takes care that the habits, arms, manners, proportions, and the like, exactly correspond.

COSTUS, in botany, a genus of the monogynia order, and monandria class of plants; natural order, Scitamineæ. Corolla inferior, inflated, and ringent, with the other lip trifid. Four species are known, natives of the East and West Indies.

COTABAMBO, a territory of South America, in Peru, 60 miles S. W. of Cusco. It abounds in grain, fruits, and cattle. Its rich mines are now almost exhausted.

COTANGENT, in geometry, the tangent of an arch which is the complement of another of ninety degrees. See **TRIGONOMETRY**.

COTE, or **LA COTE**, one of the most beautiful, rich, and populous districts of the Helvetic republic, in the Pays de Vaud, about 15 miles long, near the lake of Geneva.

COTE, in coursing, the advantage one greyhound has over another when he runs by the side of it, and, putting before it, gives the hare a turn. See **HUNTING**.

COTE D'OR, [*i. e.* gold coast,] a department of France, bounded by those of Aube on the N. Upper Marne on the N. E. Upper Saone on the E. Jurr on the S. E. Saone and Loire on the S. and Nievre and Yonne on the W. It is chiefly formed out of the late province of Burgundy. Dijon is the capital.

COTEAUX, a town of St. Domingo.

COTE-GARE, a kind of refuse wool, so clung or clotted together that it cannot be pulled asunder.

COTERELLUS, and **COTARIUS**, according to Spelman and Du Fresne, are servile tenants; but in Doomsday and other ancient MSS. there appears a distinction, as well in their tenure and quality as in their name: for the cotarius had a free socage tenure, and paid a stated firm or rent in provisions or money, with some occasional customary services; whereas the coterellus seems to have held in mere villenage, and his person, issue, and goods, were disposable at the pleasure of the lord.

COTERIE, a term adopted from the French trading associations or partnerships, where each person advances in quota of stock, and receives his proportion of grain; and which retains its original meaning when applied to little assemblies or companies associated for mirth and good humour, where each one furnishes his quota of pleasantry.

COTES, ROGER, an excellent mathematician of the 18th century. At seventeen years of age he was admitted a pensioner of Trinity college, Cambridge. In 1706 he was appointed professor of astronomy in the professorship founded by Dr. Plume, being the first in that chair. In 1713, he published at Cambridge in 4to. a second edition of "Newton's Principia," with all the author's improvements; to which he prefixed an excellent Preface

He prepared several useful books for the public; and wrote "A Description of the Great Meteor which appeared on the 6th March 1716," published in the Philosophical Transactions. He died in the prime of his age in 1716, to the great regret of all the lovers of the sciences.

COTES DU NORD, or, **THE NORTH COASTS**, a department of France, so named from its situation; bounded on the N. by the British channel; on the E. by the department of Ille and Vilaine; and on the S. and E. by those of Morbihan and Finisterre.

COTESIAN THEOREM, in geometry, an appellation used for an elegant property of the circle discovered by Mr. Cotes. The theorem is this:

If the factors of the binomial $a \pm x^{\frac{c}{a}}$ be required, the index c

being an integer number. With the centre O, (Plate LI. fig. 2.) and radius AO = a , describe a circle, and divide its circumference into as many equal parts as there are units in $2c$, at the points A, B, C, D, &c.; then in the radius, produced if necessary, take OP = x ; and from the point P, to all the points of division in the circumference, draw the lines, PA, PB, PC, &c.; so shall these lines taken alternately be the factors sought: viz.

$$PB \times PD \times PF \&c. = a \pm x^{\frac{c}{a}}$$

and $PA \times PC \times PE \&c. = a \mp x^{\frac{c}{a}}$, viz. $a - x$, or $x - a$, according as the point P is within or without the circle.

For instance, if $c = 5$, divide the circumference into 10 equal parts, and the points being within the circle, then will

$$OA^5 + OP^5 = BP \times DP \times FP \times HP \times KP,$$

$$\text{and } OA^5 - OP^5 = AP \times CP \times EP \times GP \times IP.$$

In like manner, if $c = 6$, having divided the circumference into twelve equal parts, then will

$$OA^6 + OP^6 = BP \times DP \times FP \times HP \times KP \times MP,$$

$$OA^6 - OP^6 = AP \times CP \times EP \times GP \times IP \times LP.$$

The demonstration of this theorem may be seen in Dr. Pemberton's Epist. de Cotesii Inventis. See also Dr. Smith's Theoremata Logometrica et Trigonometrica, added to Cotes's Harm. Mens. page 114; De Moivre Miscel. Analyt. page 17; and Waring's Letter to Dr. Powell, page 39.

By means of this theorem, the author made a farther progress in the inverse method of fluxions than had been done before. But in the application of his discovery there still remained a limitation, which was removed by M. Demouivre.

COTHEN, a town of Germany in Upper Saxony, the capital of Anhalt Cothen, 12 miles S. W. of Dessau.

COTHIBEB, a town of Africa in Morocco.

COTHURNUS, the **BUSKIN**, is said to have been invented by Æschylus. See **BUSKIN**.

COTHUSE, **COTBUS**, or **COTUITZ**, a town of Germany in Lower Lusatia, 60 miles S. by E. of Berlin.

COTICE, or **COTISE**, in heraldry, is the 4th part of the bend; which with us is seldom or never borne, but in couples, with a bend between them. A bend thus bordered is said to be coticed.

COTPUTLY, a town of Hindostan, in Mewat, 8 miles S. S. W. of Delhi.

COTT, a sort of bed-frame, suspended from the beams of a ship for the officers to sleep in between the decks. It is much more convenient at sea than either the hammocks or fixed cabins; being a large piece of canvas sewed into the form of a chest, about six feet long, one deep, and from two to three wide. It is extended by a square wooden frame with a canvas bottom, equal to its length and breadth, to retain it in an horizontal position.

COTTAGE, [*cottagium*,] in law, is properly a little house for habitation without lands belonging to it; stat. 4. Edw. I. But by a latter statute, 31 Eliz. c. 7, no man may build a cottage unless he lay four acres of land thereto; unless in market-towns or cities, or within a mile of the sea, or for the habitation of labourers in mines, sailors, foresters, shepherds, &c. and cottages erected by orders of justices of peace for poor indigent people are excepted out of the statute. The four acres of land, to make it a legal cottage, must be a freehold, and land of inheritance. Four acres holden by copy, or for life or lives, or for any number of years, are not sufficient.

COTTILAH,

COTTILAH, a town of Hindostan, in Mewat; 82 miles S. of Delhi.

COTTON, [named, according to Skinner, from the down that adheres to the *mala cotonea*, or *quince*, called by the Italians *cotogni*;] in commerce, soft downy substance found on the gossypium, or cotton-tree. See **GOSSYPIMUM**. The finest sort comes from Bengal and Coromandel. Cotton makes a very considerable article in commerce, and is distinguished into cotton wool and cotton thread. Cotton wool used in Britain is brought mostly from the West India plantations: the most esteemed is white, long, and soft. Those who buy it in bales should see that it has not been wet, moisture being very prejudicial to it. Of cotton thread, that of Damas, called cotton d'ounce, and that of Jerusalem, called bazas, are the most esteemed; as also that of the West India islands. It is to be chosen white, fine, very dry, and evenly spun. The other cotton threads are the half bazas, the rames, the beledin, and gondezel; the payas and montasiri, the genequins, the baquins, the josselassars, of which there are two sorts. Cotton is separated from the seeds of the plant by a mill, and then spun and prepared for all sorts of fine works, as stockings, waistcoats, quilts, tapestry, curtains, &c. Muslin is also made of it, and sometimes it is mixed with wool, sometimes with silk, and even with gold itself. The cotton manufacture consists of various branches, and requires much machinery.

COTTON, CARDING OF, as a preparation for spinning, used formerly to be performed by the hand, with a pair of single cards upon the knee: but this being a tedious method, ill-suited to the rapid operations of the new spinning machines, other methods were contrived for affording a quicker and more adequate supply. The first improvement for this purpose was made by Mr. James Hargrave, weaver, near Blackburn, in Lancashire, and consisted in applying two or three cards to the same board, and fixing them to a stool or stock; whence they obtained the name of stock cards. With these, one woman could perform two or three times as much work as she could do before in the common way. A still more expeditious method of carding, however, by what are commonly called cylinder cards, was soon afterwards invented, and is that which is now most commonly practised.

COTTON MILLS are large buildings with peculiar machinery for carding, roving, and spinning cotton. These were entirely unknown in this country before the different inventions and improvements of Messrs. Arkwright and Hargrave; since which time great numbers have been erected in England, and several in Scotland. The first erections of the kind were by Messrs. Arkwright and Hargrave, both in the town of Nottingham, and both nearly at the same time. The engines were then driven by horses: but since that time they have been chiefly erected upon water-falls in different parts of the country; particularly the warp machines, which are better adapted for being driven by water than any other. The most extensive of these is in the village and neighbourhood of Cromford in Derbyshire, and till very lately under the immediate inspection of Sir Richard Arkwright. The first that was erected in Scotland was for Mr. Peter Brotherston, under the inspection and direction of Mr. John Hackett from Nottingham; and is in the neighbourhood of Pennycuik near Edinburgh. Since which time several have been erected in the neighbourhood of Glasgow, Paisley, Lanark, Perth, &c.

COTTON SPINNING is the art or process of reducing cotton wool into yarn or thread. The most simple method for this purpose, and the only one in use for a long time in this country, was by the hand upon the well known domestic machine called a one-thread wheel. But as the demand for cotton goods began to increase, other inventions were thought of for expediting this part of the manufacture. About 60 years ago, one Paul and others of London contrived an engine for a more easy and expeditious method of spinning cotton, and for which they obtained a patent; but the undertaking did not prove successful. Some years thereafter, various machines were constructed by different persons for facilitating the spinning of cotton; but without producing any very material or lasting advantage. At length, about 1767, Mr. Hargrave, constructed a machine by which a great number of threads (from twenty to eighty) might be spun at once, and for which he obtained his Majesty's letters patent. This machine is called a Jenny, and is the best contrivance for spinning wool or shute that has hitherto appeared. It is now commonly constructed for 84

threads; and with it one person can spin 100 English hanks in the day, each hank containing 840 yards. The most capital improvements which this branch of manufacture received were from Mr. afterwards Sir Richard Arkwright, a native of Lancashire, and long a resident at Cromford in Derbyshire. He first brought forward his new method of spinning cotton in 1768, for which he obtained a patent in 1769; he afterwards, in 1775, obtained a patent for engines which he had constructed to prepare the materials for spinning: though one of these patents, being challenged at law, was set aside some years before it expired. The result of Mr. Arkwright's different inventions and improvements is a combination of machinery, by which cotton is carded, roved, and spun, with the utmost exactness and equality; and such a degree of perfection attained in spinning warp, as is not to be equalled in any other part of the world. To these improvements this country is entirely indebted for the great extent of its cotton manufactures; large buildings have been erected for that branch both in England and Scotland, many of which contain several thousands of spindles, each driven by one or more large water-wheels; and some of such extent as to spin at the rate of 1000 yards of twist or warp yarn in the minute. Other machines have been invented at different times, and a variety of improvements made by different mechanics and manufacturers; one of which in particular we must not omit to mention. It is called a Mule, being a kind of mixture of machinery between the warp machine of Mr. Arkwright and wool machine or hand-jenny of Mr. Hargrave; and was also invented in Lancashire. This machine bids fair to be of great use in spinning cotton yarn for muslins to a degree of fineness never before known in this country, being nearly equal to those usually brought from India.

COTTON, STATE OF THE MANUFACTURE OF. The facilities which the manufacturers of Great Britain had suddenly acquired, and the immense capitals which they have so recently laid out in expensive machinery and other heavy establishments for carrying on the cotton trade, are unparalleled in the annals of the world. A multitude of cotton mills are now built in Great Britain, of which the greater part have been erected within these 30 years. Besides these, there are above 20,500 hand-mills or jennies for spinning the shute for the twisted yarn spun by the water mills. Above a million of money was, within this time, sunk in mills, hand-engines, and other machines, and a power created of working nearly two millions of spindles; and men, women, and children, were trained to this business, capable of carrying the cotton manufacture almost to any extent. In the branches applicable to muslin and calico, it was calculated that employment was given to 100,000 men and women, and at least 60,000 children. The quantity of the raw material of cotton wool consumed in this manufacture, which did not amount to 6,000,000 lb. in 1781, and was only about 11,000,000 lb. in 1784, had amounted in the year 1787 to the enormous height of 22,000,000 lb. and upwards; and the astonishing rapidity of this increase is in some measure to be attributed to the extension of these branches to the goods of India, particularly the calicoes and muslins. British calicoes were first made in Lancashire about the year 1772, but the progress was slow till within these last thirty years. The quantity manufactured has since extended from about 50,000 to 1,000,000 of pieces made in the course of a single year. British muslins were not successfully introduced until the year 1781, and were carried to no great extent until 1785, after which period the progress during two years became rapid beyond all example. The acquisition of cotton wool of a superior quality from Demerara and the Brazils, and the improvements made in the spinning fine yarns upon the mule jennies, had given a spring to this branch of the cotton manufacture, which extended it beyond what it was possible to have conceived. Not only the quantity of goods manufactured in Great Britain have increased daily with the new accession of powers, but the quality have been exceedingly improved; and a yearly supply of about 300 bales of East India cotton have been obtained, yarns spun, and muslins wove, equal to any from India. Nothing, therefore, but a fine raw material appeared wanting to enable the British manufacturer to carry this branch to the greatest extent, and the utmost perfection of which it is capable. East India cotton wool has been spun into one pound of yarn worth five guineas; and when wove into muslin, and afterwards ornamented by children in the tambour, has extended to the value of 15*l.*; yielding

ing a return of 5,900 per cent. on the raw material. But the state of the raw materials, and the progressive and astonishing increase of this manufacture, will be best understood by what follows:

	Cotton Wool used in the Manufacture.	Supposed Value when manufactured.
1781	5,101,920	L. 2,000,000
1782	11,206,810	3,900,000
1783	9,546,179	3,200,000
1784	11,280,238	3,950,000
1785	17,992,888	6,000,000
1786	19,151,867	6,500,000
1787	22,600,000	7,500,000

In June, 1796, a patent was granted to Mr. Robert Miller, calico-printer, Dumbartonshire, Scotland, for a method of weaving all kinds of cotton, linen, and worsted-cloths, by means of looms worked by water; and which may be farther facilitated by steam-engines, horses, or any other power: the weaving is performed at considerably less expence, and more expeditiously, than it can be accomplished by the hands of weavers; the cloth thus woven is of a more regular texture, and superior to that wrought by the hand. But, as this patent relates purely to a mechanical operation, solely calculated for manufacturers, we refer the reader to the eighth vol. of the "Repertory of Arts and Manufactures." Further improvements have lately been made in the manufacturing of this important article by the application of steam, &c. The utility of cotton is not merely confined to the manufacture of different cloths: it is also capable of being converted into hats and paper. Experiments have shewn, that, if raw cotton be beaten to a sufficient degree, and then reduced to a proper pulp, it will produce a smooth, strong, white paper, little inferior in texture to that commonly made of linen rags.

COTTON, Sir ROBERT, a most eminent English antiquarian, descended from an ancient family, was born in 1570. In his 18th year he began to collect ancient records, charters, and other MSS. Camden, Selden, and Speed, acknowledged their obligations to him in their respective works. He was highly distinguished by queen Elizabeth, and by James I. who created him a baronet. He wrote many things himself; but our principal obligations to him are for his valuable library, consisting of curious MSS. &c. which he was 40 years in collecting. At his death, in 1631, he left the property of it to his family, though designed for public use. A large accession was made to this library by private benefactions before the death of the founder, and afterwards by the purchases of his heirs, and donations of others, who added to it a great number of books, chiefly relating to the history and antiquities of Britain. An act of parliament was obtained, at the request of Sir John Cotton, in 1700, for preserving it after his decease, under the denomination of the Cottonian Library, for public use. It is now fixed in the British Museum. For statutes relating to it, see 12 and 13 William III. cap. 5, and 5 Anne, cap. 30.

COTTON WEED, a species of Filago.

COTTUS, the BULL-HEAD, in ichthyology, a genus of fishes of the order thoracici. Head broader than the body, spiny; eyes vertical and supplied with a nictitating membrane; gill membrane, of six rays; body round, without scales, tapering towards the tail; dorsal fins generally two. There are ten species, of which the principal is *C. gobio*, the river bull-head. This is about five inches long when full grown, is found in almost every part of Europe in clear streams, and conceals itself under a stone, or in the gravel. Its food consists of worms, aquatic insects, and extremely young fish. The mailed bull-head, or *C. cataphractus*, is found in abundance in the seas of Europe. For a representation of it see Plate LV.

COTULA, in botany, MAY-WEED; a genus of the polygamia superflua order, and syngenesia class of plants. Receptacle almost naked; pappus marginated; florets of the disc quadrifid; of the radius frequently none. There are fifteen species, all herbaceous annuals.

COTULA, or COTYLA, a liquid measure in use among the ancients. Fannius says, the cotyla was the same thing with the hemina, which was half a sextary.

COTUY, a canton and town in the Spanish part of the island of St. Domingo.

COTYLEDON. A seed consists of three parts: viz. the cotyledons, the radicle, and the plumula, which are usually inclosed in a cover. If we take a garden bean, we may perceive each of these three parts with great ease; for this seed is of so large a size, that all its organs are exceedingly distinct. When we strip off the external coats of the bean, which are two, we find that it easily divides into two lobes, pretty nearly of the same size and figure. Each of these lobes is called a cotyledon. The cotyledons of the bean, then, are two in number. See BOTANY.

COTYLEDON, NAVAL WORT; a genus of the pentagynia order, and decandria class of plants; natural order, Succulentæ. Calyx quinquefid; corolla monopetalous; there are five nectariferous scales at the base of the germ; capsules five. There are nineteen species, most of them hardy succulent perennials; natives chiefly of the Cape.

COTYLEDONES, in anatomy, are certain glandular bodies, adhering to the chorion of some animals.

COTYTIA, the festivals of Cotytto.

COTYTTO, the goddess of all debauchery. Her festivals were celebrated by the Athenians, Corinthians, Thracians, &c. during the night. Her priests were called baptæ, and nothing but debauchery and wantonness prevailed at the celebration.

COUCH, in painting, denotes a lay, or impression of colour, whether in oil or water, wherewith the painter covers his canvas, wall, wainscot, or other surface to be painted.

COUCH is also used for a lay or impression on any thing, to make it firm and consistent, or to screen it from the weather. Paintings are covered with a couch of varnish; a canvas to be painted must first have two couches of size, before the colours be laid; two or three couches of white lead are laid on wood, before the couch of gold is applied.

COUCHA-HOTUN, a town of Asia, in Thibet, 270 miles S. S. W. of Tourfan.

COUCHANT, in heraldry, is understood of a lion, or other beast, when lying down, but with his head raised; which distinguishes the posture of couchant from dormant, wherein he is supposed quite stretched out and asleep.

COUCHE, in heraldry, denotes any thing lying along: thus, chevron-couche, is a chevron lying sideways, with the two ends on each side of the shield, which should properly rest on the base.

COUCHER, or COURCHER, in our statutes, is used for a factor, or one that continues in some place or country for traffic; as formerly in Gascoigne, for the buying of wines. Anno 37 Edw. III. c. 16.

COUCHER is also used for the general book in which any religious house or corporation register their particular acts. Anno 3 and 4 Edw. VI. c. 10.

COUCHES, a town of France, in the department of Saone and Loire, 12 miles E. S. E. of Autun.

COUCHGRASS. See TRITICUM.

COUCHING OF A CATARACT, in Surgery. See SURGERY.

COUCO, a country of Africa, in Algiers, governed by an independent chief. It is mountainous, but fertile, and lies between Algiers and Boujeiah.

COUCOUR-HOTUN, a town of Thibet, 210 miles W. of Tourfan.

COVENANT, in ecclesiastical history, denotes a contract or convention agreed to by the Scots in 1638 for maintaining their religion free from innovation. In 1581, the general assembly of Scotland drew up a confession of faith, or national covenant, condemning episcopal government, under the name of hierarchy, which was signed by James I. and which he enjoined on all his subjects. It was again subscribed in 1590 and 1596. The subscription was renewed in 1638, and the subscribers engaged by oath to maintain religion in the same state as it was in 1580, and to reject all innovations introduced since that time. This oath annexed to the confession of faith received the name of the covenant: as those who subscribed to it were called covenanters.

COVENANT, in law, is the agreement of two or more persons to do, or not do, some act, or thing, contracted between them. Also it is the declaration the parties make, that they will stand to such agreement, relating to lands or other things: and is created by deed in writing, sealed and executed by the parties, or otherwise it may be implied in the contract thereto. And if the persons do

not perform their covenants, a writ or action of covenant is the remedy to recover damages for the breach of them.

COVENANT, in theology, is much used in connection with other terms; as,

1. **COVENANT OF GRACE** is that which is made between God and those who believe the gospel, whereby they declare their subjection to him, and he declares his acceptance of them and favour to them. The gospel is sometimes denominated a covenant of grace, in opposition to the Mosaic law.

2. **COVENANT OF REDEMPTION** denotes a mutual stipulation, tacit or express, between Christ and the Father, relating to the redemption of sinners by him, previous to any act on Christ's part under the character of Mediator.

3. **COVENANT OF WORKS** signifies, in the language of many divines, a covenant whereby God requires perfect obedience from his creatures, in such a manner as to make no express provision for the pardon of offences to be committed against the precepts of it, on the repentance of such supposed offenders, but pronounces a sentence of death upon them: such, they say, was the covenant made with Adam in a state of innocence, and that made with Israel at Mount Sinai.

COVENANT. See **SOLEMN LEAGUE**.

COVENANT, ARK OF THE. See **ARK**.

COVENTRY, an ancient city of England in Warwickshire, supposed to derive its name from a convent formerly situated in it. Coventry sends two members to parliament; and lies 91 miles N. W. of London. Lon. 1. 30. W. Lat. 52. 23. N.

COVERSED SINE, in geometry, the remaining part of the diameter of a circle, after the versed sine is taken from it. See **TRIGONOMETRY**.

COVERT WAY, in fortification, a space of ground level with the field, on the edge of the ditch, three or four fathoms broad, ranging quite round the half-moons, or other works toward the country. See **FORTIFICATION**.

COVERTURE, in law, is applied to the state and condition of a married woman, who is under the power of her husband, and therefore called *femme coverte*; and disabled to contract with any person to the detriment either of herself or husband, without his consent and privity; or allowance and confirmation thereof.

COUGH, in farriery. See **FARRIERY**.

COUGH, in medicine. See **MEDICINE**.

COVIN, **COVINE**, a deceitful agreement between two or more, to the hurt of another.

COUL, or **COWL**. See **COWL**.

COULAM, a town of Hindostan, on the S. coast; 15 miles N. E. of Cape Comorin.

COULONS, a town of France, in the department of Loiret, seven miles S. W. of Gien.

COULTER, in husbandry, an iron-instrument, fixed in the beam of a plough, and serving to cut the edge of each furrow. See **PLOUGH**.

COUNCIL, [*concilium*, Lat.] in church history, an assembly of prelates and doctors, met for the regulating of matters relating to the doctrine or discipline of the church. These are either National or General.

COUNCIL, COMMON, in the city of London, is a court wherein are made all by-laws which bind the citizens. It consists like the parliament, of two houses; an upper one composed of the lord mayor and aldermen; and a lower, of a number of common council men, chosen by the several wards, as representatives of the body of the citizens.

COUNCIL, NATIONAL, is an assembly of prelates of a nation under their primate or patriarch.

COUNCIL, OECUMENICAL, or GENERAL, is an assembly which represents the whole body of the universal church. The Romanists reckon 18 of them; Bullinger, in his *Treatise de Conciliis* 6; Dr. Prideaux, and bishop Beveridge 8, which, he says, are all the general councils which have ever been held since the time of the first Christian emperor. They are as follows: 1. The council of Nice, held in the reign of Constantine the Great, on account of the heresy of Arius. 2. The council of Constantinople, called under the reign and by the command of Theodosius the Great, for much the same end that the former council was summoned. 3. The council of Ephesus, convened by Theodosius the younger at the suit of Nestorius. 4. The council of Chalcedon, held in the

reign of Martianus, which approved of the Eutychian heresy. 5. The second council of Constantinople, assembled by the emperor Justinian, condemned the three chapters taken out of the book of Theodorus of Mopsuestia, having first decided that it was lawful to anathematize the dead. Some authors tell us, that they likewise condemned the several errors of Origen about the Trinity, the plurality of worlds, and pre-existence of souls. 6. The third council of Constantinople, held by the command of Constantius Pogonatus the emperor, in which they received the definitions of the five first general councils, and particularly that against Origen and Theodorus of Mopsuestia. 7. The second Nicene council. 8. The fourth council of Constantinople, assembled when Louis II. was emperor of the West. Their regulations are contained in 27 canons, the heads of which are set down by M. du Pin, to whom the reader is referred.

COUNCIL OF ANCIENTS, the senior branch of the legislative body of the French republic, according to the constitution of 1795. It consisted of 250 members; of whom 126 were to be present at a sitting before they could deliberate. Their exclusive privilege was to approve or reject the propositions of the Council of Five Hundred. No proposition of a law could originate in the Council of Ancients. Each member was to be above 40 years of age; either married or a widower; be possessed of some property, and have resided in the territory of the republic for 15 years previous to his election, unless sent out of it on the business of the nation.

COUNCIL OF FIVE HUNDRED, the junior branch of the French legislature, was invariably fixed by the constitution of 1795, to consist of 500 members. To this council belonged exclusively the privilege of proposing laws. Each member was to be 30 years of age; possessed of some real property, and must have resided within the republic for 10 years previous to his election. They could not deliberate unless 200 members were present. The members of both councils were chosen by the citizens in the electoral assemblies. One third went out annually, and their places were filled up by new members, elected between the 20th and 30th of Germinal. Old members were not to be re-elected till they had been two years out of the legislative body. Each council chose a president and secretary monthly. Both councils resided always in the same commune. This council was dissolved by Napoleon Bonaparte, Nov. 9, 1799, preparatory to his being elected first consul of the French republic.

COUNCIL OF WAR, an assembly of principal officers of an army or fleet, occasionally called by the general or admiral to concert measures for their conduct with regard to sieges, retreats, engagements, &c.

COUNCILS, KING'S. In Great Britain, the law, in order to assist the king in the discharge of his duties, the maintenance of his dignity, and the exertion of his prerogative, has assigned him a diversity of councils to advise with, viz. 1. The high court of parliament. See **PARLIAMENT**. II. The peers of the realm are by their birth hereditary counsellors of the crown; and may be called together by the king, to give their advice in all matters of importance to the realm, either in time of parliament, or, which has been their principal use, when there is no parliament. Accordingly, Bracton, speaking of the nobility of his time, says, they might properly be called "*consules a consulendo; reges enim tales sibi associant ad consulendum.*" And in the law books, it is laid down, that the peers are created for two reasons: 1. *Ad consulendum*. 2. *Ad defendendum regem*; for which reasons the law gives them certain great and high privileges; such as freedom from arrests, even when no parliament is sitting; because the law supposes that they are always assisting the king with their counsel for the common-wealth, or keeping the realm in safety by their prowess and valour. Instances of conventions of the peers, to advise the king, have been in former times very frequent; though now fallen into disuse, by reason of the more regular meetings of parliament. Sir Edward Coke gives an extract of a record, five Henry IV. concerning an exchange of lands between the king and the earl of Northumberland, wherein the value of each was agreed to be settled by advice of parliament (if any should be called before the feast of St. Lucia,) or otherwise by advice of the grand council of peers, which the king promises to assemble before the said feast, in case no parliament shall be called. Many other instances of this kind of meeting are to be found under our ancient kings, though the formal method of convoking them had been so long

left off, that when king Charles I. in 1640, issued out writs under the great seal, to call a council of all the peers of England, to meet and attend his majesty at York, previous to the meeting of the long parliament, the earl of Clarendon mentions it as a new invention, not before heard of; that is, as he explains himself, so old, that it had not been practised in some hundreds of years. But though there had not for long before been an instance, nor has there been any since, of assembling them in so solemn a manner, yet in case of emergency, our princes have at several times thought proper to call for, and consult as many of the nobility as could easily be brought together: as was particularly the case with king James II. after the landing of the prince of Orange, and with the prince of Orange himself, before he called the convention parliament which afterwards called him to the throne. Besides this general meeting, it is usually looked upon to be the right of each particular peer of the realm, to demand an audience of the king, and to lay before him with decency and respect such matters as he shall judge of importance to the public weal. And therefore, in the reign of Edward II. it was made an article of impeachment in parliament against the two Hugh Spencers, father and son, for which they were banished the kingdom, "that they by their evil covin would not suffer the great men of the realm, the king's good counsellors, to speak with the king, or to come near him; but only in presence and hearing of said Hugh the father and Hugh the son, or one of them, and at their will, and according to such things as pleased them." III. A third council belonging to the king, according to Sir Edward Coke, are his judges of the courts of law, for law matters. And this appears frequently in the English statutes, particularly 14 Edward III. c. 5, and in other books of law. So that when the king's council is mentioned generally, it must be defined, particularized, and understood, *secundum subjectam materiam*; "according to the subject matter;" and if the subject be of a legal nature, then by the king's council is understood his council for matters of law; namely, his judges. Therefore, when by statute 16 Richard II. c. 5, it was made a high offence to import into England any papal bulls, or other processes from Rome; and it was enacted, that the offenders should be attached by their bodies and brought before the king and his council to answer for such offence; here, by the expression of king's council, were understood the king's judges of his courts of justice, the subject matter being legal: this being the general way of interpreting the word council. IV. But the principal council belonging to the king is his privy council, which is generally, by way of eminence, called the council. See COUNCIL, PRIVY.

COUNCIL, PRIVY, the primum mobile of the civil government of Great Britain, bearing part of that great weight in the government which otherwise would be too heavy upon the King. It is composed of eminent persons, the number of whom is at the Sovereign's pleasure, who are bound by oath to advise the King to the best of their judgment, with all the fidelity and secrecy that becomes their station. The King may declare to, or conceal from, his privy council whatever he thinks fit, and has a select council out of their number, commonly called the cabinet council, with whom his Majesty determines such matters as are most important, and require the utmost secrecy. All proclamations from the King and the privy council, ought to be grounded on law, otherwise they are not binding to the subject. Privy counsellors, though but gentlemen, have precedence of all the knights and younger sons of barons and vicounts, and are styled right honourable.

COUNSEL, or ADVOCATES, in English courts of law, are of two species or degrees: Barristers and Serjeants. See these articles; also Advocates. From both these degrees, some are usually selected to be his majesty's counsel, learned in the law; the two principal of whom are called his attorney-general, and solicitor-general. A custom has of late years prevailed of granting letters patent of precedence to such barristers as the crown thinks proper to honour with that mark of distinction; whereby they are intitled to such rank and preaudience as are assigned in their respective patents; sometimes next after the king's attorney-general, but usually next after his majesty's counsel next being.

COUNSEL, KING'S. The first king's counsel, under the degree of serjeant, was Sir Francis Bacon, who was made so *honoris causa*, without patent or fee. The first of the modern order (who are now the sworn servants of the crown, with a standing salary) seems to have been Sir Francis North, afterwards lord keeper of the

Great Seal to king Charles II. These king's counsel answer, in some degree, to the advocates of the revenue, *advocati fisci*, among the Romans.

COUNSELLOR AT LAW, a person retained by a client to plead his cause in a public court of judicature. There are two degrees of counsel, viz. barristers and sergeants. Barristers are called to the bar after a certain period of standing in the inns of court. See BARRISTER. After 16 years standing they may be called to the degree of sergeant. The judges of the courts of Westminster are always admitted sergeants before they are advanced to the bench. From both sergeants and barristers the King's counsel are usually selected, the two principal of whom are called his attorney and solicitor-general. Counsel are supposed to plead gratis, and can maintain no action for their fees; and to encourage in them a freedom of speech in the lawful defence of their clients, a counsellor is not answerable for any matter by him spoken, though it should prove groundless, and reflect on the reputation of another; provided it relates to the cause which he espouses, and is suggested in his client's instructions. And notwithstanding counsellors have a special privilege to practise the law, yet they are punishable for misbehaviour by attachment. No counsel is allowed to a prisoner upon a general issue of indictment of felony, unless some point of law arise; for the court is the prisoner's only counsel.

COUNT, [*compte*, Fr. *computus*, Lat.] in law, denotes the original declaration in a real action; as the declaration is in a personal one; the libellus of the civilians answers to both. Yet, count and declaration are sometimes confounded, and used for each other; as count in debt, count in appeal, &c.

COUNT, [*comte*, Fr. *comes*, Lat.] a title of foreign nobility; supposed equivalent to an earl.

COUNT properly signifies a nobleman who possesses a domain erected into a county. See VISCOUNT. English and Scottish counts we distinguish by the title of earls; foreign ones still retain their proper name. The dignity of a count is a medium between that of a duke and a baron. According to the modern use, most plenipotentiaries and ambassadors assume the title of counts, though they have no county. Anciently, all generals, counsellors, judges, and secretaries of cities under Charlemagne, were called counts; the distinguishing character of a duke and a count being this, that the latter had but one town under him, but the former several. A count has a right to bear on his arms a coronet, adorned with three precious stones, and surmounted with three large pearls, whereof those in the middle and extremities of the coronet advance above the rest. The Germans call a count, *graaf*, or *graff*; which properly signifies judge; and is derived from *gravius* or *graffio*; of *graffio*, I write. They have several kinds of these counts or graffs; as landgraves, marchgraves, burg-graves, and palgraves, or counts palatine. These last are of two kinds; the former are of the number of princes, and have the investiture of a palatinate; the others have only the title of count palatine without the investiture of any palatinate. Some assert, that by publicly professing the imperial laws for 20 years, the person acquires the dignity of a count palatine; and there are instances of professors in law who have assumed the title accordingly: but there are others who question this right.

COUNT WHEEL, in the striking part of a clock, a wheel which moves round once in 12 or 24 hours. It is sometimes called the locking wheel.

COUNTER, in law, applied to deeds, means an exact copy kept by the contrary party, and sometimes signed by both parties.

COUNTER is also the name of a piece of metal with a stamp on it, used in playing at cards.

COUNTERS IN A SHIP, are two: viz.

1. COUNTER, LOWER, between the transom and the lower part of the gallery.

2. COUNTER, UPPER, the hollow arching from the gallery to the lower part of the straight piece of the stern.

COUNTER-BARRY, or *CONTRE-BARRE*, in heraldry, is the same as our bendy sinister per bend counterchanged.

COUNTER-BATTERY, is a battery raised to play upon another to dismount the guns.

COUNTER-BOND, a bond of indemnification given to one who has given his bond as a security for another's payment of a debt, or the faithful discharge of his office or trust.

COUNTER-

COUNTER-CHANGED, in heraldry, the intermixture, or opposition of any metal with a colour.

COUNTERDRAW, with painters, to copy a design or painting by means of a fine linen cloth, an oiled paper, or other transparent matter, whereon the strokes appearing through, are traced with a pencil.

COUNTER-DRAWING is sometimes done on glass, and with frames or nets divided into squares with silk or thread; and also by means of instruments invented for the purpose, as the parallelogram.

COUNTER-ERMINÉ, in heraldry, is the contrary of ermine, being a black field with white spots.

COUNTERFEITS, in law, are persons that obtain money or goods by counterfeit letters or false tokens; who being convicted before justices of assize or of the peace, &c. are to suffer such punishment as shall be thought fit to be inflicted, under death, as imprisonment, pillory, &c.

COUNTER-FLORY, in heraldry, is said of a tressure whose flowers de luce are opposite to others. See **HERALDRY**.

COUNTER-FOIL, or **COUNTER-STOCK**, in the exchequer, that part of an ally which is kept by an officer of the court.

COUNTER-GAGE, in carpentry, a method used in measuring the joints. For example, they transfer the breadth of a mortise to the place in the timber where the tenon is to be, in order to make them fit each other.

COUNTER-GUARD, in fortification, is a work raised before the point of a bastion, consisting of two long faces parallel to the faces of the bastion, making a salient angle: they are sometimes of other shapes, or otherwise situated.

COUNTER-LIGHT, or **CONTRE-JOUR**, a light opposite to any thing, which makes it appear to disadvantage. A single counter-light is sufficient to take away all the beauty of a fine painting.

COUNTERMAND, in the English law, is where a thing before executed is by some act or ceremony afterwards made void by the party that did it.

COUNTER-MARCH, in military affairs, a change of the face or wings of a battalion, by which means those that were in the front come to be in the rear.

COUNTERMARK, 1. A second or third mark put on a bale of goods belonging to several merchants, that it may not be opened but in the presence of them all. 2. The mark of the goldsmiths company, to shew the metal is standard, added to that of the artificer. 3. An artificial cavity made in the teeth of horses, that have outgrown their natural mark, to disguise their age. 4. A mark added to a medal a long time after it is struck, by which the curious know the several changes in value which it has undergone.

COUNTER-MINE, in war, a well and gallery drove and sunk till it meet the enemy's mine, to prevent its effect.

COUNTER-MURE, a wall built close to another, that it may not receive any damage from the contiguous buildings.

COUNTER-PALED, [*contre-palé*], in heraldry, is when the escutcheon is divided into twelve pales parted per fesse, the two colours being counterchanged: so that the upper are of one colour, and the lower of another.

COUNTER-PART, in music, denotes one part to be applied to another. Thus the bass is said to be a counter-part to the treble. In law, it is the duplicate or copy of any indenture or deed.

COUNTER-PASSANT, is when two lions are in a coat of arms, and the one seems to go quite the contrary way from the other.

COUNTER-PLEA, in law, a cross or contrary plea, particularly such as the defendant alleges against a tenant in courtesy, or dower, who prays the King's aid, &c. for his defence.

COUNTER-POINT, in music, the art of composing harmony, or of disposing several parts in such a manner as to make an agreeable whole or a concert. In general, every harmonious composition, or composition of many parts, is called counter-point. It took its name from hence: before notes of different measures were invented, the manner of composing was to set pricks or points one against another, to denote the several concords.

COUNTER-POINTED, in heraldry, is when two chevrons in one escutcheon meet in the points, the one rising as usual from the base, and the other inverted falling from the chief; so that they are counter to one another in the points. They may also be counter-pointed when they are founded upon the sides of the

shield, and the points meet that way, called counter-pointed in fesse.

COUNTER-POISE is a piece of metal, called by some the pear, on account of its figure, and the mass, by reason of its weight, which sliding along the beam, determines the weight of bodies weighed by the statera Romana.

COUNTER-PROOF, in rolling-press printing, a print taken off from another fresh printed; which by being passed through the press, gives the figure of the former, but inverted.

COUNTER-QUARTERED, [*contre écartelé*, Fr.] in heraldry, denotes the escutcheon, after being quartered, to have each quarter again divided into two.

COUNTER-REVOLUTION, a change of government in a country, where a revolution has already taken place; either by restoring the old government, or establishing a new one different from both. It is generally used in the former sense. This word, though in much use, especially since the commencement of the French revolution, has not hitherto found a place in any English dictionary.

COUNTER-SALIENT, in heraldry, is when two beasts are borne in a coat leaping from each other directly the contrary way.

COUNTER-SCARP, in fortification, is properly the exterior talus or slope of the ditch; but it is often taken for the covered way and the glacis. In this sense we say, the enemy have lodged themselves on the counter-scarp.

COUNTER-SCARP, ANGLE OF THE, is that made by two sides of the counter-scarp meeting before the middle of the curtain.

COUNTER-SIGNING, the signing of the writing of a superior in quality of a secretary. Thus charters are signed by the king, and countersigned by a secretary of state or lord-chancellor.

COUNTER-SWALLOW-TAIL, in fortification, an out-work in form of a single tenaille, wider at the gorge than the head.

COUNTER-TIME, in the manege, is the defence or resistance of a horse that interrupts his cadence, and the measure of his manege, occasioned either by a bad horseman, or by the malice of the horse.

COUNTER-TRIPPING, is when two beasts are borne in a coat in a walking posture, the head of the one being next the tail of the other.

COUNTER-VALLATION, in the military art, a ditch made round a besieged place, to prevent the garrison from making sallies. See **CONTRAVALLATION** and **FORTIFICATION**.

COUNTER-WORKING, the raising of works to oppose those of the enemy.

COUNTORS, **CONTOURS**, or **COUNTERS**, has been used for sergeants at law, retained to defend a cause, or to speak for their client in any court of law. They were anciently called serjeant contours.

COUNTRIES, among the miners, an appellation they give to their works under ground.

COUNTRY, among geographers, is used indifferently to denote either a kingdom, province, or less district. But its most frequent use is in contradistinction to town.

COUNTY, in geography, originally signified the territory of a count or earl, but now it is used in the same sense with shire. See **SHIRE**. England, for the better government thereof, and the more easy administration of justice, is divided into fifty-two counties, each whereof is subdivided into rapes, lathes, wapentakes, hundreds; and these again into tythings. For the execution of the laws in the several counties, excepting Cumberland, Westmoreland, and Durham, every Michaelmas term officers are appointed, called sheriffs: other officers of the several counties are lord-lieutenants, custodes rotulorum, justices of the peace, bailiffs, high constables, coroner, clerks of the market, &c. Of the fifty-two counties in England and Wales, there are four termed counties-palatine, viz. Lancaster, Chester, Durham, and Ely: these counties are reckoned among the superior courts, and are privileged as to pleas, so that no inhabitant of such counties shall be compelled by any writ to appear, or answer the same, except for error, and in cases of treason, &c. The counties palatine of Durham and Chester are by prescription, where the king's writs ought not to come, but under the seal of the counties-palatine, unless it be a writ of proclamation. There is a court of chancery in the counties-palatine of Lancaster and Durham, over which there are chancellors. Scotland is divided into thirty-three counties, the government of which is committed to sheriffs. See **SHERIFF**.

COUNTY,

COUNTY CORPORATE is a title given to several cities, or ancient boroughs, on which our monarchs have thought fit to bestow extraordinary privileges; annexing to them a particular territory, land, or jurisdiction; and making them counties of themselves, to be governed by their own sheriffs and magistrates.

COUNTY COURT, in English law, a court incident to the jurisdiction of the sheriff. It is not a court of record, but may hold pleas of debt or damages under the value of 40s. Over some of which causes these inferior courts have, by the express words of the statute of Gloucester, a jurisdiction totally exclusive of the king's superior courts. For in order to be intitled to sue an action of trespass for goods before the king's justiciars, the plaintiff is directed to make affidavit, that the cause of action does really and bona fide amount to 40s. which affidavit is now unaccountably disused, except in the court of exchequer. The statute also 43 Eliz. c. 6, which gives the judges in many personal actions, where the jury assess less damages than 40 s. a power to certify the same and abridge the plaintiff of his full costs, was also meant to prevent vexation by litigious plaintiffs; who, for purposes of mere oppression, might be inclinable to institute such suits in the superior courts for injuries of a trifling value. The county court may also hold plea of many real actions, and of all personal actions to any amount, by virtue of a special writ called justices; which is a writ empowering the sheriff for the sake of dispatch to do the same justice in his county court, as might otherwise be had at Westminster.

COVORDEN, a city of Holland, in Over-yssel; 42 miles N. E. of Deventer.

COUP-DE-MAIN, in military affairs, implies a desperate resolution in all small expeditions of surprise, &c. The favourable side of the proposed action must ever be viewed; for if what may happen, arrive, or fall out, is chiefly thought upon, it will, at the very best, not only greatly discourage, but in general it will produce a total failure. The very name of an expedition implies risk, hazard, precarious warfare, and a critical but desperate operation or coup-de-main.

COUP-D'ŒIL, in a military sense, signifies that fortunate aptitude of eye in a general or other officer, by which he is enabled at one glance on the map to see the weak parts of an enemy's country, or to discern the strong ones of his own. By possessing a ready coup-d'œil, a general may surmount the greatest difficulties, particularly in offensive operations. On a small scale this faculty is of the greatest utility. Actions have been recovered by a sudden conception of different openings upon the enemy, which could only be ascertained by a quick and ready eye, during the rapid movements of opposing armies.

COUPÉD, [from *coupé*, Fr. cut,] in heraldry, is used to express the head, or any limb, of an animal, cut off from the trunk, smooth; distinguishing it from that which is called *crassed*, that is, forcibly torn off, and therefore is ragged and uneven. It is also applied to such crosses, bars, bends, chevrons, &c. as do not touch the sides of the escutcheon, but are, as it were, cut off from them.

COUPEE, POINT, a Spanish settlement of N. America, extending 20 miles on the west side of the Mississippi.

COUPLE-CLOSS, in heraldry, the 4th part of a chevron, never borne but in pairs, except there be a chevron between them, saith Guillim, though Bloom gives an instance to the contrary.

COUPTRAIN, a town of France, in the department of Maine, $7\frac{1}{2}$ miles N. of Vitaine.

COUR, a town of France, in the department of Loire and Cher, 9 miles S. of Blois.

COURA, a river of Portugal, which runs into the Duero, four miles N. E. of Lamego.

COURAGE, in ethics, is that quality of the mind, derived either from constitution or principle, or both, that enables men to encounter difficulties and dangers. See **FORTITUDE**.

COURANT, in music, is a piece in triple time: the air of the courant is ordinarily noted in triples of minims; the parts to be repeated twice. It begins and ends when he who beats the measure falls his hand; in contradistinction from the saraband, which ordinarily ends when the hand is raised.

COURAP, a general name in the East-Indies for any sort of itch; but particularly applied to a species very common in Java and some other parts.

COURSÉ, a post of Chinese Tartary.

COURGIS, a town of France, in the department of Yonne, 5 miles E. of Auxerre.

COURGIVAUX, a town of France, in the department of Marne, 10 miles W. S. W. of Sezanne.

COURLAND, a duchy of Europe, situated between 51° and 60° Lon. E. and between $56^{\circ} 30'$ and $57^{\circ} 30'$ Lat. N. It is bounded by the gulph of Riga and the river Dwina, which divide it from Livonia, on the N.; by Lithuania, on the E.; by Samogitia, on the S.; and by the Baltic sea on the W.; being 250 miles long and 40 broad. This duchy was formerly independent, and elected their own duke; but is now subject to Russia. This country rises in gentle hills, and is fertile in corn, hemp, and flax. It also abounds in pines, firs, oaks, &c. and has many neat villages and good inns. It is divided into Courland Proper and Semigallia. The chief towns are Mittau the capital, Candau, Golden-gen, Groben, Libau, and Winday.

COURSE, in navigation, that point of the compass, or horizon, on which the ship steers; or the angle between the rhumb-line and the meridian. See **NAVIGATION**.

COURSE, in architecture, a continued range of stones, level, or of the same height throughout the whole length of the building, without being interrupted by any aperture.

COURSE OF PLINTHS, the continuity of a plinth of stone, or plaister, in the face of a building, to mark the separation of the stones.

COURSES, in a ship, the mainsail and foresail: when the ship sails under them only, without lacing on any bonnets, she is then said to go under a pair of courses. To sail under a main course and bonnets, is to sail under a mainsail and bonnet.

COURSE is used for a collection or body of laws, canons, or the like. As, the civil course is the collection of the Roman law compiled by order of Justinian: canonical course, the collection of the canon law, made by Gratian. See the articles **CIVIL-LAW** and **CANON-LAW**.

COURSE is also made to express the elements of an art, explained either by experiment or writing.

COURSE is also applied for the time spent in learning the elements of a science; as a student is said to go through his courses of philosophy, divinity, mathematics, &c. at the university.

COURT, [*curia*, Lat.] in a law sense, the place where judges distribute justice, or exercise jurisdiction; also the assembly of judges, jury, &c. in that place. As by our excellent constitution, the sole executive power of the laws is vested in the person of the king, it follows that all courts of justice, which are the medium by which he administers the laws, are derived from the power of the crown. For whether created by act of parliament or letters patent, or subsisting by prescription, (the only methods by which any court of judicature can exist,) the king's consent in the two former is expressly, and in the latter impliedly, given. In all these courts, the king is supposed in contemplation of law to be always present; but as that is in fact impossible, he is there represented by his judges, whose power is only an emanation of the royal prerogative. For the more speedy, universal, and impartial administration of justice between subject and subject, the law has appointed a great variety of courts, some with a more limited, others with a more extensive jurisdiction; some constituted to inquire only, others to hear and determine; some to determine in the first instance, others upon appeal and by way of review. See **LAW**, and the respective articles in the order of the alphabet. One distinction runs throughout them all; viz. that some of them are courts of record, others not of record. A court of record is that where the acts and judicial proceedings are enrolled in parchment for a perpetual memorial and testimony: which rolls are called the records of the court, and are of such high and super-eminent authority, that their truth is not to be called in question. For it is a settled rule and maxim, that nothing shall be averred against a record, nor shall any plea, or even proof, be admitted to the contrary. And if the existence of a record be denied, it shall be tried by nothing but itself; that is, upon bare inspection, whether there be any such record or no; else there would be no end of disputes. But if there appear any mistake of the clerk in making up such record, the court will direct him to amend it. All courts of record are the king's courts, in right of his crown and royal dignity, and therefore no other court hath authority to fine

or imprison; so that the very erection of a new jurisdiction with power of fine or imprisonment, makes it instantly a court of record. A court not of record is the court of a private man; whom the law will not intrust with any discretionary power over the fortune or liberty of his fellow-subjects. Such are the courts baron, and other inferior jurisdictions: where the proceedings are not enrolled or recorded; but as well their existence as the truth of the matters therein contained shall, if disputed, be tried and determined by a jury. These courts can hold no plea of matters cognizable by the common law, unless under the value of 40s. nor of any forcible injury whatsoever, nor having any process to arrest the person of the defendant. In every court there must be at least three constituent parts, the actor, reus, and judex: the actor, or plaintiff, who complains of an injury done; the reus, or defendant, who is called upon to make satisfaction for it; and the judex, or judicial power, which is to examine the truth of the fact, to determine the law arising upon that fact, and, if any injury appears to have been done, to ascertain, and by its officers to apply the remedy. It is also usual in the superior courts to have attorneys, and advocates or counsel, as assistants. See ATTORNEY, and COUNSEL.

COURT, ARCHES. See ARCHES COURT.

COURT BARON, in English law, a court incident to every manor in the kingdom, to be holden by the steward within the said manor. This court baron is of two natures: the one is a customary court, appertaining entirely to the copyholders, in which their estates are transferred by surrender and admittance, and other matters transacted relative to their tenures only. The other is a court of common law, and it is the court of the barons, by which name the freeholders were called: for that it is held before the freeholders who owe suit and service to the manor, the steward being rather the registrar than the judge. These courts, though in their nature distinct, are confounded together.

COURTS, ECCLESIASTICAL, are those courts which are held by the king's authority, as supreme governor of the church, for matters which chiefly concern religion. As to suits in spiritual or ecclesiastical courts, they are for the reformation of manners; as for the punishing of heresy, defamation, laying violent hands on a clerk, and the like; and some of their suits are to recover something demanded, as tithes, a legacy, contract of marriage, &c.; and in cases of this nature, the court may give costs, but not damages. The proceedings in the ecclesiastical courts are according to the civil and canon law: they are not courts of record.

COURT OF CONSCIENCE, a court in the cities of London, Westminster, and some other places, that determines matters in all cases, where the debt or damage is under forty shillings.

COURT OF DELEGATES, a court where delegates are appointed by the king's commission, under the great seal, upon an appeal to him from the sentence of an archbishop, &c. in ecclesiastical causes; or of the court of admiralty, in any marine cause.

COURT OF HUSTINGS, a court of record held at Guildhall, for the city of London, before the lord mayor and aldermen, sheriffs, and recorder, where all pleas, real, personal, and mixt, are determined; where all lands, tenements, &c. within the said city, or its bounds, are pleadable in two hustings; the one called the hustings of plea of lands, and the other the hustings of common pleas. The court of hustings is the highest court within the city, in which writs of exigent may be taken out, and out-lawries awarded, wherein judgement is given by the recorder. To the lord mayor and city of London belong several other courts, as the court of common-council, consisting of two houses, the one for the lord mayor and aldermen, and the other for the commoners; in which court are made all by-laws which bind the citizens. The chamberlain's court relates to the rents and revenues of the city, to the affairs of servants, &c. See CHAMBERLAIN. To the lord mayor belongs the court of coroner and escheator; another court for the conversation of the river of Thames; another of gaol delivery, held eight times a year at the Old Bailey, for the trial of criminals, where the lord mayor himself is the chief judge. There are also other courts called ward-motes, or meeting of the wards; and courts of holymote, or assemblies of the guilds and fraternities.

COURT-LEET, a court ordained for the punishment of offences under high treason against the crown.

COURT-MARTIAL, a court appointed for the punishing of offences in officers, soldiers, and sailors, the powers of which is regulated by the mutiny-bill.

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COURT OF PIEPOWDER, a court held in fairs to do justice to buyers and sellers, and for redress of disorders committed in them; so called because they are most usual in summer, when the suitors to the court have dusty feet. The court of piepowder may hold plea of a sum above 40s. The steward before whom the court is held is the judge, and the trial is by merchants and traders in the fair; and the judgement against the defendant shall be, quod amercietur. If the steward proceeds contrary to the statute 17 Edw. IV. he shall forfeit 5*l*.

COURT OF REQUESTS, was a court of equity, of the same nature with the chancery, but inferior to it. It was chiefly instituted for the relief of such petitioners as in conscionable cases addressed themselves to his majesty: the lord privy-seal was the chief judge of this court.

COURTENAY, a town of France, in the department of Loiret, 13½ miles S.W. of Sens.

COURTESY, or **CURTESY OF ENGLAND**, a certain tenure, whereby a man marrying an heiress seized of lands of fee simple, or fee tail general, or seised as heir of the tail special, and hath a child by her that cometh alive into the world, though both it and his wife die forthwith; yet if she were in possession, he shall keep the land during his life, and is called tenant per legem Angliæ, or tenant by the courtesy of England; because this privilege is not allowed in any country except Scotland, where it is called curialitas Scotiae.

COURTHEZON, a town of France, in the department of the Mouths of the Rhone.

COURTINE. See CURTIN, and FORTIFICATION.

COURT-OF-ALDERMEN, a cluster of small islands, in the S. and N. Pacific Ocean, off the coast of New Zealand.

COURTRAI, or **COURTRAY**, a town of France in the department of Lys, 24 miles S. of Bruges.

COUSIN, is a term of relation between the children of brothers and sisters, who, in the first generation, are called cousins-german; in the second generation, second cousins, &c. Theodosius the Great prohibited cousins from marrying, under pain of death; on pretence that they were, in some sort, brothers and sisters to each other.

COUSU, in heraldry, signifies a piece of another colour or metal placed in the ordinary, as if it were sewed on, as the word imports.

COUTAHOU, a town of Asia, in Thibet, 25 miles E. of Manas-Hotun.

COUTANCES, a city of France, in the department of the Channel, 40 miles S. of Cherbourg. Lon. 1. 23. W. Lat. 49. 3. N.

COUTANTIN, **COTANTIN**, or **COTENTIN**, a late territory of France, in Lower Normandy; containing the towns of Coutances, Carentan, Cherbourg, Barileur, Granville, St. Saviour, Valogne, Ville-Dieu, &c. It is now included in the department of the Channel.

COUTCHING, a town of China, in Petcheli.

COU-TCHING-KEON, an island of China.

COUTOUCTOU-HOTUN, a town of Chinese Tartary, 225 miles E. of Pekin.

COUTRAS, a town of France, in the department of Dordogne, 20 miles N.E. of Bourdeaux.

COUVERT, in heraldry, a piece of hanging, or a pavilion falling over the top of a chief or other ordinary, so as not to hide, but only to be a covering to it.

COUXEA, a town of Africa, on the coast of Guinea, in Sierra Leone.

COW, in zoology. See BOS.

Cow, SEA. See TRICHECUS.

Cow and CALF, two rocks of Ireland, off the S.E. coast of the county of Down.

COWBRIDGE, a town of S. Wales, in Glamorganshire, where the county assizes are held. It is 12 miles W. of Cardiff, 63 W. by N. of Gloucester.

COWE, the capital of the Cherokee Indians, situated on the foot of the hills, on both sides the river Tennessee.

COWEL DR. JOHN, a learned and eminent civilian, born about 1554. In 1607, he compiled a Law Dictionary, which gave great offence to Sir Edward Coke and the common lawyers: so that they first accused him to James I. as asserting that the king's prerogative was in some cases limited; and when they failed in that attempt, they complained of him to the house of commons.

as a betrayer of the rights of the people, by asserting that the king was not bound by the laws; for which he was committed to custody, and his book publicly burnt. He also published "*Institutiones Juris Anglicani*," in the manner of Justinian's *Institutes*; and died of the operation for the stone, in 1611.

COWES, EAST, and COWES WEST, two towns on the N.E. coast of the Isle of Wight.

COWLS, habits worn by the Bernardines and Benedictines; they are of two kinds; the one white, very large, worn in ceremony, and when they assist at the office; the other black, worn on ordinary occasions, in the streets, &c. F. Mabillon maintains that the cowl was the same thing in its origin with the scapular. The author of the apology of the Emperor Henry IV. distinguishes two forms of cowls: the one a gown reaching to the feet, having sleeves, and a capuchin, used in ceremonies; the other a kind of hood to work in, called also a scapular, because it only covers the head and shoulders.

COWLEY, ABRAHAM, an English poet, was born in London in 1618, and educated at Westminster school. At the age of 15 he published a small collection of poems, entitled *Poetical Blossoms*. From Westminster he removed to Trinity college, Cambridge, where he wrote several of his pieces. In 1643 he was ejected from the college for his loyalty, and then went to Oxford, where he materially served the royal cause. He afterwards removed to France in the family of the earl of St. Albans. In 1656 he returned to England, and was soon after committed to prison, from whence he was bailed by Dr. Scarborough. Next year he went to Oxford, and obtained the degree of M.D. On the death of Cromwell he again visited France, but returned at the Restoration, and obtained a lease of a farm at Chertsey, valued about 300*l.* a year, where he died in 1667. His remains were deposited in Westminster abbey, where is a monument to his memory. Dr. Johnson places Cowley at the head of those whom he calls metaphysical poets; but though he is sometimes sublime, always moral, and frequently witty, yet his poems are tedious and affected. The anacreontics are reckoned the best. He also wrote a comedy called the *Cutter of Colman-street*, and some pieces in prose, particularly a *Discourse on the Government of Cromwell*, and a *Proposition for the Advancement of Experimental Philosophy*.

COWPER, WILLIAM, an excellent English poet, son of Dr. Cowper, chaplain to George II. rector of Berkhamstead in Herefordshire. He was born in 1731, at Berkhamstead, and lost his mother when he was only six years old. His constitution was very delicate from his infancy. He received the rudiments of learning at Market-street, Hertfordshire, from whence he was removed to Westminster school, which he quitted at the age of eighteen. After finishing his studies for the law at the age of thirty-one, he was nominated a clerk in the house of lords; but an unconquerable timidity prevented him from taking it. He was next appointed clerk of the journals; but an occasion occurring which rendered it necessary for him to appear at the bar of the house, it had such an effect on his nerves, that he was obliged to resign the place. In 1765 he settled at Huntingdon, where he formed an acquaintance with a clergyman of the name of Unwin, in whose family he became an inmate. That gentleman being killed by a fall from his horse in 1767, Cowper and Mrs. Unwin went and settled at Olney in Buckinghamshire, where they contracted an intimacy with Mr. Newton, then curate of that parish, and well known as a popular preacher, and calvinistic writer. To a collection of hymns published by that gentleman, our poet contributed 68. In 1782 appeared a volume of his poems, which did not excite much attention; but the second volume, in 1785, stamped his reputation as a first-rate poet, particularly by that exquisite piece "*The Task*." Lady Austin, for whom the poet had a tender regard, being a great admirer of Milton, requested him to try his powers in blank verse; and, on his asking her for a subject, she said, "Oh, you can write upon any; let it be this sofa." Thus originated one of the finest poems in our language. The same lady was also the occasion of the popular ballad of John Gilpin, which story she related to amuse Cowper in one of his gloomy moments; and it had such an effect upon him, that he turned it into verse. About this time he engaged in translating Homer into Miltonic verse; and though the version is not so pleasing as that of Pope, it exhibits more of the original. In 1786 he removed to Weston in Northamptonshire, with Mrs. Unwin, whom he regarded as a mother. In 1794 his majesty granted him a pension of 300*l.* per annum, but the royal

bounty yielded pleasure only to his friends, for he was now sunk into a state of complete dejection, from which he never fully emerged. He continued, however, occasionally to write, and also finished a revival of his *Homer*, which has since been printed. This amiable man, and extraordinary genius, died at Dereham, in Norfolk, April 25, 1800.

COWSLIP. See *PRIMULA*.

COWS-LUNGWORT. See *VERBASCUM*.

COW-WEED. See *CHELOPHYLLUM*.

COW-WHEAT. See *MELAMPYRUM*.

COXWOLD, a town in the North riding of Yorkshire, 14 miles N. of York.

COYAU, a settlement of the United States, on the river Tennessee, 30 miles below Knoxville.

COYPEL, a celebrated family of painters in France. 1. Noel Coypel was born in 1628, and became the disciple of Quilletier. The king gave him apartments in the Louvre, and nominated him director of the French academy at Rome, which institution flourished greatly under his care. He executed a number of excellent works, and died in 1707. 2. Anthony Coypel, eldest son of the above, was born at Paris in 1661. He accompanied his father to Rome, where he greatly improved himself. He succeeded his father in his honours, and in 1715 was appointed first painter to the king. To his professional talents he added a taste for literature, and wrote a poetical epistle on painting in a style of elegance. He died in 1722. 3. His son Charles was an eminent artist, and a dramatic poet. He died in 1752, aged 58. 4. Noel Nicholas Coypel, another son of Noel Coypel, and brother of Antony, was born at Paris in 1692. His father dying while he was young, he lost several advantages of instruction; but he acquired great knowledge by his own application, and produced a picture for a royal prize, which was highly admired. He also painted some fine church pieces. In 1733 he was appointed a professor in the academy, and died in 1735.

COZUMEL, an island near the west coast of Yucatan, where Cortez landed and refreshed his troops before entering upon the conquest of Mexico.

CRAB, in zoology. See *CANCER*.

CRAB, an engine of wood, with three claws, placed on the ground like a capstan, and used on launching or heaving ships into the dock. See Plate XLVII. fig. 15.

CRAB'S CLAWS. See *MATERIA MEDICA*.

CRAB'S EYES. See *MATERIA MEDICA*.

CRAB, or GIN, an engine used for mounting large guns on their carriages, &c. It is composed of three long and stout legs, meeting together at their tops; these legs are round poles of about 12 or 13 feet long, whose diameters at the lower end are about four inches, five just below the roller besides the cheeks that are added to them in that place, and about three inches and a half above.

CRACATOA, the most southern of a cluster of islands lying in the entrance of the Straits of Sunda in the East Indies.

CRACOVIA, or CRACOW, a palatinate of Poland, bounded on the N. by Siradia, on the S. by Hungary; and on the W. by Silesia. The principal towns are Cracow, and Landscom.

CRACOW, or CRACKOW, situated in the above-mentioned palatinate, was built by Cracus I. king of Poland, and was formerly the capital where the kings were elected and crowned.

CRADLE, a well-known machine in which infants are rocked to sleep. It denotes also that part of the stock of a cross-bow where the bullet is put.

CRADLE, in surgery, a case in which a broken leg is laid after being set.

CRADLE, among shipwrights, a timber frame made along the outside of a ship by the bilge, for the convenience of launching her with ease and safety. See Plate XLVII. fig. 16.

CRAFT, in the sea-language, signifies all manner of nets, lines, hooks, &c. used in fishing. Hence all such little vessels, as ketches, hoys, and smacks, &c. used in the fishing trade, are called small craft.

CRALIOVA VELIKA, a town of Sclavonia, 52 miles E. of Carlsstadt.

CRAMBE, SEA CABBAGE, SEA BEACH KALE, or SEA COLEWORT, in botany, a genus of the siliquosa order, and tetradynamia class of plants; natural order, siliquosæ. Filaments, the four longer forked at top, with one anthera at the end of each; the fruit a dry, globose, and deciduous berry. There are six species, all

all herbaceous esculents with perennial roots, producing annually large leaves resembling those of cabbage spreading on the ground, with strong flower-stalks and yellowish flowers.

CRAMP, in medicine, a convulsive contraction of a muscular part of the body, being either natural, as in convulsive constitutions, or accidental, from living in cold places, under ground, &c. It affects all parts indifferently, but the ham, calves, feet, and toes, oftener than the arms and hands: it is seldom mortal, though its returns are often quick, and continuance long, with great pain and distension of some vessels, as appears from the knots and ganglions it occasions. If it be natural, observe the cure as in an epilepsy or convulsions; if accidental, it is removed by rubbing the part affected. To prevent the cramp in the calves of the legs, stretch out the heel as far as possible, at the same time drawing up the toes towards the body.

CRAMP FISH, or **TORPEDO**. See **RAJA**.

CRAMPONEE, in heraldry, an epithet given to a cross which has at each end a cramp or square piece coming from it; that from the arm in chief towards the sinister angle, that from the arm on that side downwards, that from the arm in base towards the dexter side, and from the dexter arm upwards.

CRAN-BERRY. See **VACCINIUM**.

CRANBERRY, in geography, a thriving town of New Jersey, in Middlesex county, 16 miles S. S. W. of Brunswick.

CRANBERRY ISLANDS, two islands of the United States. on the coast of the district of Maine.

CRANBOURN, or **CRANBURN**, a town of Dorsetshire, on the borders of Hampshire.

CRANBROOK, a town in Kent, 13 miles S. of Maidstone, and 52 S. E. of London.

CRANE, in ornithology. See **ARDEA**.

CRANE, in mechanics. See **MECHANICS**, (Art. 19.)

CRANGANORE, a town of Hindostan on the coast of Malabar, 58 miles S. S. W. of Calicut.

CRANICHIS, in botany, a genus of the gynandria diandria class and order. Natural order orchideæ. Nectary galeated. There are five species, all natives of Jamaica.

CRANIOLARIA, in botany, a genus of the didynamia angiospermia class and order. Natural order Personatæ. Calyx double of the flower; perianth four-leaved; spathe one-leaved; corolla tube very long. One species, viz. *C. annua*, found in the neighbourhood of Carthage in New Spain.

CRANIUM. See **ANATOMY**. The word comes from the Greek *κράνιον*, of *κράνιον*, *galea*, a helmet; because it serves to defend the brain like a head-piece.

CRANK, a contrivance in machines, in manner of an elbow, only of a square form, projecting from a spindle, and serving by its rotation to raise and fall the pistons of engines.

CRANK likewise denotes the iron support for a lantern, and also the iron made fast to a stock of a bell for ringing it. In the sea-language, a ship is said to be crank-sided when she can bear but small sail, for fear of oversetting; and when a ship cannot be brought on the ground without danger, she is said to be crank by the ground.

CRANMER, THOMAS, a celebrated archbishop, reformer, and martyr, was the son of Thomas Cranmer, Esq. of Aslacton in Nottinghamshire, where he was born in 1489. At the age of 14, he was admitted a student of Jesus' College, Cambridge, of which he afterwards became fellow; but marrying the relation of an inn-keeper's wife, he lost his fellowship and quitted the college. On the death of his wife, he was readmitted fellow of Jesus' college. In 1523, he took the degree of D. D. and was made theological lecturer and examiner. The plague being at Cambridge, he retired to the house of a relation at Waltham Abbey, where meeting with Fox the king's almoner, and Gardener the secretary, he gave his opinion concerning the king's marriage with Catherine much to the satisfaction of Henry. This opinion was, that instead of disputing about the validity of the king's marriage with Catharine, they should reduce the matter to this simple question, "Whether a man may marry his brother's wife or not?" When the king was told of it, he said, "This fellow has got the right sow by the ear." He then sent for him to court, made him one of his chaplains, and ordered him to write in vindication of the divorce in agitation. This book having quieted the king's tender conscience, he was desirous that all Europe should be convinced of the illegality of his marriage with Queen Catharine; and for that purpose

sent Cranmer to France, Italy, and Germany, to dispute the matter with the divines of those countries. At Nuremberg Cranmer married a second wife. Being returned to England, in March 1533, he was consecrated Abp. of Canterbury; in May following he pronounced the sentence of divorce between the king and queen; and soon after married the amorous monarch to Anna Boleyn. Being now at the head of the church, he exerted himself in the business of the Reformation. The Bible was translated into English, and monasteries were dissolved principally by his means. In 1536, the royal conscience again requiring his assistance, he divorced the king from Anna Boleyn. In 1537, he visited his diocese, and endeavoured to abolish the superstitious observation of holidays. In 1539, he and some of the bishops fell under the king's displeasure, because they would not give their consent in parliament that the monasteries should be suppressed for the king's sole use. He also strenuously opposed the act for the six articles in the house of lords, speaking three days against it: and upon its passing, sent away his wife into Germany. In 1540, he was one of the commissioners for inspecting into matters of religion, and explaining some of its chief doctrines. The result of their commission was the book intitled "A necessary Erudition of any Christian man. After Lord Cromwell's death, (in whose behalf he had written to the king,) he retired and lived in great privacy, not meddling with state affairs. In 1541, he gave orders for taking away superstitious shrines; and, exchanging Bishopsbourn for Bekebourn, united the latter to his diocese. In 1542, he procured the "Act for the Advancement of true Religion, and the Abolishment of the Contrary," which moderated the rigour of the six articles. The king continued afterwards to protect him from his enemies; and at his death appointed him one of the executors of his will, and one of the regents of the kingdom. In 1546, he crowned Edward VI. during whose short reign he promoted the reformation to the utmost of his power; and was particularly instrumental in composing, correcting, and establishing the liturgy by act of parliament. He had also a share in compiling the 39 articles. In 1553, he opposed the settlement of the crown upon Lady Jane Gray, though at last, through importunity, he was prevailed upon to set his hand to it. Upon Queen Mary's accession, he was committed to the tower; partly for setting his hand to the instrument of Lady Jane's succession, and partly for the public offer he had made of justifying openly the religious proceedings of the late king. Some of his friends, foreseeing the storm that was likely to fall upon him, advised him to fly, but he refused. In the ensuing parliament, Nov. 3, he was attainted, and at Guildhall found guilty of high treason; whereupon the fruits of his archbishopric were sequestered. In April, 1554, he with Ridley and Latimer were removed to Oxford, for a public disputation with the Papists; which was held there towards the middle of the month, with great noise, triumph, and impudent confidence on the Papists side, and with as much gravity, learning, modesty, and convincing sufficiency, on the side of the Protestant bishops. The 20th of April, two days after the end of these disputations, Cranmer and the two others were brought before the commissioners, and asked, whether they would subscribe (to Popery): which they unanimously refusing, were condemned as heretics. From this sentence the archbishop appealed to the just judgement of the Almighty, and wrote to the council giving them an account of the disputation, and desiring the queen's pardon for his treason, which it seems was not yet remitted. By the convocation which met this year, his Defence of the true and Catholic Doctrine of the Sacrament of the Body and Blood of our Saviour Christ, was ordered to be burnt. Some of his friends petitioned the queen in his behalf; putting her in mind how he had once preserved her in her father's time, by his earnest intercessions with him for her. All solicitations, however, were ineffectual; and the archbishop being degraded, and most ignominiously treated, was at last flattered and terrified into an insincere recantation and renunciation of the Protestant faith. But this triumph was not sufficient to gratify the pious vengeance of the Romish Mary. On the 24th of Feb. 1556, a writ was signed for the burning of Cranmer; and on the 24th of March, which was the fatal day, he was brought to St. Mary's church, Cambridge, and placed on a kind of stage over against the pulpit, where Dr. Cole was appointed to preach a sermon on the occasion. While Cole was haranguing, Cranmer expressed great inward confusion; often lifting up his hands and eyes to heaven, and frequently shedding tears. At the end of the sermon, when Cole desired him to make

an open profession of his faith, as he had promised him he would, he first prayed in the most fervent manner; then made an exhortation to the people present, not to set their minds upon the world, to love each other, and to be charitable. After this he made a confession of his faith, beginning with the creed, and concluding with these words: "And I believe every word and sentence taught by our Saviour Jesus Christ, his apostles, and prophets, in the Old and New Testament. And now (added he) I come to the great thing, that so much troubleth my conscience more than any thing I ever did, or said, in my whole life; and that is the setting abroad a writing contrary to the truth, which I here now renounce, as things written with my hand contrary to the truth which I thought in my heart; and written for fear of death, and to save my life if it might be: that is, all such bills and papers which I have written, or signed with my hand since my degradation, wherein I have written many things untrue. And forasmuch as my hand offended, writing contrary to my heart, my hand shall first be punished; for, may I come to the fire, it shall be first burned. As for the pope, I refuse him, as Christ's enemy and antichrist, with all his false doctrine. And as for the sacrament, I believe as I have taught in my book against the Bishop of Winchester." Thunder-struck with this unexpected declaration, the enraged Popish crowd admonished him not to dissemble. "Ah! (replied he) since I lived hitherto, I have been a hater of falsehood, and a lover of simplicity, and never before this time have I dissembled." Whereupon they pulled him off the stage with the utmost fury, and hurried him to the place of his martyrdom over against Balliol College; where he put off his clothes in haste, and standing in his shirt, and without shoes, was fastened with a chain to the stake. Some pressing him to agree to his former recantation, he answered, shewing his hand, "This is the hand that wrote it, and therefore it shall first suffer punishment." Fire being applied to him, he stretched out his right hand into the flame, and held it there unmoved (except that once with it he wiped his face) till it was consumed; crying with a loud voice, "This hand hath offended; and often repeating, "This unworthy right hand." At last, the fire getting up, he soon expired, never stirring or crying out; only keeping his eyes fixed to heaven, and repeating more than once, "Lord Jesus, receive my spirit." Such was the end of the renowned Thomas Cranmer, in the 67th year of his age. Abp. Cranmer wrote a great number of books: many of them he published himself; and many of them still remain in MS. viz. two folio volumes in the king's library, several letters in the Cottonian Library, &c.

CRANNY, in glass-making, an iron instrument wherewith the necks of glasses are formed.

CRANSAC, a town of France, in the department of Aveiron, 15 miles N. W. of Rhodés.

CRANTARA, among the ancient Britons, was a sort of military signal used for collecting the distant and scattered warriors to the standard of their chief.

CRAON, a town of France, in the department and late province of Maine.

CRANZIA, in botany, a genus of the pentandria monogynia class and order. Calyx five-parted; petals five; nectary none; capsule, berried. There is but one species, viz. *C. aculeata*, a prickly shrub; native of the East Indies.

CRAPE, in commerce, a kind of stuff made in the manner of gauze, with raw silk, gummed and twisted on the mill.

CRASIS, [*κράσις*,] temperature; constitution arising from the various properties of humours.

CRASIS, in grammar. See **SYNÆRESIS**.

CRASPEDIA, a genus of the class and order syngenesia polygamia segregata. Calyx imbricate; florets in depressed bundles; down feathered; receptacle chaffy. There is one species, a native of New Zealand.

CRASSULA, **LESSER ORFINE**, in botany, a genus of the pentandria pentagynia class and order. Natural order Succulentæ. Calyx one-leaved, five-cleft; petals five; nectareous scales five at the base of the germ; capsule five, many-seeded. There are sixty-four species.

CRASSUS, **M. LICINIUS**, a celebrated Roman, surnamed the Rich on account of his opulence. At first he was very circumscribed in his circumstances, but by educating slaves, and selling them at a high price, he soon enriched himself. When the Gladiators with Spartacus at their head had spread an universal alarm

in Italy and defeated some of the Roman generals, Crassus was sent against them. A battle was fought, in which Crassus slaughtered 12,000 of the slaves, put an end to the war, and was honoured with an ovation at his return. He was soon after made consul with Pompey, A. U. C. 682, and in this high office he displayed his opulence, by entertaining the populace at 10,000 tables. He was afterwards Censor, and formed the first triumvirate with Pompey and Cæsar. As his love of riches was more predominant than that of glory, Crassus never imitated the ambitious conduct of his colleagues, but was satisfied with the province of Syria, which promised an inexhaustible source of wealth. With hopes of enlarging his possessions he set off from Rome, though the omens proved unfavourable, and every thing seemed to threaten his ruin. He crossed the Euphrates, and hastened to make himself master of Parthia. He was betrayed in his march by the delay of Artavasdes, king of Armenia, and the perfidy of Ariamnes. He was met in a large plain by Surena the Parthian general, and a battle was fought in which 20,000 Romans were killed and 10,000 taken prisoners. The darkness of the night favoured the escape of the rest; and Crassus, forced by the mutiny and turbulence of his soldiers, and the treachery of his guides, trusted himself to the general of the enemy on pretence of proposing terms of accommodation. However his head was cut off and sent to Orodes, who poured melted gold down his throat. He has been called avaricious, yet he shewed himself always ready to lend money to his friends without interest. He was fond of philosophy, and his knowledge of history was great and extensive.

CRATEGUS, **WILD-SERVICE TREE**, **HAWTHORN**, &c.: A genus of the digynia order, and icosandria class of plants; natural order, Pomaceæ. Calyx quinquefid; petals five; berry inferior, two-seeded. Twenty species, three of the tree and shrub kind, hardy and deciduous. Those most valuable for economical and ornamental purposes in gardening are the following:

C. OXYCANTHUS, **THE HAWTHORN**, or **WHITE THORN**, grows naturally all over Europe. In the state in which we usually see it, it is nothing better than a tall, uncouth, irregular shrub; but trained up as a standard, it swells to a large timber size, with a tall stem and a full spreading head. The standard hawthorn, whether we view its flowers in the spring, its foliage in the summer, or its fruit in the autumn and winter, is one of the most ornamental plants standing singly, that can be scattered over a park or lawn. This shrub is very useful for making fences. See **HEDGES**. To propagate a quantity of quick, one method is generally practised, viz. first burying the haws, and taking them up to sow the October following; though Hanbury thinks it preferable to prepare the beds, and sow the haws soon after they are gathered. Whoever pursues the former method, having gathered what quantity of haws will answer his purpose, should, in some bye-corner of the kitchen garden or nursery dig a hole or pit capacious enough to receive them; some of the earth which came out of the hole, after the haws are put in it, should be laid upon them; and being thus carefully covered they may remain there till October. Then, having ground well dug, and cleared of the roots of all troublesome weeds, and the mould being fit for working, the beds should be made for the haws. Four feet is a very good width for these beds, as they may be easily reached over to be weeded; and if the alleys between be each one foot and a half wide, they will be of a good size. The beds being marked out with a line, sufficient mould must be raked out to cover the haws an inch and an half deep. This being done, and the bottom of the beds being made level and even, the haws should be sown, and afterwards gently tapped down with the back of the spade; and then the fine mould, which had been raked out of the beds, must be thrown over them, covering them an inch and a half deep. In the spring the plants will come up, and in the summer following should be kept clear of weeds; though it sometimes happens, that few of them will appear till the second spring after sowing. Sometimes the young plants are planted out from the seed-beds at one, two, or three years old; but the best plants are obtained by transplanting them into fresh mould the first or second year, letting them remain in the nursery two or three years longer. Of this species there are the following varieties: the large scarlet, the yellow, the white, the maple-leaved, and the double blossomed hawthorns; and the Glastonbury thorn. The scarlet hawthorn is exceedingly large, oblong,

oblong, perfectly smooth, and of a bright scarlet. The yellow haw is a most exquisite plant. The buds are of a fine yellow, and the fruit is of the colour of gold. The tree retains its fruit all winter. It was originally brought from Virginia, is greatly admired, and no collection of hardy trees should be without it. White hawthorn hardly ever grows to the height of the common hawthorn, and the fruit is small. Maple-leaved hawthorn grows to near 20 feet high, and has very few thorns. The leaves are large, resemble those of the maple, and are of a whitish green. The flowers are produced in large bunches in June, and are succeeded by remarkable fruit, of a shining red, which looks beautiful in winter. Double-blossomed hawthorn produces a full flower, and is one of the sweetest ornaments in the spring. These beautiful double flowers come out in large bunches in May, and the tree often appears covered with them. Glastonbury thorn differs in no respect from the common hawthorn, except that it sometimes flowers in winter. It is said to have been originally the staff of Joseph of Arimathea, who, according to tradition, attended by 11 companions, came over into Britain, and founded the first Christian church in this isle. As a proof of his mission, he is said to have stuck his staff into the ground, which immediately shot forth and bloomed. This tree is pretended to have blossomed on Christmas day ever since; but Hanbury says, in fine seasons they will sometimes be in blow before Christmas, sometimes they afford their blossoms in February, and sometimes it so happens that they will be out so early as Christmas day.

CRATCHES, in the manege, a swelling on the pastern, under the fetlock, and sometimes under the hoof; for which reason it is distinguished into the sinew cratches, which affect the sinew, and those upon the coronet, called quitter-bones.

CRATER, the cup, a constellation in the southern hemisphere, consisting in Mr. Flamsteed's catalogue of 11 stars. See **ASTRONOMY**.

CRATER, in natural history, the mouth of a volcano. See **VOLCANO**.

CRATES, a famous philosopher of Thebes: a disciple of Diogenes the Cynic. It is said that he threw all his money into the sea, that he might the more freely apply himself to the study of philosophy. Others assert that he placed it in another person's hands, with orders to give it to his children if they should happen to be fools: For (said Crates), if they should be philosophers, they will have no need of it; in which case it was to be given to the people. He flourished about B. C. 328.

CRATEVA, the **GARLIC PEAR**, a genus of the monogynia order, and dodecandria class of plants; natural order, Putamineæ. Corolla three-petaled; calyx five-cleft; berry one-celled, many-seeded. There are five species, natives of both the Indies; trees chiefly distinguished by their fruit.

CRATO, a small town of Portugal, in Alentejo, 10 miles W. of Port-alegre.

CRAVAN, or **CRAVANT**, a town of France, in the department of Yonne, nine miles S. E. of Auxerre.

CRAVEN, in geography, a district in Yorkshire, about the source of the river Aire.

CRIVEN, a county in Newbern district, N. Carolina.

CRAX, in ornithology, the **CRASSOU**, a genus of birds, of the order gallinæ. Generic character: Bill strong, convex, and thick, the base of each mandible covered with a cere; nostrils small, fixed in the cere, feathers which cover the head often curling at the ends: tail large and straight. Five species are enumerated.

C. ALECTOR, the **PEACOCK PHEASANT** of Guiana. It abounds in Brazil, and the warm parts of America. It is about the size of a small turkey, and is black, with a white belly. A yellow wax covers about one-half of each mandible; the tongue is entire; the temples are bare and black. These birds are very common at Guiana; and are called powese by the natives from their cry, which is somewhat similar; are pretty numerous in the woods, and make no small part of the food of the planters, who are supplied by the Indian hunters; and their flesh is reckoned as delicate as that of a turkey. They are easily brought up tame. See Plate XXXVIII.

C. RUBRA, the **PERUVIAN-HEN**, is red, with a bluish head. These birds are natives of Mexico and Peru. They feed on fruits, and perch on trees: the flesh is white; and esteemed good food. They are frequently kept tame in our menageries in England, and readily mix with other poultry, feeding on bread and

grain; but they are not able to bear the dampness of our meadows, which makes their toes rot off.

CRAYER, **CASPER DE**, an eminent painter, born at Antwerp in 1535. He was a disciple of Raphael Coxis, whose father had studied under Raphael; but he soon far surpassed his master, and formed for himself a manner that was exceedingly pleasing. The first work which established him in the favour of the court at Brussels, was a portrait of Cardinal Ferdinand, brother to the king of Spain, which he painted at full length, and as large as life. In that picture he succeeded so happily, that the king sent him a gold chain with a medal, and an appointment for a considerable pension. But nothing places the talents of Crayer in a stronger light, than the testimony of Rubens, who went to Antwerp on purpose to visit him, and after examining attentively his picture of the Centurion, in the abbey of Afflegheem, he declared that no painter could surpass Crayer. Nor was he less distinguished by Vandyck. He had not so much fire in his compositions as Rubens, but his design is frequently more correct. His compositions generally consisted of a small number of figures; and he avoided the encumbering of his subject with any thing that did not contribute to its elegance or probability. There is a remarkable variety in his draperies, and an equal degree of simplicity in their folds; and his colouring is admirable. He was accounted to approach nearest to Vandyck, not only in history but in portrait. He principally painted religious subjects, and though he lived to a great age, yet to the last month of his life, he retained the same force and freedom which he possessed in his most vigorous time.

CRAYON, [*crayon*, French,] a general name for all coloured stones, earths, or other minerals and substances, used in designing or painting in pastel: whether they have been beaten and reduced to a paste, or are used in their primitive consistence, after sawing or cutting them into long narrow slips. In this last manner are red crayons made, of blood-stone or red chalk; black ones, of charcoal and black-lead. Crayons of all other colours are compositions of earths reduced to paste.

CRAYON-PAINTING. See **PAINTING**.

CRAZE-MILL, or **CRAZING-MILL**, a mill in all respects like a grist-mill to grind corn, and so called by the tin-miners, who use it to grind their tin, which remains too great after trampling.

CREAM, [*cremor*, Latin,] a general name applicable to all substances that separate from a liquor, and are collected upon its surface.

CREAM, **CORSTORPHINE**, a very agreeable preparation of milk, slightly acidulated, for which the village of Corstorphine has been famous for centuries past. The Rev. Mr. Oliver says "the most approved process" for making it "is very simple, and is as follows: They put the milk, when fresh drawn, into a barrel, which is submitted to a certain degree of heat, generally by immersion in warm water. This accelerates the stage of fermentation; the serous is separated from the other parts of the milk, the oleaginous and coagulable; the serum is drawn off by a hose in the lower part of the vessel; what remains is put into the plunge churn, and after being agitated for some time is sent to market."

CREAM OF MILK, the most oily part, which being naturally only mixed, and not dissolved in the rest, soon separates, being specifically lighter; after which it collects on the surface; from which it is generally skimmed, to complete the disengagement of the oily from the caseous and serous parts. Cream is an agreeable and very nourishing article of food, when fresh; but too fat and difficult to be digested by persons of a sedentary life, or possessed of a weak stomach. It is nevertheless of considerable service in medicine, as a lenient (though palliative) application to tetter and erysipelas, which are attended with pain, and proceed from acrid humours.

CREAM, A METHOD OF PRESERVING. Take 12 ounces of white sugar, and dissolve them in the smallest possible quantity of water, over a moderate fire. After the solution has taken place, the sugar ought to be boiled for about two minutes in an earthen vessel; when 12 ounces of new cream should be immediately added, and the whole uniformly mixed, while hot. Let it then gradually cool, and pour it into a bottle, which must be carefully corked. If kept in a cool place, and not exposed to the air, it may be preserved in a sweet state for several weeks, and even months.

CREAM OF TARTAR, is the crystals of tartar pulverised. It is a supertartrate of potash well known as a mild purgative, and of late years has been employed largely with advantage in dropsies.

CREATION,

CREATION, [*creatio*, from *creo*, Lat.] in its primary import, signifies the bringing into being something which did not before exist. The term is therefore most generally applied to the original productions of the materials whereof the visible world is composed. It is also used in a secondary or subordinate sense, to denote those subsequent operations of the Deity upon the matter so produced, by which the whole system of nature, and all the primitive genera of things, received their form, qualities, and laws. There are few subjects, concerning which there have been more disputes than this. It is certain that many of the ancient philosophers had no idea of its being possible to produce a substance out of nothing, or that even the power of the Deity himself could work without any materials to work upon. Hence some of them, particularly Aristotle, asserted that the world was eternal, both as to its matter and form. Others, though they believed that the gods had given the world its form, yet imagined the materials whereof it is composed to have been eternal. Indeed the opinions of the ancients, who had not had the benefit of revelation, were on this head so confused and contradictory, that nothing of any consequence can be deduced from them. The freethinkers of the present and former ages have denied the possibility of creation, as being a contradiction to reason; and of consequence have taken the opportunity from thence to discredit revelation. On the other hand, many defenders of the sacred writings have asserted, that creation out of nothing, so far from being a contradiction to reason, is not only probable, but demonstrably certain. Nay, some have argued, that from the very inspection of the visible system of nature, we are able to infer, that it was once in a state of non-existence. It would be impossible for us, however, to enter into the multiplicity of arguments used on both sides; nor can we pretend to settle it on the ground of human reason, since the subject is confessedly above human comprehension. But one thing appears to be certain, that, as we have no ideas but what we receive from our senses, and as no man ever saw any thing created out of nothing, so the idea of such a creation never could have entered into the mind of man, if it had not been at first revealed to the first pair, by the Creator himself, and afterwards communicated by tradition to their posterity. Hence the Christian may draw a decisive argument in favour of the divine origin of that system of religion, which first promulgated this doctrine. No person who believes in the existence of one infinite, omnipotent, and omniscient, Deity, can doubt, that, all other beings whatsoever are his creatures. Men and other animals that inhabit the earth, the air, and the waters; all the immense varieties of herbs and plants of which the vegetable kingdom consists; the globe of the earth, and the expanse of the heavens; these we know to have been produced by his power. Besides the terrestrial world which we inhabit, we see many other material bodies disposed around it in the wide extent of space. The moon, which is in a particular manner connected with our earth, and even dependent upon it; the sun, and the other planets with their satellites, which, like the earth, circulate round the sun, and appear to derive from him light and heat; those bodies which we call fixed stars, and consider as illuminating and cherishing with heat each its peculiar system of planets; and the comets which at certain periods surprise us with their appearance, and whose connection with the general system of nature, or with any particular system of planets, we know very little about. See ASTRONOMY. These are so many more of the Deity's works, from the contemplation of which we cannot but conceive the most awful ideas of his infinite creative power. Matter, however, whatever the varieties of form under which it is made to appear, the relative disposition of its parts, or the motions communicated to it, is but an inferior part of the works of creation. We ourselves are animated with a much higher principle than brute matter; in viewing the manners and economy of the lower animals, we can scarce avoid acknowledging even them to consist of something more than mere modifications of matter and motion. The other planetary bodies which seem to be in circumstances nearly analogous to those of our earth, are doubtless, as well as it, destined for the habitations of rational, intelligent beings. The existence of created intelligences of a higher order than man, appears extremely probable.—Of those spiritual beings called Angels we have express intimation in scripture, (See ANGELS.) Such are our notions concerning the existence of beings essentially distinct from matter, and in their nature far superior to it: these are the creatures of the Deity. But the limits of creation we cannot pretend

to define. How far the regions of space are filled, we know not. How the planetary worlds, the sun and the fixed stars, are occupied, we cannot ascertain. We are even ignorant how wide a diversity of forms, what an immense number of animated beings, inhabit our own globe. So confined is our knowledge of creation; yet so grand, so awful, that part which our limited understandings can comprehend! At what periods of time the Deity executed his several works of creation mankind have no particular information. From viewing the phenomena of nature, and considering the general laws by which they are regulated, we cannot draw any conclusive, or even plausible inference, with respect to the precise time at which the universe began to exist. We know not, whether the different systems of planets circulating round our sun and the other fixed stars, were all created at once, or at different periods. We cannot even determine, from any thing that appears on the face of nature, whether our earth was not created at a later period than any of her fellow planets which revolve round the same sun. Astronomers are, from time to time, making new discoveries in the heavens; and it is impossible to say whether some of these successive discoveries may not be owing to successive creations. Philosophers have, indeed, formed some curious conjectures concerning the antiquity of the earth, from the appearances of its surface, and from the nature and disposition of its interior strata. The beds of lava in the neighbourhood of volcanoes have afforded ground for some calculations, which, though they do not fix the period of the earth's origin, are yet thought to prove that period to have been much more remote than the earliest age of sacred or profane history. In the neighbourhood of mount *Ætna*, or on the sides of that extensive mountain, there are beds of lava covered over with a considerable thickness of earth; and another, which, though known from ancient monuments and historical records to have issued from the volcano at least 2000 years ago, is still almost entirely destitute of soil and vegetation: In one place a pit has been cut through seven different strata of lava; and these have been found separated from each other by almost as many thick beds of rich earth. Now, from the fact, that a stratum of lava 2000 years old is yet scantily covered with earth, it has been inferred by the ingenious canon *Rebupero*, who has laboured thirty years on the natural history of mount *Ætna*, that the lowest of these strata, which have been found divided by so many beds of earth, must have been emitted from the volcanic crater at least 14,000 years ago; and consequently that the age of the earth, whatever it may exceed this term of years, cannot possibly be less. Other facts of a similar nature concur to favour this conjecture. But all these facts are as nothing in comparison with the long series which would be requisite to establish such a conjecture as an incontrovertible truth. And, besides, any evidence, which they can be supposed to afford, may be very easily explained. The bed of lava, which in the course of 2000 years has scarcely acquired a covering of earth, is confessed to stand in a situation in which it is exposed to the spray of the sea, and to all the violence of the winds and rains. In such a situation, it cannot be thought that a thick bed of earth could, in any length of time, be formed on it: we might as well expect depth of soil and vigorous vegetation on the craggy cliffs of hills. In crevices here and there over it, in which the earth has been retained, there is a depth of soil which supports large trees. The fact, therefore, admits of no such inference as that which *Recupero* has deduced from it. The local circumstances, again, of the seven strata that have been pierced through, are very different. They are situated at *Jaci Reale*, in a situation where showers of ashes from the volcano must frequently fall; and where whatever falls must be naturally retained and accumulated: so that seven beds of earth might be formed on these seven strata of lava, much sooner than one thin layer could be formed on the stratum above mentioned. In other places, some of which are within the influence of the same awful volcano, and some adjacent to that of *Vesuvius*, soil is known to have accumulated on lava, with the help of showers of ashes from the volcanoes, with sufficient rapidity to justify this supposition concerning the coverings of the strata at *Jaci Reale*. From the observation of these phenomena of volcanoes, therefore, no facts have been gained, that can help us to determine with any certainty the earth's age. And so wide is the variety of circumstances to be here taken into the account, that it cannot be hoped that this desideratum will be ever supplied from this quarter. But, by examining the composition and arrangement of the interior strata of the globe, and by viewing the general appearance

appearance of its surface, philosophers have endeavoured to guess at the length of time during which it must have existed. Observing the exuviae of sea and land animals deposited at profound depths under ground, and accompanied with vegetable bodies in a good state of preservation, as well as with oleaginous and bituminous substances which have in all probability been formed from vegetable bodies; and remarking at the same time with what confusion the other materials, composing the crust of this terrestrial ball, are, in various instances, not arranged, but cast together; they have concluded that the earth must have existed for many an age before the earliest events recorded in sacred or profane history, and must have undergone many a revolution before it settled in its present state. Such at least are the ideas which the Count de Buffon, M. de Luc, and Dr. Hutton, have communicated concerning its changes and antiquity. It is but justice to these philosophers to acknowledge, that they have collected, with amazing industry, almost every fact in the natural history of the earth that can serve to give plausibility to their conjectures. But still their facts, besides the inconsistency of many of them, are by far too scanty to warrant the conclusions which they have deduced from them. See EARTH. Profane history is far from being decisive concerning the age of the world; nor is it to be expected that it should. When the earth first arose into existence, mankind were not spectators of the event: and we may naturally imagine that the first human beings who occupied it, would be too much busied in furnishing themselves with the immediate necessities and the conveniences of life, to think of curious researches into its origin, or even their own. Profane history is not, however, without accounts of the age of the earth, and the origin of human society; but these accounts are various and contradictory. Plato, in his *Critias*, mentions his Atlantis to have been buried in the ocean about 9000 years before the age in which he wrote. He asserts it to have been well known to the Egyptian priests, and to the contemporary inhabitants of Attica. But the learned world generally agree in regarding his accounts of that island as a fiction, which the author himself did not design to be understood in any other light. The Chinese represent the world as some hundreds of thousands of years older: and we are also told that the astronomical records of the ancient Chaldeans carried back the origin of society to a very remote period; no less than 473,000 years. The Egyptian priests reckoned between Menes and Sethon 341 generations. But these accounts are so discordant, and so slenderly supported by evidence, that we cannot hesitate to reject them as false; the fables of historians scarce merit so much attention as the hypotheses of philosophers. From sacred history, we may reasonably expect more accurate information concerning the antiquity of the globe. As the authenticity of the Holy Scriptures is incontrovertibly established, wherever they afford evidence concerning any fact, that evidence must be regarded as decisive. A fact so important as the present may be thought highly worthy of a place in them; but it should be remembered, that they have a much higher object in view than the adjusting of chronology; viz. the eternal felicity of mankind. It is evidently but a secondary object of the Scriptures to hint at the era of creation. We need not, therefore, be surprised that they do not fix it with accuracy; or that they leave us at a loss whether to extend what they say concerning that era to the whole contents of created space, or to confine it to our earth and its inhabitants; much less need we be surprised, that among the numerous copies made out of them, different dates should be found in different versions. The Hebrew copy of the bible, which Christians consider as the most authentic, dates the creation 3944 years before the Christian era. The Samaritan bible, again, fixes the era of the creation 4305 years before the birth of Christ. And the Greek translation, known by the name of the Septuagint version of the bible, gives 5270 as the number of the years, which intervened between those two periods. By comparing the various dates in the sacred writings, examining how these have come to disagree and to be diversified in different copies, endeavouring to reconcile the most authentic profane with sacred chronology, some ingenious men have formed very plausible schemes of chronology. Ussher makes out from the Hebrew bible 4004 years, as the term between the creation and the vulgar era of the birth of Christ: Josephus, according to Dr. Wills and Mr. Whiston, makes it 4658 years; but the Rev. William Hales, D.D. in his "Rectification of the Chronology of Josephus," with great ingenuity and learning, demonstrates it to be 5411 years. M.

Pezron, with the help of the Septuagint, extends it to 5872 years. Ussher's system is the most generally received; and, in our opinion, is the best that has hitherto been given. But though these different systems of chronology disagree, yet the differences among them are so inconsiderable, when compared with those which we find in the chronologies of the Chinese, the Chaldeans, and the Egyptians, and they agree so well with the general information of authentic history, and with the appearances of nature and of society, that they may be considered as nearly fixing the true period of the creation of the earth. See CHRONOLOGY. Some difficulties occur in comparing the above account of the creation, with the laws which appear at present to regulate the system of nature. It seems hard to conceive how the earth, while yet a stranger to the influence of the sun, could experience the vicissitude of day and night. The condition of matter when the earth was without form and void, and the operation of the Spirit of God on the face of the waters, are equally mysterious. Some ingenious men have eagerly laboured to remove these difficulties. Among these is Dr. Burnet, who supposes all the celestial bodies, even the sun and all the other planets of the solar system, to have existed long before the earth. The chaos on which the Spirit of God moved, consisted, according to him, of the first principles from which all terrestrial bodies have been formed. When those laws, by which the material world is regulated, first began to operate on the mass, he supposes that its grosser and heavier parts would sink towards the centre, and there form a solid ball. Around this solid ball, two species of particles would still float together in confusion. Of these, he thinks one, being more volatile, would by degrees make its escape from the other, would leave it still recumbent on the solid centre, and spread around it in an atmosphere. The middle stratum he composes of aqueous and oleaginous fluids; and he makes no doubt, that after the air had made its escape, the levity of the oleaginous fluids would enable them to rise above the aqueous, and dispose themselves next the surface of the liquid mass. On them he supposes the impure atmosphere to have then deposited a quantity of terrene particles, sufficient to form, by intermixture with the oils, a thick crust of rich earth for the production of plants and herbage, and to afford an habitation to animals. This delicate shell he was careful not to furrow with seas, or load with mountains; either of these would have reduced all to confusion. Such is his earth; and after moulding it with so much ingenuity, and into so happy a form, he contents himself, without venturing to use the same freedoms with the remaining part of Moses's account of the creation. We need not attempt to refute so absurd a theory which has long been justly condemned as equally unsupported by scripture and philosophy. Mr. Whiston treats both the scriptures and the laws of nature with greater reverence; yet he certainly involves himself in no small difficulties in attempting to solve those of Moses. He supposes the sun, moon, and stars, to be all more ancient than the earth. The chaos from which the earth was formed, he represents as having been originally the atmosphere of a comet. The six days of the creation he would persuade us to be equal to six of our years: for he is of opinion that the earth did not revolve daily round its axis, but only annually round its orbit, till after the fall. On the first day or year, therefore, the more ponderous parts of the chaos were according to this theory conglomerated into an orb of earth, the chinks and interstices over that orb filled up with water, and the exterior part or atmosphere rarefied, so as to admit some faint glimmering of the rays of the sun. On the second day, the atmosphere was diffused to its due extent around the earth, and reduced to a degree of rarity and purity which rendered it still more suitable for the transmission of light; the earth was still more consolidated; and the waters, being almost entirely excluded from the interstices which they before occupied, were partly spread over the surface of the earth, and partly raised in vapour into the atmosphere or firmament. On the third day the earth's surface became so irregular, in one place rising into hills, in another sinking into vales, as to cause the waters, which were before equally diffused, to collect into seas and lakes, leaving large tracts of ground unoccupied. And no sooner was a part of the earth's surface left bare by the waters, than the general influence of the sun produced on it a rich covering of herbage, and all the different species of vegetables. On the fourth day, the earth was rendered subject to the regular influence of the sun, moon, and stars. On the fifth day, or year, things were so far advanced, that fishes and fowls were now produced from the waters. On the

sixth day the earth was furnished with animals; and the lord of all the other animals, man, was now created. Such is Mr. Whiston's account of the phenomena of the Mosaic creation. But he likewise assumes much more than can be reasonably granted. The atmosphere of a comet could not well be the primitive chaos; it is not an obscure, but a pellucid fluid; and its exterior strata, if of the same nature with the matter of our earth, must be scorified by its near approach to the sun. Had the earth not begun to move round its axis till after the work of creation was completed, the immoderate degrees of heat and cold which its different parts would have alternately felt, would in all probability have proved fatal to both plants and animals. No interpretation of Moses's words can represent him as informing us, that the sun and moon were created at different periods. Nor will philosophy permit us to imagine, that the moon was formed before the earth. And therefore we cannot agree with Mr. Whiston, that the creation of the earth was later than that of the other bodies of the solar system. M. de Luc, like Mr. Whiston, thinks that the days of the creation were much longer periods of time than our present days. He seems to think that the earth had existed long before the Mosaic creation; but began at that era to experience new changes, and to be regulated by new laws: that all the different events described by Moses in his history of the creation, actually took place in the order in which he relates them; but that Moses's days are indefinite spaces of time, which must have been very long, but of which we cannot hope to ascertain the precise length. These are ingenious conjectures; but they do not appear necessary, nor are they justified by history. What appears to us the most natural way of understanding Moses's account of the creation, is, that it was neither confined to the earth alone, nor extended to the whole universe. The relation which all the planets of the solar system bear to the same illuminating body countenances the conjecture, that they, together with the luminary by which they are enlightened, were all created at one period. On the supposition, that the whole solar system, at least, was created at once, which certainly does no violence to the narrative of Moses, the creation of the sun and the other planets may be understood to have been carried on at the same time with the creation of the earth. In that case, even in the course of the first day, though not longer than our present days, those bodies might be reduced to such order, and their relative motions so far established, as to begin the distinction between light and darkness, day and night. On the second day, we may naturally understand from Moses's narrative, that the atmosphere was purified, and the specific gravities of aqueous vapour and atmospheric air so adjusted, as to render the latter capable of supporting the former. On the third day the waters were first collected into lakes and seas; but in what manner, we cannot determine. Some call in the operation of earthquakes; others that of specific gravity, &c. But these are mere fancies; and we have not facts to offer in their stead. On the latter part of this day vegetables were caused to spring up over the earth. Their growth must have been much more rapid than we ever behold it now: but by what supernatural power that might be effected, we should in vain inquire. On the fourth day the sun, moon, and stars, were made to appear. But according to the conjecture which we have mentioned as plausible, those heavenly bodies may have been created before this day; though they had not till now begun to exert their full influence on the earth, as they have since continued to do. The creation of the inanimate world was now finished, and the earth prepared for the reception of animals. On the fifth day, therefore, were the living inhabitants of the air and the waters created. On the sixth day the inferior animals inhabiting the earth were first created; and after that, the whole work was crowned by the creation of a male and a female of the human species. To the account of the creation of the animals, nothing certain can be added in explanation of Moses's narrative. As only one pair of the human species were at first created, the same economy might possibly have been observed in the creation of the inferior animals. Though many philosophers, leaning too much on their own too often delusive reasonings, have endeavoured to bring into dispute the Mosaic account of the creation; yet, after all their bitter sarcasms and ingenious sophisms, none of them have yet been able to propose to the world any other system instead of it, which is at all plausible, or which would do any credit to the infinite intelligence, and eternal omniscience, of the Divine Being.

CREDENTIALS are particularly applied to letters of recom-

mendation and power, given to ambassadors or public ministers, by the prince or state that sends them to foreign courts.

CREDIBILITY, a species of evidence, less than absolute certainty or demonstration, but greater than mere possibility: it is nearly allied to probability, and seems to be a mean between possibility and demonstration.

CREDIT, in commerce, a mutual trust, or loan of merchandise, or money, on the reputation of the property or solvency of a dealer. Credit is either public or private. Every trader ought to possess some estate, stock, or portion, of his own property, sufficient to carry on the traffic in which he is engaged: his dealings should also never exceed his capital, so that no disappointment in his return may incapacitate him from supporting his credit. Yet traders of worth and judgement, may sometimes be obliged to borrow money, in order to carry on their business to the best advantage. We cannot, however, avoid observing, that the almost unlimited credit given to wholesale, as well as retail traders, is by no means a prudential, or even justifiable practice; for it not only tends to encourage the most shameful monopoly carried on, at present, with many articles, both of subsistence and convenience (for instance, those of bread-corn and paper); but here also we may discover the prolific source of those bankruptcies which swell every Tuesday's and Saturday's Gazette. The public national credit is said to run high, when the commodities of that nation are readily sold at a good price, and when dealers may be safely entrusted with them: also, when houses and lands meet with ready purchasers; money is borrowed at a low interest; and, lastly, when notes, mortgages, &c. will pass as currently as money. Private credit has no accurate scale, and depends entirely on the mutual confidence of the parties. When it is extended beyond a certain length, without proper controul (as is too frequently the case with families of a certain rank, or fashion,) we may safely predict, that the following generally are its concomitant effects, viz. inferior goods, higher charges, inaccurate calculations, and law-suits, which dissolve all future connection. The advantage of giving credit to men of large capitals is that they get higher prices, the difference between the money-price and the credit-price being greater than the legal interest of the money-price for the time. Hence it is a principle with some traders to give very long credit at proportionate prices. The advantage to purchasers of small capital is, that these credits are so much addition to their capital for the time. Some men of large property, but whose concerns admit of indefinite extension, will take all the credit they can get, either on pecuniary loans, or in purchases, being able to make a larger profit on any capital they can procure by either of these methods, than it costs them. They are exposed, however, 1. to the risk of having great demands made upon them when it may be inconvenient to satisfy them; and, 2. to the very common misfortune of forgetting how much of their capital belongs to other people: Dr. Franklin's observation being too true, that most men think their debt and their sins less than they really are. A person on whom credit is placed, and to whom it is advantageous, should be religiously punctual. Nothing will so much confirm his credit. He, however, is in a safer condition who can give credit without taking any; who sells on credit, but buys for money. And this should in general be the object of every young tradesman.

CREDIT is also used for the currency which papers or bills have in the public or among dealers. In this sense credit is said to rise, when, in negotiating the shares of the company, they are received and sold at prices above par, or the standard of their first creation. Discredit is opposed to credit, and is used where money, bills, &c. fall below par.

CREDIT was also anciently a right which lords had over their vassals; consisting in this, that during a certain time they might oblige them to lend them money. In this sense, the Duke of Brittany had credit during 15 days on his own subjects, and those of the Bishop of Nantes; and the bishop had the same credit or right among his subjects and those of that prince.

CREDIT, LETTERS OF, are those given to persons in whom a merchant, &c. can trust, to take money of his correspondent abroad, in case he happens to need it.

CREDITON, a town in Devonshire, which has a considerable woollen manufactory. It is situated 12 miles N. W. of Exeter.

CREECH, THOMAS, eminent for his translations of ancient authors both in prose and verse, was son of Thomas Creech, and born near Sherbourne in Dorsetshire, in 1659. He was educated under

under Mr. Carganven of Sherborne, and entered a commoner of Wadham college in Oxford, in 1675. He was accounted a good philosopher and poet, and a diligent student. In 1699, having taken holy orders, he was presented by his college to the living of Welwyn, in Herefordshire; but this he had not long enjoyed before he put an end to his own life. The author of the *Nouvelles de la Republique des Lettres* informs us, that in 1700, Mr. Creech fell in love with a woman, who treated him with great neglect, though she was complaisant enough to several others. This affront he could not bear, and resolved not to survive it. Wherefore he shut himself up in his study, where he hanged himself, about the end of June, 1700, and was found in that situation three days after. The Poetical Register ascribes this fatal catastrophe to the moroseness of his temper, which made him less esteemed than his great merit deserved, and engaged him in frequent animosities and disputes. But from an original letter of Arthur Charlett, preserved in the Bodleian library, it has been discovered, that this unhappy event was owing to a very different cause. There was a fellow collegian of whom Creech frequently borrowed money; but, repeating his applications too often, he met one day with such a cold reception, that he retired in a fit of gloomy disgust, and in three days was found hanging in his study. Creech's principal performances are, 1. A Translation of Lucretius. 2. A Translation of Horace; in which, however, he has omitted some odes. 3. The *Idylliums* of Theocritus, with Rapin's Discourse of Pastorals. 4. A Translation of Manilius's *Astronomicum*. Besides translations of several parts of Virgil, Ovid, and Plutarch; printed in different collections.

CREED, APOSTLES, a formula, or summary, of the Christian faith, drawn up, according to Rufinus, by the apostles themselves; who, during their stay at Jerusalem, soon after our Lord's ascension, agreed upon this creed, as a rule of faith. Baronius and others conjecture, that they did not compose it till the second year of Claudius, a little before their dispersion. As to their manner of composing it, some say, that each Apostle pronounced his article, which is the reason of its being called *symbolum Apostolicum*, it being made up of sentences jointly contributed, after the manner of persons paying each their club, (*symbolum*,) or share of a reckoning. But there are many reasons which induce us to question whether the apostles composed any such creed. For, 1st. Neither St. Luke, nor any other writer before the 5th century, make any mention of an assembly of the apostles for composing a creed. 2dly, The fathers of the three first centuries, in disputing against the heretics, endeavour to prove, that the doctrine contained in this creed was the same which the apostles taught; but they never pretend that the apostles composed it. 3dly, If the apostles had made this creed, it would have been the same in all churches, and in all ages; and all authors would have cited it after the same manner. But the case is quite otherwise. In the second and third ages of the church, there were as many creeds as authors, and the same author sets down the creed after a different manner in several places of his works; which is an evidence that there was not at that time any creed reputed to be the apostles. In the 4th century, Rufinus compares together the three ancient creeds of the churches of Aquileia, Rome, and the East, which differ very considerably. Besides, these creeds differed not only in the terms and expressions, but even in the articles, some of which were omitted in one or other of them; such as those of the descent into hell, the communion of the saints, and the life everlasting. From all which it may be gathered, that though this creed may be said to be that of the apostles, in regard to the doctrines contained therein, yet it cannot be referred to them as the authors of it. Its great antiquity, however, may be inferred from hence, that the whole form, as it now stands in the English liturgy, is to be found in the works of St. Ambrose and Rufinus; the former of whom flourished in the 3d, and the latter in the 4th century. The primitive Christians, did not publicly recite the creed, except at baptisms, which, unless in cases of necessity, were only at Easter and Whitsuntide. The constant repeating of it was not introduced into the church till the end of the 5th century; about which time Peter Gnapheus, bishop of Antioch, prescribed the recital of it every time divine service was performed.

CREED, ATHANASIAN, OF CREED; NICENE. See **ATHANASIAN** and **NICENE**. These two, with the Apostles Creed, are the most universal. They are used in the public offices of the church

of England; and subscription to them is required of the clergy, and of dissenting teachers properly qualified by the toleration act, as the 8th article declares that they may be proved by the surest testimonies of scripture.

CREE INDIANS, a nation of North Americans who inhabit W. of Winnipeg, around Fort Dauphin, in Upper Canada.

CREEK, a part of a haven, where any thing is landed from the sea. So many landing places as there are in a harbour or port, so many creeks there are. It is also said to be a shore or bank whereon the water beats, running in a small channel from any part of the sea; from the Latin *crepido*. This word is used in the stat. 4 Hen. IV. c. 20, and 5 Eliz. c. 5.

CREEK seems to be used, in the United States of America, in a sense different from those in the above definitions; being repeatedly applied by Messrs. Morse and Scott, in their *Gazetteers*, to small rivers, several of which it makes part of the names of.

CREEKS, confederated nations of North American Indians. They form a numerous tribe in Georgia.

CREEPER, in naval affairs, an instrument of iron resembling a grappling iron, having a shank, and four hooks or claws. It is used to throw into the bottom of any river or harbour, with a rope fastened to it, to hook and draw up any thing from the bottom which may have been lost. See Plate XXVII.

CREEPER, in ornithology. See **CERTHIA**.

CREEPING LEAF, in zoology. See **MANTIS**.

CREE-TOWN, a small sea-port of Scotland, in Kirkcudbrightshire.

CREGLINGEN, a town of Germany, in the circle of Franconia, and principality of Anspach, and 22 miles S. of Wurtzburgh.

CREICHGOW, a country of Germany, between Suabia and the Lower Palatinate.

CREIL, a town of France in the department of Oise, 5 miles N. W. of Senlis.

CREMA, a town of Italy, capital of Cremasco, now included in the department of Adda. It is situated 20 miles N. of Piacentia.

CREMASCO, a small territory of Italy, in the late Venetian territories, now included in the department of Adda. It is fertile in corn, wine, and flax.

CREMASTER, in anatomy, the name of two muscles of the testicles, of which there is one on each side.

CREMATION is particularly applied to the ancient custom of burning the dead. This custom is well known to have prevailed among most eastern nations, and continued with their descendants after they had peopled the different parts of Europe. It prevailed in Greece, Italy, Gaul, Britain, Germany, Sweden, Norway, and Denmark, till Christianity abolished it.

CREMIEU, or **CREMIU**, a town of France, in the department of Isere, 18 miles E. of Lyons.

CREMMEN, a town of Germany, in Upper Saxony.

CREMONA, an ancient city of Italy, capital of the Cremonese, 30 miles N. W. of Parma. Lon. 9. 58. E. Lat. 45. 8. N.

CREMONESE, a territory of Italy, in the late duchy of Milan, north of Parma.

CREMOR, in anatomy, is used for Chyle.

CRENOPHYLAX, [*ἡ κρηνη*, fountain, and *ἡ φύλαξ*, the guardian,] in antiquity, a magistrate of Athens, who had the inspection of fountains.

CREODIBA, [from *creuy* and *diven*, i. e. wood-robbers,] in the customs of the middle age, a robbery and murder committed in a wood, where the body of the person killed was burnt, in order to prevent any discovery of the crime.

CREOLES, a name given to the families descended from the Spaniards who settled at Mexico, in America. These are much more numerous than either the Spaniards properly so called, or the Mulattoes: which two other species of inhabitants are excluded from all considerable employments. The name throughout the rest of the West Indies is applied to all the natives who are descended from European parents.

CREON, king of Corinth, in fabulous history, the son of Siphos. He promised his daughter Glauce to Jason, who had repudiated Medea. To revenge the success of her rival, Medea sent her as a present, a gown covered with poison. Glauce put it on, and was seized with sudden pains. Her body took fire;

the house also was consumed, along with Creon and his whole family.

CREON, king of Thebes, in fabulous history, the son of Menætiæ, and father of Jocasta, the mother and wife of Oedipus. On the death of Laius, who had married Jocasta, Creon ascended the vacant throne of Thebes. As the ravages of the Sphynx were intolerable, Creon offered his crown and daughter in marriage to him who could explain the enigmas which the monster proposed. Oedipus explained the riddles, ascended the throne, and married Jocasta, without knowing she was his mother; and by her he had two sons, Polynices and Eteocles, and two daughters.

CREPIDÆ, in Roman antiquity, a kind of slippers or shoes, which were always worn with the pallium, as the calcei were with the toga.

CREPIS, **HAWK-WEED**: a genus of the polygamia superflua order, and syngenesia class of plants; natural order, Compositæ. Receptacle naked; calyx calyculated with deciduous scales; pappus feathery and stalked. There are twenty-three species, most of them herbaceous annuals.

CREPITATION, in chemistry, the noise which some salts make over the fire in calcination.

CREPITATION, in surgery, the noise made by the ends or pieces of bones, when the surgeon moves a limb to assure himself by his ear of the existence of a fracture.

CREPUNDIA, in antiquity, a term used to express such things as were exposed along with children, as rings, jewels, &c. serving as tokens whereby they afterwards might be known.

CREPUSCULUM, [from *creperus*, Lat. doubtful, *q. d.* a dubious light,] the twilight. See **ASTRONOMY** and **TWILIGHT**.

CRESCENT, [*crescens*, Lat.] the new moon, as it begins to recede from the sun, shews a little rim of light, terminating in points or horns, which are still increasing till it become full and round in the opposition. The term is also used, but improperly, for the same figure of the moon in its decrease. The horns are then turned towards the W. whereas they point to the E. in the proper crescent.

CRESCENT, in heraldry, is a bearing in form of a half moon. The Ottomans bear sinople, a crescent montant, argent. The crescent is frequently used as a difference in coat-armour, to distinguish it for that of second brother or junior family. The figure of the crescent is the Turkish symbol; or rather is that of the city Byzantium, which bore this device from all antiquity; as appears from medals struck in honour of Augustus, Trajan, &c. See **HERALDRY**.

CRESCENT is also the name of a military order, instituted by Renatus of Anjou, king of Sicily, &c. in 1448; so called from its symbol, a crescent of gold enamelled. Renatus took for his device a crescent, with the motto loz, "praise," which in the style of rebus, makes loz in crescent, *q. d.* by advancing in virtue, one merits praise.

CRESCENTIA, the **CALABASH TREE**, a genus of the angiospermia order, and didynamia class of plants; natural order, Putamineæ. Calyx bipartite, equal; corolla gibbous; berry pedicelated or stalked, unilocular, and polyspermous; seeds bilocular. There are two species:

C. CUJETE, with oblong narrow leaves, and a large oval fruit.

C. LATIFOLIA, the broad-leaved calabash, seldom rises more than 15 or 20 feet high, with an upright trunk. They are both natives of the West Indies.

CRESCENTINO, a fortified town of Italy, in Piedmont, seated on the Po.

CRESPEY, or **CRESPIY**, a town of France, in the department of Oise, 39 miles N. E. of Paris.

CRESS, a species of *Lepidium*.

CRESS, **WATER**. See **SISYMBRIUM**.

CRESSA, in botany, a genus of the pentandria digynia class and order. Calyx five-leaved; corolla salver form; filaments sitting on the tube; capsule two-valved, one-seeded. There are two species, natives of the East Indies, in salt marshes.

CRESSY, or **CRECY**, a town of France, in the department of Somme, in the late province of Picardy; remarkable for a great victory obtained over the French by Edward III. of England, in 1346. Edward having encountered and overcome many difficulties in his expedition, was at last so closely followed and harassed by the French army, commanded by Philip VI. King of France

in person, that he determined to make a stand at this place, and to give his pursuers a check. For this purpose he chose his ground with great judgement, on the gentle declivity of a hill, with a thick wood in his rear. He ordered deep entrenchments to be made on each flank, and waited with firmness the approach of his enemies. The King of France, dreading nothing so much as the escape of the English, began the march of his great army from Abbeville early in the morning, August 26, and continued it several hours with great eagerness, till he received intelligence that the English had halted at Cressy, and were prepared to give him battle. He was advised at the same time not to engage that day, when his troops were much fatigued with their march, and in great disorder; and he was disposed to have taken this advice. But the discipline of these times were so imperfect, that the orders given for halting were not obeyed; and one corps of this mighty host impelling another, they continued advancing till they came into the presence of their enemies in much confusion. Edward had employed the forenoon of this important day in drawing up his army in the most excellent order, in three lines. The first line, which consisted of 800 men at arms, 4000 English archers, and 600 Welsh foot, was commanded by his young, amiable, and heroic son, the Prince of Wales, assisted by the Earls of Warwick and Oxford, and several other noblemen. The second line, composed of 800 men at arms, 4000 halberdiers, and 2400 archers, was led by the Earls of Arundel and Northampton; the last line, or body of reserve, in which were 700 men at arms, 5300 billmen, and 6000 archers, was ranged along the summit of the hill, and conducted by the King in person, attended by the Lords Mounbray, Mortimer, and others. When the army was completely formed, Edward rode along the lines, and by his words and looks inspired his troops with the most ardent courage and strongest hopes of victory. He then commanded the cavalry to dismount, and the whole army to sit down upon the grass, in their ranks, and refresh themselves with meat, drink, and rest. As soon as the French army came in view, they sprang from the ground, full of strength and spirit, and stood ready to receive them. The King of France, asisted by the Kings of Bohemia and Majorca, the Dukes of Lorraine and Savoy, and several other sovereign princes, with the flower of the French nobility, laboured to restore some degree of order to his prodigious army, and drew it up also in three lines, but very indistinctly formed. The first line was commanded in chief by the King of Bohemia; the 2d by the Earl of Alencon, the French king's brother; and the 3d by Philip in person: and each of these lines contained a greater number of troops than the whole English army. The battle was begun about three o'clock P. M. Aug. 26, by a great body of Genoese cross-bowmen, in the French service, who let fly their quarrels at too great a distance to do any execution, and were presently routed by a shower of arrows from the English archers. The Earl of Alencon, after trampling to death many of the flying Genoese, advanced to the charge, and made a furious attack on that corps commanded by the Prince of Wales. The Earls of Arundel and Northampton advanced with the 2d line to sustain the Prince, and Alencon was supported by as many troops as could crowd to his assistance. Here the battle raged for some time with uncommon fury; and the King of Bohemia, the Earl of Alencon, and many other great men, being slain, the whole 1st and 2d lines of the French army were put to flight. Philip, undismayed, advanced to the charge with the line under his immediate command. But this body soon shared the same fate with the other two; and Philip, after having being unhorsed, and wounded in the neck and thigh, was carried off the field by John de Hainault, and fled with no more than five knights and about 60 soldiers in his company, of all his mighty army, which at the beginning of the battle consisted of more than 120,000 men. Such was the famous victory of Cressy, the greatest ever gained by any king of England. Edward continued with his army at Cressy three days, numbering and burying the dead. The French had left on this bloody scene the King of Bohemia, 11 other princes, 80 bannerets, 1200 knights, 1500 gentlemen, 4000 men of arms, and 30,000 other soldiers. (Henry's History of Britain, vol. iv. p. 178.) Cressy lies 10 miles N. of Abbeville, 32 S. E. of Calais, and 100 N. of Paris.

CREST, in armoury, the top part of the armour for the head, mounting over the helmet, in manner of a comb, or tuft of a cock, deriving its name from *crista*, a cock's comb. The crest

was for the most part made of feathers, or the hair of horses' tails or mains. The soldiers took great pride in adorning them. In most of the old monuments we find the crest represented, not much unlike those on the tops of our modern head-pieces: but whatever the common soldiers had, those of the officers were usually wrought in gold or silver, and the plumes of a larger size, quite across the helmet; and some wore two, three, or four together of these plumes.

CREST, in heraldry, the uppermost part of an armoury, or that part of the cask or helmet next to the mantle. Guillim says, the crest, or cognizance, claims the highest place, being seated on the most eminent part of the helmet; yet so as to admit of an interposition of some escrol, wreath, chapeau, crown, &c. The crest is esteemed a greater mark of nobility than the armoury, being borne at tournaments, to which none were admitted till such time as they had given proof of their nobility: sometimes it serves to distinguish the several branches of a family; and it has served, on occasion, as a distinguishing badge of factions; sometimes the crest is taken for the device; but more usually is formed of some piece of the arms. Families that exchange arms do not change their crest.

CREST-FALLEN, in the manege, a fault of an horse, when the crest hangs to one side. The cure is to place it upright, clipping away the spare skin, and applying plasters to keep it in a proper position.

CRETE, in ancient geography, one of the largest islands in the Mediterranean, lying between 22° and 27° Lon. E. and between 35° and 36° Lat. N. According to Strabo, this island is 287 miles in length; according to Pliny, 270; and according to Scylax, 312. As to its breadth, it is not, as Pliny observes, above 55 miles where widest; whence it was styled, as Stephanus observes, the Long Island. Anciently it was known by the names of Aeria, Chthonia, Curete, Idæa, Macaris, &c. but its most common name was Crete. Homer, the celebrated Grecian bard, thus describes this island as it stood in his time: "Crete is an extensive island in the midst of the stormy main. The soil is rich and fertile. It contains an immense number of inhabitants. It is adorned with 100 cities. Its inhabitants speak in various languages. We find there Achæans, valiant Eteocretes, Cydonians, Dorians, and god-like Pelasgians. Crete received its name from Cres, the first of its monarchs. He was author of several useful inventions, which contributed to the happiness of his subjects. Prompted by gratitude, they endeavoured to perpetuate the memory of his favours, and to immortalize his name, by naming the island after him. To distinguish the true Cretans from strangers, they were named Eteocretes. A number of colonies, from different parts of Greece, settled on the island. The agreeableness of the climate, and the fertility of the soil, invited them to fix their habitation there. The Lacedæmonians, Argives, and Athenians, were the principal people who sent colonies into Crete. The Eteocretes inhabited the southern division of the island; they built there the city of Præsus, and erected a temple to Dictæan Jove. Cres was not the only monarch who reigned in the island of Crete. He had a series of successors. But history affords little information concerning them; only the names of a few are preserved, and a small number of events which happened under the reign of some others, but blended and disfigured with an intermixture of fable. Among those monarchs we find two Jupiters, and two of the name of Minos. However, most writers confound them, and ascribe to one those transactions and exploits which should be shared between the two. Minos was esteemed the wisest legislator of antiquity. The office assigned him in the regions below, is a clear proof of his having gained an exalted reputation by his justice. Greece, says Plato, has with great propriety adopted the laws of Crete; for they are founded on the solid basis of reason and equity, and have a natural tendency to render the people, who live in subjection to them, opulent and happy. One of those laws forbade "the Cretans ever to carry their festivity so far as to intoxicate themselves with wine." The following was very suitable to repress the presumptuous ardour of youth, "Let young people not canvass the laws with an indiscreet curiosity; let them not examine whether the lawgiver has done right or wrong in promulgating them; but let them join unanimously in declaring them good, since they proceed from the gods. If any of the old men perceive something in them meriting amendment, let him men-

tion it to the magistrate, or discuss it with his equals, but never in the presence of the young people." That excellent code was engraved on tables of brass; and Talos, chief minister to Minos, visited all the towns and cities in the island, three times a year, to observe in what manner the laws were executed and obeyed. The king, knowing that the marvellous was necessary to command the belief and enforce the obedience of his people, pretended that he had received those laws from his father Jupiter, in the grotto of mount Ida. In opposition to this account, others of the ancients describe Minos as a prince abandoned to the fury of his passions, and a barbarous conqueror. Falling passionately in love with the nymph Dictynna, who refused to gratify his wishes, he pursued her to the brink of the shore, and forced her to plunge into the sea, where she was saved by some fishermen, who received her in their nets. He was the first of the Greeks who appeared in the Mediterranean at the head of a naval armament. He conquered the Cyclades, expelled the Carians, established Cretan colonies in those islands, and committed the government of them to his son. Being informed, at Paros, that his son Androgeus was slain at Athens, he declared war against Ægeus, and imposed on him a disgraceful tribute; from the payment of which Theseus delivered his country. He took arms against Nisus, king of Megara, made him prisoner by the treachery of his daughter Scylla, and put him to death, together with Megarus, the son of Hippomanes, who had brought some forces to his assistance. Dædalus, who had by some means incurred his displeasure, despairing of pardon from so severe and inflexible a prince, employed the resources of his inventive genius, to escape from his power. He fled to Sicily, gained the protection of king Cocalus, and obtained an asylum in his court. Valerius Flaccus has described his flight: "Thus Dædalus, with the wings of a bird, ascended from mount Ida. Beside him flew the comrade of his flight, with shorter wings. They appeared like a cloud rising in the air. Minos, seeing his vengeance thus eluded, glowed with impotent rage. In vain he followed with his eyes the secure flight of his enemies through the wide expanse of heaven. His guards returned to Gortynia with their quivers filled with arrows." The Cretan monarch did not, however, give up his prey. He equipped a fleet, pursued the fugitive to Sicily, and fell before the walls of Camicum. It is plain, that these actions do not agree to the character of the monarch, whose justice immortalized him. We may, therefore, reasonably conclude, that Minos the legislator is a different person from the conqueror; that it was the former who gained a lasting reputation by his wisdom and justice; and the latter who subdued most of the islands of the Archipelago, but tarnished his glory by his cruelty and merciless thirst for vengeance. The last king of Crete was Idomeneus, who conducted 24 ships (or according to Hyginus 40) to the assistance of Agamemnon. Homer informs us of the illustrious exploits by which he signalized himself before the walls of Troy. At his departure from Crete, he committed the government to Leucus his adopted son, promising him the hand of his daughter Clisithera if he governed wisely in his absence. But Leucus forgot these favours, and aspired to the immediate possession of the crown, without waiting till he should obtain it lawfully by marriage. Mida, wife to Idomeneus, and the princess Clisithera, were obstacles to his wishes. But ambition knows no restraint, and tramples under foot the most sacred obligations. Having seduced the people from their allegiance, and gained over the nobles, he sacrificed those unfortunate victims in the temple. When Idomeneus, crowned with laurels, landed on the coast of Crete, Leucus, who had now firmly established his power, attacked him with an armed force, and obliged him to reembark. Servius indeed gives a different account of the banishment of Idomeneus, and says, that he had vowed, in a storm, to sacrifice to the gods the first person that his eyes should behold on the Cretan shore; that his son having met him first after his arrival, he fulfilled his vow, by sacrificing him; and that the island being soon after depopulated by pestilence, the inhabitants looked upon that affliction as the effect of divine vengeance, and expelled the parricide; who, retiring to Italy, founded Salentum, on the Messapian coast. But that opinion appears entirely groundless. History mentions no son of Idomeneus. If he had one, why did he adopt Leucus? The most probable opinion is, that the plague was introduced into the island by his ships, when he returned from the siege of Troy, as Herodotus asserts; and that Leucus artfully made use of that pretext

pretext to expel his lawful sovereign from the island. But the usurper did not long enjoy the fruit of his crimes. Soon after the departure of Idomeneus, monarchy was abolished, and Crete became a republic. The republic of Crete has been celebrated by the panegyric of Plato, served Lycurgus as a model for that which he established in Lacedæmon, and was beloved by all Greece with admiration. Strabo has thought it not unworthy of his pencil, and has consecrated the leading features of its constitution to lasting fame in his immortal work. It was indeed a system of legislature, whose direct tendency was to call forth the buds of virtue in the heart of infancy; to open and expand them in youth; to inspire man, as he reached maturity, with the love of his country, of glory, and of liberty; and to comfort the infirmities of age with the respect and esteem due to the experience and wisdom of that period of life. It tended to form affectionate friends, patriotic citizens, and worthy magistrates. It made no use, however, of a multitude of acts and statutes to produce those inestimable advantages. They flowed all from one source; the public education of youth, judiciously directed. The virtuous examples set before youth in the course of that education; the illustrious deeds which were recited to them with high applause, the honours conferred on valour and on noble actions, the opprobrium invariably cast on vice; these were the only means which the Cretan lawgiver made use of to form a warlike, humane, and virtuous nation. The Cretan government, soon after the expulsion of Idomeneus, became partly aristocratical. The power was divided between the nobles and the people. Yet as the chief employments were occupied by the nobles, they directed the administration of affairs. Ten magistrates were annually elected, by a majority of voices, in the national assembly. These were named Cosmoi, and their public office and character were the same with those of the Ephori at Sparta. They were the generals of the republic in time of war, and directed all affairs of any importance. They had the right of choosing certain old men for counsellors. Those old men, to the number of 28, composed the Cretan senate. They were chosen from among such as had discharged the office of Cosmoi, or had distinguished themselves by extraordinary merit and blameless probity. These senators continued in office during life, possessed a weighty influence, and were consulted in every affair of importance. This body was a barrier against the ambition of the ten chief rulers. Another restraint on their power was the limiting of their administration to one year. As the suffrages of the people might be obtained by bribery or personal influence, and as their choice might sometimes fall on a man unworthy of so honourable an office, he who had been thus undeservedly advanced to the dignity of Cosmes was degraded, either in a national assembly, or simply by the voices of his colleagues. This, doubtless, is what Plato alludes to, when he says, "Neither the commonwealth, which approaches too near to a monarchical constitution, nor that which affects a licentious liberty, is founded on the solid basis of a just medium between anarchy and despotism. O Cretans! Lacedæmonians! by establishing yours on firmer foundations, you have avoided those fatal extremes. Such were the distribution of power and the administration of public affairs in the Cretan government. Its simplicity was admirable. A people who were blessed with the sacred enjoyment of liberty, but possessed not sufficient knowledge and discernment to direct themselves, elected magistrates to whom they delegated their authority. These magistrates, thus arrayed with sovereign power, chose senators to assist and direct their deliberations. These counsellors could neither enact or decide of themselves; but they held their office for life; and that circumstance contributed to strengthen their influence and to increase their experience. The magistrates were animated by the most powerful motives to distinguish themselves when in office, by unwearied activity in the public service. On one side, they were restrained by the fear of degradation; on the other, actuated by the hope of becoming one day members of the national council. "The legislator, says Strabo, considered liberty as the greatest blessing that cities can enjoy. Liberty alone can secure the property of the citizens of any state. Slavery either robs them of it, or renders it precarious. The first care of nations should therefore be to preserve their liberty. Concord strengthens and supports her empire; she flourishes wherever the seeds of dissention are extinguished. Almost all those hostilities which prevail among nations or individuals spring either from an inordinate desire of

wealth or the love of luxury. Introduce, instead of those baneful principles, frugality, moderation, and equality of conditions; you will thus banish envy, hatred, injustice, and haughty disdain." This was what the Cretan lawgiver happily effected. And the community, which was regulated by his wise institutions, rose to glory, opulence, and power; and was honoured with the panegyrics of the most celebrated philosophers of Greece. But the highest honour it ever obtained, was that of serving Lycurgus as a model for the form of government, which he established at Sparta. The republic of Crete continued to flourish till the age of Julius Cæsar. No other state has enjoyed so long a period of strength and grandeur. The legislator, regarding liberty as the only sure basis of a nation's happiness, had instituted a system of laws, the natural tendency of which was, to inspire men with an ardent passion for liberty, and with such virtue and valour as are necessary to support and defend it. All the citizens were soldiers; all skilled in the art of war. The valiant youth of other nations resorted to Crete, to learn the exercises, manœuvres, and evolutions, of the military art. Philopœmen (says Plutarch) to acquire skill in arms, embarked for Crete. When he returned to the Achæans, the knowledge he had acquired made him so eminent among them, that he was immediately appointed general of their cavalry. On the other hand, the legislator, being persuaded that conquests are generally unjust and criminal, that they often exhaust the strength of the victorious nation, and almost always corrupt its manners, endeavoured to preserve the Cretans from the ambition of conquest. The fertility of the island abundantly supplied their wants. They needed not that commerce should introduce among them the riches of foreign countries, along with which luxury and her train of attendant vices would also be introduced; and he inspired them with an indifference for such acquisitions, without expressly forbidding them. The gymnastic exercises, which occupied the leisure of the gallant youths; the pleasures of the chase; the ardour of friendship; the public shews, at which both men and women assembled; the love of equality, order, and their country, with which he inflamed every breast; the wise institutions, which united a whole nation so closely that they seemed to compose but one family;—all these ties attached the Cretans to their native island; and finding happiness at home, they never thought of wandering abroad in search of imaginary glory, or of extending their empire over other nations. Therefore, from the period at which that state assumed a republican form, till the time when they were attacked by the Romans, the nation was not once known to send an hostile force into the territories of any of their neighbours. This instance of moderation is unparalleled in history; no other nation can divide the glory of it with the Cretans. Individuals indeed might leave their country to engage in foreign armies. Those princes and states, who knew their valour and skill in archery, eagerly sought to take them into their pay; all the neighbouring monarchs were desirous of having in their armies a body of Cretan archers. But though the independent cities which flourished in Crete did not unite their arms to subjugate the neighbouring islands, yet they were not so wise as to live in peace among themselves. Sometimes Gnosus and Gortynia marched with social banners against their neighbours, levelled their fortresses, and subjected them to their power; at other times they attacked each other with hostile violence, and saw their bravest youth perish amid the horrors of civil war. Lyctos and Cydon opposed an invincible barrier to their ambition, and preserved their own liberty. The last of these cities had acquired such strength and influence, that she held the balance between the rival powers of the island. These wars destroyed a number of the cities, and drenched the native country of Jupiter with blood. It is difficult to trace the source of those intestine dissensions. Part of the island was occupied by the Eteocretes, the original inhabitants; the rest was peopled with colonies from Athens, Sparta, Argos, and Samos. Perhaps the ancient grudges, which had subsisted among those strangers, were rekindled by accident, and inflamed with new fury. The most powerful among them, would endeavour to take advantage of the weakness of the rest, and disregarded all laws but those of force; and the glowing ardour of the youth, trained to military exercises, would be ever ready to fly to arms. Such, probably were the causes which fomented discord and hostility among a people living under the same religion, customs, and laws. Whatever these might be, the

the Cretans, being persuaded that the firm union of their soldiers was essential to victory, arrayed the bravest youths of the army in splendid robes, and caused them to sacrifice to Friendship before engaging in battle. In some countries it would be very proper to oblige the generals, on such occasions, to sacrifice to Concord. Nations are effaced from the earth like the monuments of their power, and after the revolution of several ages we can scarce trace in their posterity any remains of their ancient character. Some of them exist longer, others shorter; but we may almost always calculate the period of their duration by the excellence of their laws, and the fidelity with which they support and obey them. The republic of Crete, being established on a solid basis, knew no foreign master for a period of ten centuries. She bravely repelled the attacks of those princes who attempted to enslave her. At length the time arrived when the warlike and victorious Romans would suffer none but their subjects or slaves to inhabit within the reach of their arms. Florus acknowledges, that the Romans had no other motive for invading Crete but the ambition of subduing the renowned native country of Jupiter. "If any person wish to know the reasons which induced us to attack Crete (says he), the true reason was our desire to subdue so celebrated an island. The Cretans had appeared to favour Mithridates, and the Romans thought proper to declare war against them on that pretext. Mark Antony, father of the triumvir, attacked them with strong hopes of success; but was severely punished for his presumption and imprudence. The Cretans took a great part of his fleet, hung up his soldiers and sailors on the masts amid the sails and cordage, and returned in triumph into their harbours." The Romans never forgot nor forgave a defeat. As soon as the Macedonian war was brought to a conclusion, they took arms against the Cretans to revenge their ignominy and loss. Q. Metellus was sent to Crete with a powerful armament. He met with an obstinate and vigorous resistance. Panarus and Lathenes, two experienced leaders, collecting a body of 20,000 young warriors, all eager for battle, and of determined courage, employed their arms successfully against the Romans, and protracted the fate of Crete for three years. These conquerors could not make themselves masters of the island till they had destroyed its bravest warriors. They lost a great number of troops, and bought a bloody victory at the price of many a danger and much fatigue. However, their usual good fortune at length prevailed. The first care of the conqueror was to abolish the laws of Minos, and to establish those of Numa. Strabo, that enlightened philosopher, complains of this act of severity; and informs us, that in his days the original laws of Crete were no longer in force, because the Romans compelled the conquered provinces to adopt their civil code. To secure themselves still more fully in the possession of the island, they sent a powerful colony to Gnossus. From the conquest of Crete by the Romans, to the present time, that is, for a period of 1900 years, the Cretans have no longer formed a separate nation, nor made any figure among the states and kingdoms of the world: their noble and ingenious manners, their arts and sciences, their valour and their virtues, are no more. They lost these with their liberty. So true it is that man is not born for himself; and that, when deprived of that aid which Nature has designed to strengthen and support his weakness, the flame of genius and the ardent glow of valour are extinguished in his breast; he becomes incapable of vigorous resolution, and sinks below the natural virtue and dignity of the species. The island of Crete, joined with the small kingdom of Cyrene, on the Lybian coast, formed a Roman province. It was at first governed by a proconsul; a questor and an assistant were afterwards sent there; at last, it was put under the government of a consul. It was one of the first islands, that were favoured with the light of the gospel. St. Paul introduced the Christian faith into it; and his disciple Titus, whom he left there to cultivate that precious plant, became the first bishop of the island. In the reign of the emperor Leo, it had 12 bishops, all subject to the patriarch of Constantinople. Constantine separated Crete from Cyrene, in the new division which he made of the provinces of the empire: and left Crete, with Africa and Illyria, to his third son, Constans. In the reign of Michael II. emperor of Constantinople, a rebellion, which lasted three years, caused him to neglect the other parts of the empire. The Saracens, who had conquered the finest provinces of Spain, seized

that opportunity. They fitted out a considerable fleet, plundered the Cyclades, attacked the island of Crete, and made themselves masters of it without opposition. To secure their conquest, they built a fortress which they named Khandak, *i. e.* intrenchment. From that citadel they made inroads into the interior parts of the island, carrying havoc and devastation wherever they appeared. By repeated attacks, they subdued all the cities in Crete except Cydon. Michael made some ineffectual efforts to expel them from Crete. The emperor Basilus I. was not more successful. They defeated him in a bloody battle; but being vanquished by one of his generals, they were subjected to the payment of an annual tribute. At the end of 10 years the Arabians refused the tribute. It was reserved for Nicephorus Phocas, afterwards emperor, to deliver this fine island from the yoke of the infidels. He landed on it with a numerous army, boldly attacked them, and routed them in various engagements. The Saracens, no longer daring to meet so formidable a general in the field, fled for protection to their fortresses. Phocas being plentifully supplied with all the warlike machines necessary for a siege, levelled their walls, took their cities and fortresses, and drove them into Khandak, their metropolis. In nine months he subdued the whole island, took their king Curup, and his lieutenant Aremast, prisoners, and reunited to the empire a province which had been 127 years in the hands of the infidels. It remained under the dominion of the Romans till the time when Baldwin E. of Flanders, being raised to the throne, liberally rewarded the services of Boniface Marquis of Montserrat, by making him king of Thessalonica, and adding the island of Crete to his kingdom. That lord, being fonder of gold than glory, sold it to the Venetians, A. D. 1194; under whom it assumed the name of Candia. See that article.

CRETIO, in antiquity, a certain number of days allowed the heir, to consider whether he would act as heir to the deceased or not; after which time, if he did not act, he was excluded from the estate.

CREVECŒUR, a town and fortress of Holland, in the province of Holland, 20 miles E. of Breda.

CREVECŒUR, two towns of France; viz. 1. in the department of Calvados: 2. in the department of the North.

CREVIER, JOHN BAPTIST LEWIS, a native of Paris, trained under the celebrated Rollin, and afterwards professor of rhetoric. Upon the death of his master, in 1741, he finished his "Roman History." He published other works, and was greatly serviceable to the cause of virtue and religion, as well as letters. His death happened in 1765, at a very advanced age. Besides the continuation of Rollin, he published, 1. An edition of Livius, cum Notis, in six vols. 4to. 1748: and afterwards another, for the use of his pupils, in six vols. small 8vo. 2. La Histoire des Empereurs de Romains Jusqu' a Constantin, 1749, 12 tom. 12mo. 3. Histoire de l'Université de Paris, 7 tom. 12mo. 4. Rhetorique Francoise, a just and useful work. 5. Observations sur l'Esprit des Loix.

CREUSA, a daughter of Priam, king of Troy, by Hecuba. She married Aeneas, by whom she had Ascanius.

CREUSE, a department of France. It contains the late province of Marche. Gueret is the capital.

CREUSE, a river of France, which rises eight miles S. of Fullentin, crosses the department, and that of Indre; and falls into the river Vienne.

CREUTZ, a town of Croatia, 16 miles S. S. E. of Varasdin.

CREUTZENACH, CREUTZNACH, or KREUTZNACH, a town of Germany, in the circle of the Upper Rhine, 20 miles S. W. of Meatz.

CREUX, a French term used among artificers, and literally signifying a hollow cavity, or pit, out of which something has been scooped or dug; whence it is used to signify that kind of sculpture, where the lines and figures are cut and formed within the face or plan of the plate, or matter engraved; and thus it stands in opposition to relieve, where the lines and figures are embossed, and rise prominent above the face of the matter engraved on.

CREW, the company of sailors belonging to a ship, boat, or other vessel. The sailors that are to work and manage a ship, are regulated by the number of lasts it may carry, each last making two tons. The crew of a Dutch ship, from forty to fifty lasts, is seven sailors and a swabber; from fifty to sixty lasts, the crew

consists of eight men and a swabber; and thus increases at the rate of one man every ten lasts. English and French crews are usually stronger than Dutch, but always in about the same proportion. There are in a ship several particular crews or gangs, as the gun-room crew, the carpenter's crew, &c.

CREWKERN, or **CREWKERNE**, a town of England, in Somersetshire, on the borders of Dorsetshire, a mile from the Parret.

CREX, in ornithology. See **RALLUS**.

CRIBBAGE, a game at cards.

CRIBRARIA, in botany, a genus of the cryptogamia fungi: case furnished with a double membrane, the outer one thin and fugacious, inner one reticulate; seeds without filaments, ejected through the foramina. One species, viz. the pallida.

CRICELASIA, the driving of a ring or hoop. Driving a hoop was one of the ancient gymnastics: this hoop was as high as the breast of the person who used it. It was commended for rendering the limbs pliable, and for strengthening the nerves.

CRICHTON, **JAMES**, a celebrated Scotchman, of whom so many wonderful things are related as to have procured him the name of "the admirable Crichton." He was born about 1550, in the county of Perth, of a good family, and educated at St. Andrews, where he made a rapid progress in the languages and sciences. At the age of twenty he visited Paris, and acquired uncommon reputation as a disputant, and for his skill and activity in games of all sorts, as well as martial exercises. It is said that he caused placards to be fixed on all the gates of the schools, halls, and colleges, belonging to the university, and on all the pillars and posts before the houses of the most renowned men for literature in the city, inviting all those who were well versed in any art or science, to dispute with him in the college of Navarre, that day six weeks, by nine o'clock in the morning, where he would attend them, and be ready to answer to whatever should be proposed to him, in any art or science; and in any of these twelve languages, Hebrew, Syriac, Arabic, Greek, Latin, Spanish, French, Italian, English, Dutch, Flemish, and Sclavonian; and this either in verse or prose at the discretion of the disputant. During this whole time, instead of closely applying to his studies, he regarded nothing but hunting, hawking, tilting, vaulting, riding, tossing the pike, handling the musket, and other military feats; or else he employed himself in domestic games, such as balls, concerts of music vocal and instrumental; cards, dice, tennis, and the like diversions. This conduct so provoked the students of the university, that under the placard which was fixed on the Navarre gate, they caused the following words to be placed: "If you would meet with this monster of perfection, to make search for him either in the tavern or bawdy-house, is the readiest way to find him." Nevertheless, when the day appointed arrived, Crichton appeared in the college of Navarre, and acquitted himself beyond expression in the disputation, which lasted from nine o'clock in the morning till six at night. At length, the president, after extolling him highly for the many rare and excellent endowments, which the Almighty had bestowed upon him, rose from his chair, and, accompanied by four of the most eminent professors of the university, gave him a diamond ring, and a purse full of gold, as a testimony of their esteem. The whole ended with the repeated acclamations of the spectators; and henceforward our young disputant was called The admirable Crichton. It is added, that he was so little fatigued with the dispute, that he went on the very next day to the Louvre, where he had a match of tilting, and in the presence of some of the French princes, and many ladies, carried away the ring fifteen times successively. About two years after this we find him at Rome, where he affixed a placard upon all the eminent places of the city, in the following terms: "Nos Jacobus Crichtonus Scotus, cuicumque rei propositæ ex improviso respondebimus. In a city which abounded in wit, this bold challenge, to answer to any question that could be proposed to him, without his being previously advertised of it, could not escape the ridicule of a pasquinade. It is said, however, that being nowise discouraged, he appeared at the time and place appointed; and that, in the presence of the pope, many cardinals, bishops, doctors of divinity, and professors in all the sciences, he displayed such wonderful proofs of his universal knowledge, that he excited no less surprise than he had done at Paris. From Rome he went to Venice; where he contracted an intimate friend-

ship with Aldus Manutius, Laurentius Massa, Speron Speronius, Johannes Donatus, and other learned men, to whom he presented several poems in commendation of the city and university. At length he was introduced to the Doge and Senate, in whose presence he made a speech, which was accompanied with such eloquence, and grace of person and manner, that he received the thanks of that illustrious body; and nothing was talked of through the whole city but this *rara avis in terris*, this prodigy of nature. He held, likewise, disputations on theology, philosophy, and mathematics, before the most eminent professors, and large multitudes of people. His reputation was so great, that the desire of seeing and hearing him brought together a vast concourse of persons from different quarters to Venice. At Padua he disputed for six hours with the most celebrated professors on various subjects of learning; and he exposed, in particular, the errors of Aristotle and his commentators, with so much solidity and acuteness, and at the same time with so much modesty, that he excited universal admiration. In conclusion he delivered extempore an oration in praise of ignorance, which was conducted with such ingenuity and elegance, that his hearers were astonished. This exhibition of Crichton's talents was on the 14th of March 1581. He caused a paper to be fixed on the gates of St. John and St. Paul's church, wherein he offered to prove before the university, that the errors of Aristotle, and of all his followers, were almost innumerable; and that the latter had failed both in explaining their master's meaning, and in treating on theological subjects. He promised likewise to refute the dreams of certain mathematical professors; to dispute in all the sciences; and to answer to whatever should be proposed to him or objected against him. All this he engaged to do, either in the common logical way, or by numbers and mathematical figures, or in 100 sorts of verses, at the pleasure of his opponents. According to Manutius, Crichton sustained this contest, without fatigue, for three days; during which time he supported his credit, and maintained his propositions, with spirit and energy, and with the highest applause from an unusual concourse of people. We next find him at Mantua, where he is reported to have slain a famous fencing-master in a duel. The duke of Mantua was so pleased with Crichton as to appoint him tutor of his son, who was a very licentious young man. This appointment, however, proved fatal to him; for one night, as he was walking through the streets in carnival time, he was attacked by six assassins, and after a gallant defence lost his life. It is said that the person who gave him the fatal stroke was the prince, his pupil. This event is placed in the year 1583. The following catalogue of Crichton's works is given by Dempster: 1. *Odæ ad Laurentium Massam plures.* 2. *Laudes Patavinae, Carmen extempore effusum, cum in Jacobi Aloysii Cornelli Domo Experimentum Ingenii, coram tota Academia Frequentia, non sine multorum Stupore, faceret.* 3. *Ignorantia Laudatio, extemporale Thema ibidem redditum, post sex Horarum Disputationes, ut, præsentibus Somnia potius fovere quam Rem se veram videre affirmarint, ait Manutius.* 4. *De Appulsu suo Venetias.* 5. *Odæ ad Aldum Manutium.* 6. *Epistolæ ad Diversos.* 7. *Prefationes solennes in omnes Scientias sacras et profanas.* 8. *Judicium de Philosophis.* 9. *Errores Aristotelis.* 10. *Arma an Literæ præstant? Controversia Oratoria.* 11. *Refutatio Mathematicorum.* 12. *A Comedy in the Italian language.*

CRICK, among farriers, is when a horse cannot turn his neck any way, but holds it fore right, insomuch that he cannot take his meat from the ground without great pain.

CRICKET, an exercise or game, performed with bats and a ball. This sport was formerly confined solely to the labouring class of people, but is now becoming daily more fashionable among those, whose rank and fortune entitle their countrymen to expect a very different conduct. Although we have, on all occasions, enjoined proper muscular exercise, yet we strongly reprobate that of cricket, which is in all respects too violent, and, from the positions into which players must necessarily throw themselves, cannot fail to be productive of frequent injury to the body.

CRICKET, in zoology. See **GRYLUS**.

CRICKHOWEL, a town of South Wales in Brecknockshire, on the Usk, 6 miles W. N. W. of Abergavenny.

CRICKLADE, a borough of Wiltshire, 26 m. S.W. of Oxford.

CRICKLIETH, an ancient town of North Wales, in Caernarvonshire.

CRICO-

CRICO-ARYTENOIDEUS, two muscles of the larynx. See **ANATOMY**.

CRICOIDES, in anatomy, a cartilage of the larynx, called also the annular cartilage. It occupies the lowest part by way of base to the rest of the cartilages, and to the lower part of it the *aspera arteria* adheres. See **ANATOMY**.

CRICO-THYROIDÆUS, one of the five proper muscles of the larynx. See **ANATOMY**.

CRIME, [*crimen*, Lat.] the transgression of a law, either natural or divine, civil or ecclesiastic. Civilians distinguish between *crimen* and *delictum*. By the first, they mean capital offences, injurious to the whole community, as murder, perjury, &c. the prosecution of which was permitted to all persons, though no ways immediately interested. By the latter, they understood private offences committed against individuals, as theft, &c. By the laws, nobody was allowed to prosecute in these, except those interested. With us, crimes are distinguished into capital, as treason, murder, robbery, &c. and common, as perjuries, &c. Again, some crimes are cognizable by the king's judges, as the above-mentioned; and others are only cognizable in the spiritual courts, as simple fornication. All the pleas and excuses, which protect the committer of a forbidden act from the punishment which is otherwise annexed thereto, may be reduced to this single consideration, the want or defect of will. An involuntary act, as it has no claim to merit, so neither can it induce any guilt: the concurrence of the will, when it has its choice either to do or to avoid the fact in question, being the only thing that renders human actions either praiseworthy or culpable. Indeed, to make a complete crime, cognizable by human laws, there must be both a will and an act. For though, in *foro conscientie*, a fixed design or will to do an unlawful act is almost as heinous as the commission of it; yet as no temporal tribunal can search the heart, or fathom the intentions of the mind, otherwise than as they are demonstrated by outward actions, it therefore cannot punish for what it cannot know. For which reason, in all temporal jurisdictions, an overt act, or some open evidence of an intended crime, is necessary in order to demonstrate the depravity of the will, before the man is liable to punishment.

CRIMEA. See **TARTARY**.

CRIMNOIDES, or **CRIMOIDES**, among physicians, a term sometimes used for the sediment of urine, resembling bran.

CRIMSON, one of the seven red colours of the dyes. See **DYEING**.

CRINGLE, [from *krinckelen*, Belg. to run into twists,] a small hole made in the bolt rope of a sail, by intertwisting one of the divisions of a rope, called a strand, alternately round itself and through the strands of the bolt-rope, till it becomes three-fold, and assumes the shape of a wreath or ring. The use of the cringle is generally to contain the end of some rope, which is fastened thereto for the purpose of drawing up the sail to its yard, or of extending the skirts by the means of bridles, to stand upon a side wind.

CRINODENDRUM, in botany, a genus of the monadelphia decandria class and order. Calyx none; corolla bell-shaped, six-petaled; capsule one-celled, gaping elastically at top. One species, viz. *C. patagua*, a beautiful evergreen branchy tree, with a body seven feet in diameter. It is a native of Chili.

CRINUM, in botany, a genus of the hexandria monogynia class and order; natural order, *Spathaceæ*. Corolla funnel-form, monopetalous, six-parted, three alternate segments unciate; germ at the bottom of the corolla, covered; stamina distant. There are six species.

CRISIS, [*κρίσις*, Gr.] in medicine, is used in different senses, both by the ancient and modern physicians. With some it means frequently no more than the excretion of any noxious substance from the body. Others take the word for a secretion of the noxious humours made in a fever. Others use it for the critical motion itself; and Galen defines a crisis in fevers, a sudden and instantaneous change, either for the better or the worse, productive of recovery or death.

CRISTÆ, in surgery, excrescences about the anus and pudentia.

CRISTA GALLI. See **ANATOMY**. This process is so named from its figure, which resembles a cock's comb. To it is fastened

that part of the dura mater which divides the brain, called *falx*. In adults, this process appears of a piece with the septum narium.

CRITERION, [*τὸ κριτήριον*, Gr.] a mark by which any thing is judged of, with regard to its goodness or badness.

CRITERION, in logic, a standard by which propositions and opinions are compared, to discover their truth or falsehood.

CRITHE, in surgery, commonly called the styte, a sort of tubercle that grows on the eyelids.

CRITHMUM, **SAMPHIRE**: a genus of the digynia order, and pentandria class of plants; natural order, *Umbellatæ*. Fruit oval, compressed; florets equal. There are three species.

CRITHOMANCY, [from *κριθή*, barley, and *μαντεία*, magic,] a species of divination, by considering the dough or matter of the cakes offered in sacrifice, and the meal strewed over the victims to be killed. Barley meal was commonly used; whence the name.

CRITICAL DAYS, or **CRITICAL SYMPTOMS**, among physicians, are certain days and symptoms in the course of acute diseases, which indicate the patient's state, and determine him either to recover or grow worse. See **MEDICINE**.

CRITICISM, [from *κριτικός*, Gr.] the art of judging with propriety, concerning any object or combination of objects. But in a more limited sense, the science of criticism is confined to the fine arts. The principles of the fine arts are best unfolded by studying the sensitive part of our nature, and by learning what objects are naturally agreeable and what are naturally disagreeable. The man who aspires to be a critic in these arts, must pierce still deeper: he must clearly perceive what objects are lofty, what low, what are proper and improper, what are manly, and what are mean or trivial. Hence a foundation for judging of taste, and for reasoning upon it: where it is conformable to principles, we can pronounce with certainty that it is correct; otherwise, that it is incorrect, and perhaps whimsical. Thus the fine arts, like morals, become a rational science; and, like morals, may be cultivated to a high degree of refinement. Notwithstanding the ignorance and insolence which have occasionally disgraced the writings of professed critics of minor rank, and notwithstanding the sneers of one of the wittiest of English authors against what he denominates the "cant of criticism," and his memorable eulogium of those who "are pleased they know not why, and care not wherefore," the art of criticism is founded in nature, and every man of thinking mind is led to the practice of that art. The merits or demerits of literary works are a perpetual subject of comment, and the intelligent reader is not contented with referring to his own immediate feelings as the grounds of his verdict, but appeals to certain principles which he regards as established, and which he quotes as the guides of opinion.

CRITICISM may be regarded as embracing three separate branches: 1st. The establishing of rules and principles for correct composition; such are the incomparable treatises of Cicero and Quintilian upon oratory, and of Longinus on the sublime. In English we have many valuable essays and treatises of this class. The prefaces of Mr. Dryden are a rich mine of critical principles finely illustrated. Some of Mr. Addison's papers in the *Spectator*, and Mr. Pope's and Dr. Johnson's prefaces to Shakspeare, are excellent specimens of rational criticism. In more modern times we have had some excellent compendiums of criticism: among which Lord Kaimes's *Elements of Criticism*, Dr. Blair's *Lectures*, Dr. Priestley's *Lectures on Oratory and Criticism*, and particularly bishop Lowth's *Lectures on the Sacred Poetry of the Hebrews*, deservedly hold a very high rank. See the articles **RHETORIC** and **POETRY**. The second branch of critical science relates to the commenting upon ancient authors, explaining difficult passages, and elucidating their beauties. Eustathius and the scholiasts, Vida, Scaliger, the Stephenses, and, above all, the gentlemen of Port Royal, have been great benefactors to the public in this way. The delphin and variorum editions of the classics do great credit to the learned persons by whom they were edited. Many editions of Shakspeare have been published with critical notes in this country. Mr. Theobald's was better than Mr. Pope's, except for the preface. Dr. Warburton entirely failed, for the same reason as Dr. Bentley in his edition of Milton, viz. indulging too freely in conjectural criticism. Dr. Johnson's explanatory notes on Shakspeare are excellent; and the profound reading of Malone, Steevens,

Steevens, and Farmer, in British and Saxon literature, have been excellently applied to the illustration of the first of dramatic poets. The third branch of criticism regards the forming of a correct judgement of the merits and demerits of contemporary writers. In this every man of education ought to qualify himself to see with his own eyes, and determine with his own understanding; and this is to be effected by the attentive study of the best works, ancient and modern, on the general principles of criticism (see above.) For to form our judgement on that of any other men is a species of literary slavery. The various partialities and conflicting interests by which mankind are governed, render it also very unsafe to rest our opinion upon that of others: and it is peculiarly unfortunate that this department of literature is seldom exercised by persons adequate, from education and experience, to the task. Where it is, there is no reason why the name of the critic should not be as public as that of the author; when that is not the case, his motive will be suspected: nor can the reader assent to observations from an authority, of the competency of which he is not assured. For these reasons but little credit is attached, except in remote country places, to anonymous criticism. The great vices of modern criticism are pertness and flippancy. Writers of this class seem to consider the study of Joe Miller as of more importance to their craft than that of Quintilian; and a readiness in the art of punning, as the highest praise and principal qualifications of a critic. manifold are the advantages of criticism, when studied as a rational science. I. A thorough acquaintance with the principles of the fine arts redoubles the entertainment these arts afford. To the man who resigns himself entirely to sentiment or feeling, without interposing any sort of judgement, poetry, music, and painting, are mere pastime; in the prime of life, indeed, they are delightful, being supported by the force of novelty and the heat of imagination: but they lose their relish gradually with their novelty; and are generally neglected in the maturity of life, which disposes to more serious and more important occupations. To those who deal in criticism as a regular science, governed by just principles, and giving scope to judgement as well as to fancy, the fine arts are a favourite entertainment; and in old age maintain that relish which they produced in the morning of life. II. A philosophical inquiry into the principles of the fine arts, inures the reflecting mind to the most enticing sort of logic: the practice of reasoning upon subjects so agreeable tends to a habit; and, habit strengthening the reasoning faculties, prepares the mind for entering into subjects more difficult and abstract. To have, in this respect a just conception of the importance of criticism, we need but reflect upon the common method of education; which, after some years spent in acquiring languages, hurries us, without the least preparatory discipline, into the most profound philosophy. A more effectual method to alienate the tender mind from abstract science, is beyond the reach of invention; and accordingly, with respect to such speculations, the bulk of our youth contract a sort of hobgoblin terror, which is seldom, if ever, subdued. Those who apply to the arts are trained in a very different manner: they are led, step by step, from the easier parts of the operation to what are more difficult; and are not permitted to make a new motion till they be perfected in those which regularly precede it. The science of criticism appears then to be a middle link, connecting the different parts of education into a regular chain. This science furnishes an inviting opportunity to exercise the judgement: we delight to reason upon subjects that are equally pleasant and familiar; we proceed gradually from the simpler to the more involved cases: and in a due course of discipline, custom, which improves all our faculties, bestows acuteness upon those of reason, sufficient to unravel all the intricacies of philosophy. III. The last and most important advantage of rational criticism is that it is a great support to morality. No employment attaches a man more to his duty, than that of cultivating a taste in the fine arts: a just relish of what is beautiful, proper, elegant, and ornamental, in writing or painting, in architecture or gardening, is a fine preparation for the same just relish of these qualities in character and behaviour. To the man who has acquired a taste so acute and accomplished, every action wrong or improper must be highly disgusting: if, in any instance, the overbearing passion sway him from his duty, he then turns to it upon the first reflection, with redoubled resolution never to be swayed a second time; he has now an additional motive to virtue, a conviction derived from experience, that happiness depends on regularity and order, and that a dis-

regard to justice or propriety never fails to be punished with shame and remorse.

CRITICISM, RULES OF. For these, as applicable to the fine arts, and derived from human nature, see **ARCHITECTURE, BEAUTY, COMPARISON, CONGRUITY, GRANDEUR, PROPRIETY, &c.**

CRITIC, a man skilled in the art of judging of literature; a man able to distinguish the faults and beauties of writing.

CRITIQUE, a criticism. See **CRITICISM**.

CRITO, an Athenian philosopher, who flourished B. C. 400. He was one of the most zealous disciples of Socrates, and supplied him with whatever he wanted. He had several scholars who proved great men, and he composed some dialogues which are lost.

CRIZZELLING, in the glass trade, a kind of roughness arising on the surface of some kinds of glass.

CROATIA, a country of Europe, and part of the ancient Illyricum, bounded on the E. by Slavonia and Bosnia, on the S. and S. W. by Morlachia, on the W. by Carniola, and on the N. by the Drave, which separates it from a part of Slavonia. It is about 80 miles long and 70 broad. The soil, where cultivated, is fruitful in wine and oil, &c. but being a frontier country, it is not so well cultivated as otherwise it might be. Carlstadt is the capital.

CROCODILE, in rhetoric, a captious and sophistical kind of argumentation, contrived to seduce the unwary, and draw them speciously into a snare. It has its name from the following fable, invented by the poets. A poor woman begging a crocodile, that had caught her son walking by the river-side, to spare and restore him, was answered, that he would restore him, provided she should give a true answer to a question he should propose: the question was, Will I restore thy son or not? To this the poor woman, suspecting a deceit, sorrowfully answered, Thou wilt not: and demanded to have him restored, because she had answered truly. Thou lyest, says the crocodile; for if I restore him thou hast not answered truly: I cannot therefore restore him without making thy answer false.

CROCODILE, in zoology. See **LACERTA**.

CROCODILE, FOSSILE, one of the greatest curiosities which have been discovered in the fossile world. It is the skeleton of a large crocodile, almost entire, found at a great depth under ground, bedded in stone. It was in the possession of Linkius, who wrote many pieces of natural history, and particularly an accurate description of this curious fossile. It was found in the side of a large mountain in Germany, and in a stratum of black fossile stone, somewhat like our common slate, but of a coarser texture, the same with that in which the fossile fish in many parts of the world are found. It had the back and ribs very plain, and was of a much deeper black than the rest of the stone; as is the case in the fossile fishes, preserved in this manner. The part of the stone where the head lay was not found; being broken off just at the shoulders, but irregularly; so that, in one place, a part of the back of the head was visible in its natural form. The two shoulder-bones were very fair, and three of the feet were well preserved; the legs were of their natural shape and size, and the feet preserved even to the extremities the five toes of each.

CROCUS, in botany, **SAFFRON**: a genus of the monogynia order, and triandria class of plants; natural order, **Ensata**. Corolla sex-partite, equal; stigmata convoluted or rolled spirally inwards. There are two species with many varieties, viz. *C. officinalis*, officinal crocus, or saffron, and *C. vernus*, or spring crocus.

CROCUS, in chemistry, any metal calcined to a red or deep yellow colour.

CRÆSUS, the last king of Lydia, remarkable for his riches, his conquests, his temporary prosperity, and his sad reverse of fortune. He subdued the Phrygians, Mysians, Paphlagonians, Thracians, and Carians; amassed together immense riches; and became one of the most powerful and magnificent princes in the world. He drew the learned to his court, and took a pleasure in conversing with them. Thales of Miletus, Pittacus of Mitylene, Bias of Priéné, Cleobulus of Lindus, and most of the other wise men, as they are emphatically styled, who lived in that age, as well as Æsop the fabulist, and the elegant Greek poets of the times, were bountifully received at the court of Cræsus. Cyrus, king of Persia, defeated him, B. C. 548, and commanded him to be burnt alive. When on the pile, the unfortunate monarch thrice repeated the name of Solon, on which Cyrus had the curiosity to ask him

the meaning. He told the conqueror, that Solon had maintained that poverty was a happier state than riches, and that he found now his words were true. The words of a dying man make a strong impression on the heart. Those of Cæsar deeply affected the mind of Cyrus, who considered the speech of Solon as addressed to himself. He not only spared his life, but also gave orders that he should be seated by his side, and thenceforth treated as a king; a revolution of fortune equally sudden and unexpected. But the mind of Cæsar had undergone a still more important revolution: for, tutored in the useful school of adversity, he learned to think with patience and to act with prudence; to govern his own passions by the dictates of reason, and to repay by wholesome advice the generous behaviour of his Persian master; whom he survived.

CROIA, or **CROJA**, a town of European Turkey, in Albania, anciently the capital of the Albanian kings. It is seated near the Gulf of Venice.

CROISADE, **CRUSADE**, or **CRUZADO**, [from *croix*, a cross, Fr. or *crux*, a cross, Lat.] a name given to the expeditions of the Christians against the infidels, for the conquest of Palestine; so called because those who engaged in the undertaking wore a cross on their clothes, and bore one on their standard. This expedition was also called the holy war, to which people flocked in great numbers out of pure devotion, the pope's bulls and the preaching of the priests of those days making it a point of conscience. The several nations engaged in the holy war were distinguished by the different colours of their crosses: the English wore white, the French red, the Flemish green, the Germans black, and the Italians yellow. From this enterprise several orders of knighthood took their rise. They reckon seven croisades for the conquest of the Holy Land: the first begun in the year 1095, at the solicitation of the Greek Emperor and the Patriarch of Jerusalem. Though these croisades were effects of the most absurd superstition, they tended greatly to promote the good of Europe. Multitudes indeed were destroyed. It is computed in the different expeditions that upwards of two millions of people perished. Many there were, however, who returned; and these, having conversed so long with people who lived in a much more magnificent way than themselves, began to entertain some taste for a refined and polished way of life. Thus the barbarism, in which Europe had been so long immersed, began to wear off soon after. The princes also who remained at home, found means to avail themselves of the frenzy of the people. By the absence of such numbers of restless and martial adventurers, peace was established in their dominions. They also took the opportunity of annexing to their crowns many considerable fiefs, either by purchase, or the extinction of the heirs; and thus the mischiefs which must always attend feudal governments were considerably lessened. With regard to the bad success of the croisaders, it was scarce possible that any other thing could happen them. The emperors of Constantinople, instead of assisting, did all in their power to disconcert their schemes. They were jealous, and not without reason, of such an inundation of barbarians. Yet, had they considered their true interest, they would rather have assisted them, or at least done neuter, than entered into alliances with the Turks. They followed the latter method, however, and were often of very great disservice to the western adventurers, which at last occasioned the loss of their city. But the worst enemies the croisaders had were their own internal feuds and dissensions. They neither could agree while marching together in armies with a view to conquest, nor could they unite their conquests under one government after they had made them. They set up three small states, one at Jerusalem, another at Antioch, and another at Edessa. These states, instead of assisting, made war upon each other, and on the Greek emperors; and thus became an easy prey to the common enemy. The horrid cruelties they committed, too, must have inspired the Turks with the most invincible hatred against them, and made them resist with the greatest obstinacy. They were such as could have been committed only by barbarians inflamed with the most bigoted enthusiasm.

CROISES, or **CROIZES**: the knights of St. John of Jerusalem, instituted for the defence and protection of pilgrims, were particularly so called, from a cross they wore as a badge.

CROISHTARICH, a military signal among the ancient Caledonians, similar to the Crantara of the S. Britons.

CROISIERS, a religious order founded in honour of the dis-

covery of the cross by the empress Helena. They were, till of late, dispersed in several parts of Europe, particularly in the Netherlands, France and Bohemia. Those in Italy were suppressed even before the late revolutions. These religious follow the rule of St. Augustine. They had in England the name of Crouched Friars.

CROIX, Sr. a river which forms part of the boundary line between the United States and the British province of New Brunswick.

CROIX SUR MEUSE, a town of France in the department of Meuse, 12 miles S. S. E. of Verdun.

CROMAC WATER, a romantic lake of Cumberland between Buttermere and Lowes water.

CROMARTY, [from *Crom Ba Gael*, i. e. Crooked bay,] a county of Scotland, comprehending part of a peninsula bounded on the N. by the bay of Cromarty; on the E. and S. by the Moray Frith, and on the W. by Ross-shire.

CROMARTY, the capital of the county. Lon. 3. 53. W. Lat. 57. 44. N.

CROMER, a town of England, on the N. E. coast of Norfolk, chiefly inhabited by fishermen. It is 23 miles N. of Norwich.

CROMLECH, or **CROMLEH**, in British antiquity, huge, broad, flat stones, raised upon other stones set up on end. They are common in Anglesey. See Plate XLVII. fig. 17, 18. These monuments are described fully by Mr. Rowland, by Dr. Borlase, and by Wormius, under the name of *Aræ*, or altars. Mr. Rowland, however, is divided in his opinion; for he partly inclines to their having been altars, and partly to their having been sepulchres: he supposed them to have been originally tombs, but that in after times sacrifices were performed upon them to the heroes deposited within. Cromlech is by some derived from the Armorican word *crum*, crooked or bowing, and *leh*, stone, alluding to the reverence which persons paid to them by bowing. Rowland derives it from the Hebrew words *carem huach*, signifying a "devoted or consecrated stone." They are called by the Welsh, *coetne Arthor*, or Arthur's quoits, it being a custom in Wales, as well as Cornwall, to ascribe all great or wonderful objects to king Arthur, the hero of those countries.

CROMWELL, **OLIVER**, Lord Protector of the commonwealth of England, one of the most extraordinary personages mentioned in history, was the son of Mr. Robert Cromwell of Hinchinbrooke in the county of Huntingdon, by a lady of the name of Stuart; by some said to have been descended from the royal family. His paternal ancestors were of very honourable extraction: but no ways related to Thomas Cromwell earl of Essex. Their name was originally Williams, but afterwards changed to Cromwell. Oliver was born in the parish of St. John, Huntingdon, where his father mostly lived, on the 24th or 25th of April 1599, and educated at the free school of that town. It is related by authors of unsuspected veracity, that when at school he gave many signs of a very turbulent and restless disposition. At the age of 21, he married Elizabeth, daughter of Sir James Bouchier of Essex. He continued at Huntingdon, where he settled after his marriage, till an estate of between 400*l.* and 500*l.* per annum devolved to him by the death of his uncle Sir Thomas Stuart. This induced him to remove to the isle of Ely where the estate lay, and here he embraced the puritanical doctrines. He was elected a member of the 3d parliament of Charles I. which met on the 20th Jan. 1628; and was a member of the committee for religion, where he distinguished himself by his zeal against popery. After the dissolution of that parliament, he returned again into the country, where he continued to express much concern for religion, to keep company with silenced ministers, and to invite them often to lectures and sermons at his house. Thus he brought his affairs again into a very indifferent situation; so that, by way of repairing the breaches he had made in his fortune, he took a farm at St. Ives, which he kept five years. But this scheme succeeded so ill, that he gave it up; and at last, chagrined with his disappointments, and by the treatment his party at that time received, he formed a design of going over to New England. In this, however, he was disappointed; the king issued out a proclamation against all such emigrations. Afterwards he removed to Ely, where he acquired celebrity by his gifts in prayer and preaching. In 1640 he was returned to parliament for the borough of Cambridge by the par-

tan interest. In the house he was a frequent speaker, vulgar, and vehement, always opposing the court, and attacking the church. He was in a great measure the cause of the war, as he was continually by his plots and contrivances urging matters to that extremity. In 1642, when parliament determined upon hostilities, Cromwell went to Cambridge, where he raised his troop of horse, and behaved with great inhumanity to the loyal members of the university. He soon acquired the rank of colonel, and a great reputation for military skill and valour. His men were well-disciplined, and animated with a strong portion of religious fanaticism, which their commander encouraged in such a manner that they acquired at the battle of Marston Moor, in 1644, the name of Ironsides. At the second battle of Newbury, Cromwell's behaviour obtained for him from his party the title of Saviour of the Nation. This party consisted of the independents, who had gained so great an influence in parliament as to pass the famous self-denying ordinance, by which all members of either house were excluded from commands in the army, with the particular exception of Cromwell, who, by this master-piece of policy, acquired an ascendancy over the army, and thus paved the way for his future advancement. He was now constituted lieutenant-general, and by his management the battle of Naseby was gained in 1645, which decided the fate of the royalists. This victory was followed by a series of successes, for which he was voted a pension of 2500*l.* per annum, and the thanks of the house. When the king was betrayed by the Scotch to the parliament, Cromwell determined to get him into his own power. This he effected by means of cornet Joyce in 1647. The same year he purged the house of commons, that is, he turned out those members who were not likely to be gained over to his purpose. The share he had in the murder of the king is too plain to need detail. He was present at the trial, and signed the warrant of execution. Soon after this a mutiny broke out in the army, which threatened dangerous consequences; but Cromwell, by punishing the ringleaders, put an end to it. In 1649 he went to Ireland, which he subdued, and leaving Ireton as deputy, returned to England in 1650; but his cruelties are regarded with horror and detestation in that kingdom to this day. He was now appointed commander-in-chief against the Scots, who had armed to restore Charles II. September 3, 1650, he gained the battle of Dunbar; and that day twelvemonth he defeated the king at Worcester. From this time he kept his eye on the sovereign power. He began this favourite project by moulding the army to his will; and having a party subservient to his wishes, he struck a bold stroke by dismissing the parliament and locking the door of the house. He then dissolved the council of state; after which, he called a council, composed of his officers. He next convened a mock representation of the nation, consisting of 142 persons, called, from one of the members, Barebone's parliament. This assemblage being a motley crew of ignorant fanatics, and the creatures of Cromwell, agreed to resign their authority; on which the council of officers assembled, and drew up an instrument declaring him protector of the commonwealth of England, Scotland, and Ireland: accordingly, Dec. 16, 1654, he was invested with this dignity in the court of chancery. The following year he called a parliament but finding that the members began with questioning his authority, he placed a guard at their door, and then made each member as he entered take an oath of allegiance to him. This parliament still continuing refractory, he dissolved them after sitting five months. A war broke out between England and Spain in 1655, in which Jamaica was taken, and Blake gained several splendid victories, and caused the English flag to be respected in the Mediterranean. One consequence was an alliance between the protector and France, and the delivery of Dunkirk to England, after its being taken by the united forces of the two countries. In 1656 he called another parliament, which gratified the protector by confirming his title and sanctioning his proceedings. He wanted now the title of king, but this was rejected by his most zealous friends; and finding the object unattainable, he abandoned it. However, he had the privilege granted him to make a sort of lords; and the title of protector being recognized, he was inaugurated with the pomp of a coronation in Westminster-hall. In 1658 he convened the two houses, and addressed them in the language usual for the kings of England; but none of the hereditary nobles would attend his mock parliament. Finding that he could not form any thing like a regular

establishment, he dissolved the assembly. In August of that year his favourite daughter, Mrs. Claypole, died, bitterly reproaching him for his conduct, which, with the publication of a pamphlet, by colonel Titus, entitled *Killing no Murder*, tending to prove the assassination of the tyrant a public duty, produced a slow fever, of which he died September 3, 1658. A very pompous funeral was performed at the public expence, from Somerset-house, with a splendor even superior to that bestowed upon crowned heads. Some have related that his body was deposited in Naseby-field; others, that it was wrapped in lead, and sunk in the Thames, to prevent any insult that might afterwards be offered to it. But it seems beyond doubt that it was interred at Westminster; as we are informed, that on the order to disinter him after the restoration, his corpse was found in a vault in the middle aisle of Henry VII.'s chapel. In the inside of the coffin, and on the breast of the corpse, was laid a copper-plate finely gilt, inclosed in a thin case of lead. On one side of this plate were engraven the arms of England impaled with those of Oliver, and on the reverse the following legend: *Oliverius Protector Reipublicæ Angliæ, Scotiæ, et Hiberniæ, natus 29 Aprilis 1599, inauguratus 16 Decembris 1653, mortuus 3 Septembris ann. 1658, hic situs est.* Cromwell was of a robust frame of body, and of a manly, though not agreeable aspect. His nose being remarkably red and shining, was often made the subject of ridicule. He left only two sons, Richard and Henry; and three daughters; one married to General Fleetwood, another to Lord Fauconberg, and a third to Lord Rich.

CROMWELL, RICHARD, eldest son of Oliver, was by his father appointed successor to the protectorship, but was soon deposed by the army. They discharged his debts, took all the household stuff, plate, &c. gave him a protection for six months, and so he retired. He was not qualified to support the station gained by the aspiring talents of his father. He was of a moderate temper, and untainted with either the ambitious or fanatical spirit which his father had so successfully cultivated. The late Lord Gardenstone, in his Remarks on English Historians, says, "Had Richard possessed the abilities of his father, we should have heard no more of the posterity of the holy martyr." On the restoration he went abroad; but returned in 1680 under the assumed name of Clark, and settled at Cheshunt in Hertfordshire, where he lived privately, and died in 1712, aged 86; leaving several children, whose posterity are still in existence.

CROMWELL, THOMAS, Earl of Essex, was the son of a blacksmith, at Putney, and born in 1498. Without a liberal education, but endowed with a strong natural genius, he considered travelling as the proper means of improving his understanding; and to this early token of his sound judgement he stood indebted for the high rank and distinguished honours he afterwards enjoyed. He became by degrees the confidential favourite and prime minister of Henry VIII. and from the moment he acquired any authority in the cabinet, he employed it in promoting the reformation, to his zeal for which he became a victim; for, the more firmly to secure the Protestant cause, he contrived to marry the king to Ann of Cleves, whose friends were all Lutherans. Unfortunately Henry took a disgust to this lady, which brought on Cromwell's ruin; the king, with his usual cruelty and caprice, taking this opportunity to sacrifice this minister to the Roman Catholic party, to whom he seemed desirous of reconciling himself, as soon as he had Catherine Howard in view. Cromwell was a great politician, and a good man; but, like most statesmen, was guilty of great errors. In his zeal for the new religion, he had introduced the unjustifiable mode of attainder in cases of treason and heresy: and his enemies, who were numerous (consisting of two classes, the ancient nobility and gentry, who were enraged to see the highest honours bestowed on a man of his mean extraction, and the Roman Catholics, who detested him,) having preferred many complaints against him, availed themselves of his own law. He was attainted of treason, and heresy, convicted unheard, and beheaded in 1540. He was the chief instrument of the suppression of the abbeys and monasteries, and of the destruction of images and relics; to him also we are indebted for the institution of parish registers of births, marriages, and burials.

CRONACH, a fortified town of Germany, in the circle of Franconia, 25 miles N. E. of Bamberg.

CRONENBURG, a town of Germany, in the circle of the Upper Rhine, 10 miles N. of Frankfort.

CRONENBURG, or **CRONBORG**, a strong fortress of Denmark, in the isle of Zealand, at the entrance of the Sound, where the Danes take toll of such ships as are bound for the Baltic.

CRONIENES, feasts celebrated at Athens in the month Cronius, in honour of Saturn, answering to the Saturnalia of the Romans.

CRONIUS, or **CHRONIUS**, in chronology, the ancient name of the Athenian month Hecatombræon; which was the first of their year, and answered to the latter part of our June, and beginning of July.

CRÖNSNIERE, an island on the coast of France, about five miles in circumference.

CRONSTADT, a sea-port town of Russia, where the greatest part of the navy is situated. It stands upon the island of Retusarl in the Gulph of Finland.

CRONSTADT, or **KRONSTADT**, a town of Transylvania, near the frontiers of Moldavia, 60 miles E. N. E. of Hermanstadt.

CROSIER, or **CROZIER**, a shepherd's crook; a symbol of pastoral authority, consisting of a gold or silver staff crooked at the top, carried occasionally before bishops and abbots, and held in the hand when they give the solemn benedictions. The custom of bearing a pastoral staff before bishops is very ancient. Regular abbots are allowed to officiate with a mitre and crosier. Among the Greeks none but a patriarch had a right to the crosier.

CROSIER, in astronomy, four stars in the southern hemisphere in the form of a cross, serving those who sail in south latitudes to find the antarctic pole.

CROSLET, in heraldry, is when a cross is crossed again at a small distance from each of the ends. Upton says it is not so often borne by itself in arms as other crosses are, but often in diminutives, that is, in small croslets scattered about the field. See **HERALDRY**.

CROSS, [*crux*, Lat.] in antiquity, a species of punishment, or rather the instrument wherewith it was inflicted, consisting of wood placed crosswise, either crossing at right angles at the top like a T, or in the middle of their length like an X. The cross to which our Saviour was fastened, and on which he died, was of the former kind; being thus represented by old monuments, coins, and crosses; and St. Jerom compares it to a bird flying, a man swimming, or praying with his arms extended. The punishment of the cross was common among the Syrians, Egyptians, Persians, Africans, Greeks, Romans, and Jews. It was the most dreadful of all others, both for the shame and pain of it: and so scandalous, that it was inflicted as the last mark of detestation upon the vilest of people. It was the punishment of robbers and murderers, provided that they were slaves too; but if they were free, and had the privilege of the city of Rome, it was thought too infamous a punishment for such a one, let his crimes be what they would. The Mosaic law ordained, that the bodies of persons executed should not be left upon the tree after sun-set. Deut. xxi. 22. The Jews confess, that they crucified people in their country, but deny that they inflicted this punishment upon any one alive. They first put them to death, and then fastened them to the cross either by the hands or neck. But there are indisputable proofs of their crucifying men frequently alive. Before the crucifixion the criminal was generally scourged with cords; sometimes little bones, or pieces of bones, were tied to these scourges, that the condemned person might suffer more severely. It was also a custom, that he who was to be crucified should bear his own cross to the place of execution. In this manner Christ was compelled to bear his own cross; and as he sunk under the burden, Simon the Cyrenian was constrained to bear it after him and with him. But whereas it is generally supposed that our Lord bore the whole cross, *i. e.* the long and transverse part both, this seems to be a thing impossible; and therefore Lipsius (in his treatise "De Supplicio Crucis") has set the matter in a true light, when he tells us that Jesus only carried the transverse beam; because the long beam, or the body of the cross, was either fixed in the ground before, or made ready to be set up as soon as the prisoner came: and from hence he observes, that painters are very much mistaken in representing our Saviour carrying the whole cross. There are several ways of crucifying; sometimes the criminal was fastened with cords to a tree, sometimes he was crucified with his head downwards. This way St. Peter chose out of respect to his master Jesus Christ, not thinking himself worthy to be crucified like him; though the common way of crucifying was by fastening the criminal with nails, one

through each hand, and one through both feet, or one through each of them: for this was not always performed in the same manner. The ancients sometimes represent Jesus Christ crucified with four nails, and sometimes with three. The text of the Gospel shews clearly, that Jesus Christ was fastened to the cross with nails; and the Psalmist (xxii. 17,) had foretold long before, that they should pierce his hands and his feet: but there are great disputes concerning the number of these nails. The Greeks represent our Saviour as fastened to the cross with four nails; in which Gregory of Tours agrees with them, one at each hand and foot. But several are of opinion, that our Saviour's hands and feet were pierced with three nails only, *viz.* one at each hand, and one through both his feet: and the custom of the Latins is rather for this last opinion; for the generality of the old crucifixes made in the Latin church have only three nails.

CROSS, **EXALTATION OF THE**, an ancient feast, held on the 14th of September, in memory of this, that Heraclitus restored to Mount Calvary the true cross in 642, which had been carried off 14 years before by Cosroes king of Persia, upon his taking Jerusalem from the emperor Phocas.

CROSS, **INVENTION OF THE**, an ancient feast, solemnized on the 3d of May, in memory of the true cross of Christ being found by St. Helena, the mother of Constantine, deep in the ground on Mount Calvary; where she erected a church for the preservation of part of it: the rest being brought to Rome, and deposited in the church of the Holy Cross of Jerusalem.

CROSS, **ORDEAL OF THE**, a species of trial frequently practised in the days of superstition. See **ORDEAL**.

CROSS, **ORDER OF THE**, or **CROISADE**, an order of ladies instituted in 1668, by the empress Eleonora de Gonzagua, wife of the emperor Leopold I. on occasion of the miraculous recovery of a little golden cross, wherein were inclosed two pieces of the true cross, out of the ashes of part of the palace. The fire is said to have burnt the case wherein it was inclosed, and melted the crystal, yet the wood remained untouched!

Cross, in heraldry, is defined by Guillim, an ordinary composed of fourfold lines; whereof two are perpendicular, and the other two transverse; for so we must conceive of them, though they be not drawn throughout, but meet by couples, in four right angles, near the fess-point of the escutcheon. See **HERALDRY**. This bearing was first bestowed on such as had performed, or at least undertaken, some service for Christ, and the Christian profession; and is held by divers the most honourable charge in all heraldry. It came into frequent use from the ancient expeditions into the Holy Land; and the holy war pilgrims, after their pilgrimage, taking the cross for their cognizance; the ensign of that war being the cross. In those wars, says Mackenzy, the Scots carried St. Andrew's cross; the French a cross argent; the English a cross or; the Germans, sable; the Italians, azure; the Spaniards, gules. Leigh mentions 46 several crosses; Sylvanus Morgan, 26; Upton, 30; Johannes de Bado Aureo, 12.

CROSS, **ST. GEORGE'S**, or the red cross, in a field argent, is now the standard of England; of which that saint is the reputed patron.

Cross, in law, instead of a signature to a deed, &c. is derived from the Saxon practice of affixing the sign of the cross, whether they could write or not.

Cross, in mining, two nicks cut on the superficies of the earth, thus +, which the miners make when they take the ground to dig for ore. This cross gives the miners three days liberty to make and to set on stones. As many of these crosses, as the miner makes, so many mears of ground he may have in the vein, provided he set on stones within three days after making his cross or crosses. But if he make but one cross, and a by-stander makes the second, and a stranger makes the third, every one is served with the next mear, according as they have first or last, sooner or later, made their cross or crosses upon the ground.

CROSS-BAR SHOT, a round shot, or great bullet, with a bar of iron put through it.

CROSS-BAR SHOT, is used in sea-fights to destroy the enemy's rigging. The iron bar projects six or eight inches on each side.

CROSS-BEARER, [*port-croix*, *cruciger*,] in the Latin church, the chaplain of an archbishop or primate, who bears a cross before him on solemn occasions.

CROSS-

CROSS-BEARERS also denotes certain officers in the inquisition, who make a vow before the inquisitors or their vicars to defend the Catholic faith, though with the loss of fortune and life. Their business is to provide the inquisitors with necessaries.

CROSS-BILL, in chancery, is an original bill, by which the defendant prays relief against the plaintiff.

CROSS-BILL, in ornithology. See **LOXIA**.

CROSS-BOW. See **ARCHERY**, **BALLISTA**, and **BOW**.

CROSS-GRAINED STUFF, in joinery. Wood is said to be cross-grained, when a bough or branch has shot out of it; for the grain of the branch shooting forward, runs athwart that of the trunk. In wood well grown this defect is scarce perceivable, except in working; but in deal boards these boughs make knots.

CROSS-JACK, [pronounced *cro-ject*,] a sail extended on the lower yard of the mizen-mast, which is hence called cross-jack yard. This sail however, has generally been found of little service, and is therefore very seldom used.

CROSS-PIECE, a rail of timber extended over the windlass of a merchant-ship from the knightheads to the belfry.

CROSS-STAFF, [from *cross* and *staff*,] an instrument commonly called the forestaff, used by seamen to take the meridian altitude of the sun and stars.

CROSS-TINE, in husbandry, a method of harrowing land, consisting in drawing the harrow up the interval it went down before, and down that which it was drawn up.

CROSS-TREES, certain pieces of timber, supported by the cheeks and trestle-trees, at the upper ends of the lower masts, athwart which they are laid to sustain the frame of the top.

CROSS-TREE YARD is a yard standing square, just under the mizen-top, and to it the mizen-top is fastened below.

CROSSEN, a duchy of Germany, in the circle of Upper Saxony.

CROSSEN, the capital of the duchy, 21 miles S. E. of Frankfurt.

CROSSOSTYLIS, in botany, a genus of the monadelphia polyandria class and order. Calyx simple, four-parted; corolla four-petaled; nectary twenty, corpuscles between the filaments; stigmas four-jagged. There is but one species, viz. *C. biflora*, a native of the Society Islands.

CROSTOLO, a department of the late Cisalpine republic; which comprehended the duchy of Reggio.

CROTALARIA, **RATTLE-WORT**; a genus of the decandria order, and diadelphia class of plants; natural order, Papilionacæ. Legumen turgid, inflated, pedicellated; filaments coalited with a fissure on the back. There are thirty-two species, natives of warm climates.

CROTALO, an instrument in modern military music, resembling the ancient Crotalum. The Turks are the first, among the moderns, who introduced the use of it for their troops. It is now common in Florence, and other territories on the continent. It is the same with the ancient cymbalum.

CROTALUM, an ancient kind of musical instrument, found on medals, in the hands of the priests of Cybele. It differed from the sistrum, though authors frequently confound the two. It consisted of two little brass plates or rods, which were shaken in the hand, and in striking against each other made a noise.

CROTALUS, the **RATTLE-SNAKE**, in zoology, a genus of the class and order amphibia serpentes. Generic character: scuta on the abdomen; scuta and scales beneath the tail; rattle at the end of the tail. There are five species. The *C. horridus*, or banded rattle-snake, inhabits Carolina in North America, and is from three to five feet in length, of a yellowish brown colour. The rattle is fixed at the end of the tail, and is composed of dry and hollow bones, nearly of the same form and size. See Plate LXVII. It is of a brown colour, composed of several horny, membranous cells, of an undulated pyramidal figure. These are articulated within one another in such a manner that the point of the first cell reaches as far as the basis of the protuberant ring of the third, and so on; which articulation, being very loose, gives liberty to the parts of the cells that are inclosed within the outward rings to strike against the sides of them, and so to cause the rattling noise which is heard when the snake shakes its tail. This is the most inactive and slow moving of all the snakes, and is never the aggressor except in what it preys upon. The use of the rattle has not a little perplexed naturalists, and some have considered it de-

signed to warn other animals of their danger, while others have regarded it as intended, indeed, to sound the alarm of peril, but such an alarm as is followed by consternation, under which the affrighted victims experience a prostration of all its faculties, and is bereaved at once of intelligence and motion. These animals were supposed to possess the power of charming others, or of operating upon them by some ineffable power, to induce them to drop from their stations into the very mouth of the destroyer. This opinion, long prevailing, but now exploded, not unnaturally arose from the circumstance just mentioned. The appearance of the rattle-snake to these creatures, who instantly recognize it for their mortal enemy, and the sound of that instrument, which is as it were the signal of execution, impresses them occasionally with a degree of terror, which withers all the energies of their frame, and relaxing their hold on the branches of trees, causes them to drop almost lifeless into the mouth of their adversary. The bite of these animals is not only poisonous, but rapidly fatal, and has been known to kill a man in two minutes. When the bite is received in a fleshy part, the Indians apply the knife with all possible speed. In slight cases they have recourse to various roots; and in some cases they suck the wound; but when a principal vein or artery is penetrated, with the animal's full strength, they abandon their case as hopeless, and apply no remedy whatever. In the territories of America, but thinly inhabited, rattle-snakes are abundant; but in others they are almost exterminated. They are seldom seen farther north than Lake Champlain, or south than Brazil. They are extremely fond of frogs, and are found generally where these are most to be met with. In summer they are generally seen in pairs; in winter they are gregarious, and secure themselves from the rigours of the season by withdrawing deeply in the earth, whence a fine day sometimes induces them to appear, but in a state of great weakness, in which they may be attacked without danger, and in which a single person has sometimes destroyed with a stick several scores in a single morning. The largest ever seen by Catesby, who, while in Carolina, paid particular attention to them, was about eight feet long, and nearly nine pounds in weight.

CROTCHES, in ship-building, very crooked timbers in the hold or bread-room, from the mizen-step aft, fayed cross the keelson, to strengthen the ship in the wake of the half-timbers.

CROTCHET, in music, one of the notes or characters of time, which is equal to half a minim, and double of a quaver.

CROTCHET, in printing, a sort of straight or curved line, always turned up at each extreme; serving to link such articles as are to be read together; and used in analytical tables, &c. for facilitating the divisions and subdivisions of any subject.

CROTCHETS are also marks or characters, serving to inclose a word or sentence, which is distinguished from the rest, being generally in this form [] or this ().

CROTO, or **CROTON**, in ancient geography, a city of the Brutii, in Italy, built by the Achæans; 150 stadia to the N. of Lacinium, and in the neighbourhood of Metapontum.

CROTON, in botany, **WILD RICINUS**: a genus of the monadelphia order, and monœcia class of plants; natural order, Tri-côcæ. Male calyx cylindrical, quinque-dentated; corolla pentapetalous; stamina from ten to fifteen; female calyx polyphylous; no corolla; three bifid styles; capsule trilocular; seed one. There are fifty-three species, mostly herbaceous and shrubby plants.

CROTONA, an ancient city of Naples, in the province of Calabria Ultra, originally built by the Greeks. It is seated upon the mouth of the Essaro, 50 miles E. of Cosenza.

CROTOPHAGI, in ornithology, a genus of birds of the order pica. Bill thin, compressed, greatly arched, half oval, and cultrated at top; nostrils round; tongue flat, pointed at the end; tail consists of ten feathers; toes placed two and two. Four species are known.

C. ANI is about the size of a blackbird: the colour is black, in some parts glossed with purple, and about the neck faintly tinged with green on the margins: the base of the bill is furnished with black bristles, which turn forwards: the eyelids have long hairs like eye-lashes: the tail is six inches long, and much cuneated; and the legs are black. This species is found in Jamaica, St. Domingo, and other islands in the West Indies; also at Cayenne and

and other parts of South America. Contrary to all other birds, they have the singularity of many laying in the same nest; to make which, they all unite in concert, and after laying their eggs, sit on them close to each other in order to hatch them, each unanimously striving to do the best for the general good; and when the young are hatched, the parents, without reserve, do the best to feed the whole flock. Still a greater singularity occurs, which is, that as soon as each female lays her eggs she covers them with leaves, doing the same thing whenever she is obliged to leave the nest for food: this might be necessary in a cold climate; but why it should be wanted in a hot one seems not clear, especially as it has not been observed in other birds.

CROTOY, a town of France, in the department of Somme, 16 miles N. W. of Abbeville.

CROUP, or **CYNANCHE TRACHEALIS**, a disease of the trachea, to which children are liable. See **MEDICINE**.

CROUPADES, higher leaps than those of corvets, that keep the fore and hind quarters of the horse in an equal height, so that he trusses his legs under his belly without jerking.

CROUSAZ, **JOHN PETER DE**, a learned philosopher and mathematician, born in 1663. Having made great progress in the mathematics and the philosophy of Des Cartes, he travelled to Geneva, Holland, and France; was successively professor in several universities; and at length was chosen governor to Prince Frederic of Hesse-Cassel, nephew to the King of Sweden. He wrote many works; the most esteemed of which are, 1. His *Logic*, in 6 vols. 8vo. in 1741. 2. *A Treatise on Beauty*. 3. *A Treatise on the Education of Children*, 2 vols. 12mo. 4. *Several Treatises on Philosophical and Mathematical Subjects*, &c. He died at Lausanne, in 1748.

CROUTE, **SOUR CROUTE**, or **KROUTE**, [*Sauer kraut*, Germ. *z. a.* sour herb,] a preparation of cabbage, which has been found of sovereign efficacy as a preservative from the sea scurvy in long voyages. The process for making it is as follows: the soundest and most solid cabbages are selected for this use, and cut very small, commonly with an instrument made for this purpose, resembling the plain for slicing cucumbers. A knife is used when the preparation is made with greater nicety. The cabbage thus minced is put into a barrel in layers, hand high, and over each is strewed a handful of salt and caraway seeds; in this manner it is rammed down with a rammer, stratum super stratum, till the barrel is full; when a cover is put over it, and pressed down with a heavy weight. After standing some time in this state, it begins to ferment; and it is not till the fermentation has entirely subsided, that the head is fitted to it, and the barrel is finally shut up and preserved for use. There is not a drop of vinegar employed in this preparation.

CROW, in ornithology. See **CORVUS**.

CROWD SAIL, in the sea language, is to carry an extraordinary force of sail upon a ship, in order to accelerate her course on some important occasion; as in pursuit of, or flight from, an enemy; to escape any immediate danger, &c.

CROWEA, in botany, a genus of the class decandria, order monogynia. Calyx five-parted; petals five, sessile; stamina flat, subulate; capsules five, united; seeds coated. One species, native of Australasia.

CROWFOOT. See **RANUNCULUS**.

CROWFOOT, on ship-board, a complication of small cords spreading out from a long block, like the smaller parts which extend from the back-bone of a herring. It is used to suspend the ownings; or to keep the top-sails from striking violently, and fretting against the tops. See Plate XLVII. fig. 19.

CROWLAND, a town in Lincolnshire, seated in the fens, in a dirty soil, 12 miles N. N. E. of Peterborough.

CROWLE, a town in Lincolnshire, in the isle of Axholm, 36 miles N. of Lincoln.

CROWN, [*courome*, Fr. *kroone*, Dut. *corona*, Lat.] an ornament worn on the head by kings, sovereign princes, and noblemen, as a mark of their dignity.

CROWN, is also used to signify the possessions and dignity of a king. The crown of England, according to Sir William Blackstone, is, by common law and constitutional custom, hereditary; and this in a manner peculiar to itself: but the right of inheritance may from time to time be changed or limited by act of parliament, under which limitations the crown still continues hereditary. See **SUCCESSION**.

CROWN OFFICE, an office belonging to the court of King's Bench, of which the king's coroner or attorney is commonly master. In this office, the attorney-general and clerk of the crown severally exhibit informations for crimes and misdemeanors at common law, as in the case of batteries, conspiracies, libelling, &c. on which the offender is liable to pay a fine to the king.

CROWN, PLEAS OF THE. See **ARRAIGNMENT**, and **PLEA**.

CROWN, in commerce, is a general name for coins, both foreign and domestic, of or near the value of five shillings sterling. In its limited sense, crown is only applicable to the British coin of that name, which is worth five shillings and equivalent to six livres French money: but, in its extensive sense, it takes in several others; as the French *écu*, which we call the French crown, struck in 1641 for sixty sols, or three livres; also the patagon, dollar, ducatoon, rixdollar, and piece of eight.

CROWN, in an ecclesiastical sense, is used for the clerical tonsure; the mark of the Romish ecclesiastics. This is a little circle of hair shaved off from the crown of the head; more or less broad, according to the quality of the orders received.

CROWN, in jewellery work, the upper work of the rose diamond, which all centres in the point at the top, and is bounded by the horizontal ribs.

CROWNS, ANCIENT. The first crowns were no more than a bandelet drawn round the head, and tied behind, as we still see it represented on medals round the heads of Jupiter, the Ptolemies, and kings of Syria. Afterwards they consisted of two bandelets; by degrees they took branches of trees of divers kinds; at length they added flowers, insomuch that Claudius Saturninus says, there was not any plant whereof crowns had not been made.

CROWNS, ANCIENT JEWISH. In scripture there is frequent mention of crowns, and the use of them seems to have been very common among the Hebrews. The high priest wore a crown, which was a fillet of gold placed upon the forehead, and tied with a ribbon of hyacinth colour, or azure blue. It seems that private priests, and even common Israelites, wore also a sort of crowns, since God commanded Ezekiel not to take off his crown, nor assume the marks of one in mourning. This crown was only a ribbon or fillet, with which the Jews and several people in the east girt their heads.

CROWNS, ANCIENT ROMAN. The Roman emperors had four kinds of crowns, still seen on medals, viz. a crown of laurel, a radial or radiating crown, a crown adorned with pearls and precious stones, and the fourth a kind of bonnet or cap, something like the mortar. The Romans had also various kinds of crowns, which they distributed as rewards of merit; which were considered as marks of nobility to the wearers; and upon competitions with rivals for rank and dignities, often determined the preference in their favour: such as,

1. **CROWNS, ATHLETIC**, those generally bestowed upon victors at the public games.

2. **CROWNS, CAMP**, or **TRENCH**, [*corona castrenses*, or *vol-lares*,] were circles of gold, raised with jewels or palisades; the rewards of those who first forced the enemy's entrenchments. See Plate XLVII. fig. 20.

3. **CROWNS, CIVIC**, were made of branches of green oak, and given to such as had saved the life of a citizen. See fig. 21.

4. **CROWNS, GOLDEN**, [*corona aurea*,] without any distinguishing term or form, are mentioned as often bestowed upon the soldiers for extraordinary acts of bravery.

5. **CROWNS, LAUREL**, were peculiarly appropriated, though not exclusively, to eminent poets, orators, &c.

6. **CROWNS, MURAL**, were in the form of a circle of gold, indented and embattled. See Fig. 22. They were given to such as first mounted the wall of a besieged place, and there lodged a standard.

7. **CROWNS, NAVAL**, or **ROSTRAL**, were composed of a circle of gold, with ornaments representing beaks of ships, and given to the captain who first grappled, or the soldiers who first boarded, an enemy's ship. See Fig. 23.

8. **CROWNS, OBSIDIONAL**, or **GRAMINEOUS**, [*obsidionales*, or *gramineae*,] were made of grass growing on the place, where a general had delivered a Roman army from a siege, in the form represented in fig. 24, and presented to him as a mark of honour.

9. **CROWNS, OVAL**, were made of myrtle, and presented to generals, entitled to the ovation, or less triumph, fig. 25.

10. **CROWNS, RADIAL**, were bestowed on emperors, upon their deification, fig. 26.

11. **CROWNS, TRIUMPHAL**, consisted at first of wreaths of laurel, but were afterwards made of gold, and given to such generals as had the honour of a triumph, fig. 27.

CROWNS, MODERN. See **HERALDRY**.

CROWN, in geometry, is a plane ring included between two concentric perimeters, and is generated by the motion of some part of a right line round the centre, the said moving part not being contiguous to the centre. The area of a crown will be had by multiplying its breadth by the length of the middle periphery; for

$$a + w$$

a series of terms in arithmetic progression being $n \times \frac{a + w}{2}$, that

is, the sum of the first and last multiplied by half the number of terms, the middle terms must be $\frac{a + w}{2}$; therefore that multiplied

by the breadth, or sum of all the two terms, will give the crown.

CROWN OF COLOURS, certain coloured rings, which, like halos, appear about the body of the sun or moon, but of the colours of the rainbow, and at a less distance than the common halos. These crowns sir Isaac Newton has shewn to be made by the sun's shining in a fair day, or the moon in a clear night, through a thin cloud of globules of water, or hail all the same bigness. And according as the globules are greater or less, the diameters of these crowns will be larger or smaller; and the more equal these globules are to one another, the more crowns of colours will appear, and the colours will be the more lively.

CROWN-GLASS. See **GLASS**.

CROWN IMPERIAL. See **FRITILLARIA**.

CROWN ISLAND, an island in the eastern sea, near the N. E. coast of New Guinea. Lon. 146. 50. E. Lat. 5. 18. S.

CROWN-POINT, a township of New York, in Clinton county.

CROWN-WHEEL OF A WATCH, the upper wheel next the balance, which by its motion drives the balance, and in royal pendulums is called the swing-wheel.

CROWN-WORK, in fortification, an outwork having a very large gorge, generally the length of the curtain of the place, and two long sides terminating towards the fields in two demi-bastions, each joined by a particular curtain to a whole bastion, which is the head of the work. The crown-work is intended to inclose a rising ground, or to cover the head of a retrenchment. See **FORTIFICATION**.

CROW-NET, an invention for catching wild fowl in winter, which may be used in the day-time. It is made of fine pack-thread; the meshes should be two inches wide, the length about ten yards, and the depth three; it must be verged on the side with good strong cord, and stretched out very stiff on long poles prepared for that purpose. At the proper place, open it, and lay it out at its full length and breadth; then fasten the lower end of it all along the ground, so as only to move it up and down; the upper end of the net must stand extended on the long cord; the further end thereof being staked first to the earth by a strong cord about five yards from the net. Place this cord in an even line with the lower edge of the net. The other end must be at least 25 yards distant to reach into some natural or artificial shelter, where one may lie concealed from the fowl, otherwise no success can be expected. The net must be placed in such exact order that it may give way to play on the fowl on the least pull of the cord, which must be done smartly, lest the fowl should escape. This net may be used for pigeons, crows, or other birds, on corn-fields newly sown; also in stubble-fields; provided the stubble conceals the net from the birds.

CROWNING, in architecture, is understood, in the general, of any thing that terminates or finishes a member or decoration. Thus, a cornice, a pediment, &c. are called crownings, the abacus is said to crown the capital; and any moulding is said to be crowned when it has a fillet over it; and a niche is crowned when it is covered with a capital.

CROWNING, in sea language, denotes the finishing part of a knot made at the end of a rope. It is performed by interweaving the ends of the different strands artfully amongst each other, so as they may not become loosened or untwisted. They are useful in all kinds of stoppers.

CROW'S-BILL, among surgeons, a kind of forceps for drawing bullets and other foreign bodies out of wounds.

CROWTH, or **CRUTH**, a kind of musical instrument anciently in use among the common people in Wales. It is of the fiducial kind, somewhat resembling a violin, 12 inches in length, and an inch and an half in thickness. See **PLATE XXVII**.

CROYDON, a town of England, in Surrey, near the head of the river Wandel.

CRUANACARRA, a small island in the Atlantic, on the W. coast of Ireland.

CRUANAKILLY, an island on the W. coast of Ireland.

CRUCIANELLA, **PETTY-MADDER**, a genus of the monogynia order, and tetrandria class of plants; natural order, *Stellatae*. Corolla monopetalous, funnel-shaped; calyx diphyllous; seeds two, linear. Nine species, herbaceous plants, natives of warm climates.

CRUCIBLE, a chemical vessel made of earth, and so tempered and baked as to endure the greatest fire. They are used to melt metals, and to flux minerals, ores, &c. See **CHEMISTRY**.

CRUCIFORM, in botany, a term applied to cross-shaped flowers, or flowers consisting of four petals, which spread at the top in form of a cross. Of this kind is the stock-gillyflower, &c.

CRUCITA, in botany, a genus of the digynia order, and tetrandria class of plants. Interior calyx tetraphyllous, exterior calyx triphyllous; no corolla; seed one.

CRUDEN, ALEXANDER, M. A. an author, whose literary labours will ever entitle him to the gratitude of all who wish to study the scriptures, was the son of Mr. William Cruden, merchant, and one of the magistrates of Aberdeen. He was born in 1701, and educated at the grammar-school of that city. He studied divinity at the Marischal College, and intended to follow that profession; had he not been prevented by a misfortune, to which kings and beggars have been equally subjected, and to which men of uncommon genius are perhaps peculiarly liable, if we may credit the poet; that

"Great wit to madness oft is near allied,

"And thin partitions do the bounds divide."

The cause of his insanity has been variously accounted for; but the most probable reason assigned, appears to have been disappointment in love; wherein, to the vexation of repeated refusals, was added the horror of hearing, that the object of his affection was with child to her own brother. Being a clergyman's daughter, she was sent out of the country, and never returned. Mr. Cruden never after mentioned her name, but with the most tender compassion and the bitterest grief. He was confined for some time after in a mad-house at Aberdeen. Being released, he went to London in 1722, as a private tutor; in which employment he also spent some years in the Isle of Man. About 1732, he returned to London, and acted as a bookseller, and corrector of the press. His shop was under the royal exchange. In 1733, he began to compile that important work, which he had long meditated, "A Complete Concordance of the Holy Scriptures of the Old and New Testaments." If the merit of labour only be allowed, it must be acknowledged that he bestowed labour to which no addition can be made, accompanied by a perseverance with hardly any interval. But he had the additional merit of both forming the plan and executing it. The work was dedicated to Q. Caroline, who had given him reason to expect a gratuity on presenting it. But a few days before its publication, Cruden lost his royal patroness by the queen's death. His affairs were now embarrassed; his hopes were gone, and in such circumstances it is not surprising, that he should have had a return of his mental disorder; which rendered it necessary again to confine him. Upon his release, he avenged himself on his keepers, &c. by publishing a pamphlet entitled, "The London Citizen, exceedingly injured, giving an account of his adventures, during his severe and long campaign at Bethnal Green, for nine weeks and six days," &c. After this he lived chiefly by correcting the press; particularly of the Greek and Roman classics, which were published under his inspection, with great accuracy. In such occupations he spent several years with the strictest attention and fidelity to the booksellers who employed him, till a third attack of his disorder obliged his friends to confine him once more. When released, he published his case, under the whimsical title of "The Adventures of Alexander the Corrector." This work exhibited a faithful picture of a wild mind; various, whimsical, serious, and jocose. In private life he was courteous and affable; in religious sentiments a strict Calvinist, but by no means intolerant. In 1769, he re-visited Aberdeen, where

where he spent about a year; after which he returned to London; and on the 1st of Nov. 1770, was found dead on his knees in a posture of praying. He had for some time before been troubled with an asthma.

CRUDIA, in botany, a genus of the decandria monogynia class and order. Calyx one-leaved, with a two-cleft border; no corolla; filaments dilated at the base; capsule orbicular; about two-seeded. Two species, viz. the spicata and aromatica, found in Guiana.

CRUISE, [from the Ger. *kruiss*, across,] signifies to cross to and fro, to sail up and down within a certain space of the sea, called the cruising latitude, in quest of vessels, or fleets of an enemy, &c.

CRUISERS, in the navy, are small men of war used in the channel, and elsewhere, to secure our merchant-ships and vessels from the enemy's small frigates and privateers. They are generally such as sail well, and are commonly well manned: and indeed the safety of the trade in the channel, and up and down the soundings, and other places, requires the constant keeping out of such ships at sea.

CRUIT, an island in the Atlantic, on the N. W. coast of Ireland.

CRUMENTATA, among zoologists, animals furnished with a pouch or bag, wherein to receive their young in time of danger; as the opossum.

CRUMP, an island, N. E. of Antigua, about one mile long. Lon. 61. 25. W. Lat. 17. 14. N.

CRUOR, sometimes signifies the blood in general; sometimes only the venous blood; and sometimes extravasated or coagulated blood; but is most frequently used for the red globules of the blood, in contradistinction to the limpid or serous part.

CRUPPER, [from *croupe*, Fr. the buttocks of the horse,] in the manege, the buttocks of a horse, the rump; also a thong of leather put under a horse's tail, and drawn up by thongs to the buckle behind the saddle, so as to keep him from casting the saddle forwards on his neck.

CRUREUS, or **CRUREUS MUSCULUS**, in anatomy, a fleshy mass, covering almost all the fore-side of the os femoris, between the two vasti, which likewise cover the edges of this muscle on each side. See **ANATOMY**.

CRURAL, in anatomy, an epithet given to the artery which conveys the blood to the crura or legs, and to the vein by which this blood returns to the heart. See **ANATOMY**.

CRUS, in anatomy, all that part of the body contained between the buttocks and the toes.

CRUSADO, in commerce, a Portuguese coin, struck under Alphonsus V. about A.D. 1457, when pope Calixtus sent thither the bull for a croisade against the infidels. This coin has a cross on one side, and the arms of Portugal on the other.

CRUSCA, [Ital. i. e. *bran*,] the title assumed by a celebrated academy established at Florence for purifying and perfecting the Tuscan language. See **ACADEMY**. The academy took its name from its office and object; which were to refine the language, and as it were to separate the bran from it. Accordingly, its device is a sieve; and its motto, *Il più bel fior ne coglie*; that is, "It gathers the finest flour thereof." In the hall where the Academy meets, M. Moneonis informs us, that every thing bears an allusion to the name and device: the seats are in form of a baker's basket; their backs like a shovel; the cushions of grey satin, in form of sacks; and the branches where the lights are placed resembling sacks. The vocabulary Della Crusca is an excellent Italian dictionary, composed by this academy.

CRUSTACEOUS FISH, in natural history, are those covered with shells consisting of several pieces or scales; as those of crabs, lobsters, &c. These are usually softer than the shells of the testaceous kind, which consist of a single piece, and generally are thicker and stronger than the former; such as those of the oyster, scallop, cockle, &c. Dr. Woodward observes, in his Natural History, that of all the shells found in beds, and of all the different matters dug out of the earth, there are scarcely any of the crustaceous kind: the reason he gives for it is, that these being much lighter than the rest, must have floated on the surface at the time of the deluge, when all the strata were formed, and there have corrupted and perished.

CRUSTS, in chemistry, those bony coverings of which the whole external surface of crabs, lobsters, and other sea-ani-

mals of a similar kind are composed. These consist of, 1. Cartilaginous substance, possessing the properties of coagulated albumen. 2. Carbonate of lime. 3. Phosphate of lime. By the presence of the phosphate of lime, they are distinguished from bones. Thus the crusts lie as an intermediate substance between bones and shells, partaking of the properties and constitution of each. The shells of the eggs of fowls must be referred likewise to the class of crusts, since they contain both phosphate and carbonate of lime; the animal cement in them, however, is much smaller in quantity. From the experiments of Bernard and Hatchett, it is extremely probable that the shells of snails are composed likewise of the same ingredients, phosphate of lime having been detected in them by these chemists. Mr. Hatchett examined the crust of crabs, lobsters, prawns, and crayfish. When immersed in diluted nitric acid, these crusts effervesced a little, and gradually assumed the form of a yellowish-white soft elastic cartilage, retaining the form of the crust. The solution yielded a precipitate to acetate of lead, and ammonia threw down phosphate of lime. Carbonate of ammonia threw down a much more copious precipitate of carbonate of lime. On examining the crust which covers different species of echini, Mr. Hatchett found it correspond with the other crusts in its composition.

CRUX, or **St. CROIX**, one of the Caribbee islands, situated about 60 miles S. E. of Porto-Rico. Lon. 64. 0. W. Lat. 17. 30. N. **CRUXHAVEN**, a sea-port town of Germany, on the N. coast of the duchy of Bremen.

CRYMODES, among the physicians, a kind of fever attended with a shivering cold, and inflammation of the internal parts of the body.

CRYPISIS, in botany, a genus of the diandria digynia class and order: natural order Grasses. Calyx glume two-valved, one-flowered; corolla glume two-valved, awnless. One species, viz. *C. aculeata*, prickly crypsis, a native of the south of Europe and Siberia.

CRYPTA, [from *κρυπτω*, to hide,] a subterraneous cell or vault, especially under a church, for the internment of particular families or persons.

CRYPTO-CALVINISTS, a name given to the favourers of Calvinism in Saxony, on account of their secret attachment to the Genevan doctrine and discipline.

CRYPTOCEPHALUS, in natural history, a genus of insects of the order coleoptera. Characterised by filiform antennæ; four feelers; thorax margined; shells immarginate; body somewhat cylindrical. This is a very extensive genus, having nearly 300 species. They are divided into two sections, A. feelers equal, filiform; B. feelers unequal; fore-ones hatchet-shaped. See Plate XXXVII.

CRYPTOGAMIA, [from *κρυπτε*, concealed, and *γάμος*, nuptials,] the twenty-fourth class in the Linnean system, comprehending those plants whose fructification is concealed, either through minuteness, or within the fruit. See **BOTANY**.

CRYPTOGRAPHY, [*κρυπτε* and *γραφω*,] 1. The act of writing secret characters. 2. Secret characters; cyphers. Also the art of writing with sympathetic ink. See **CYPHER** and **INK**.

CRYPTOLOGY, [*κρυπτε* and *λογω*,] enigmatical language.

CRYPTOPORTICUS, [*κρυπτε*, Gr. and *porticus*, Lat.] a subterraneous place, arched or vaulted; used as an underwork or passage in old walls.

CRYPTOSTOMUM, in botany, a genus of the pentandria monogynia class and order. Calyx ventricose, five-cleft; tube of the corolla inserted into the throat of the calyx; border five-cleft; nectary five-toothed; berry; seeds scarred. One species, viz. *C. Guianense*, Guiana cryptostomum.

CRYSTAL, [*κρυσταλλος*,] in natural history, the name of a very large class of fossils; hard, pellucid, and naturally colourless. The forms or orders of pure crystal are three: I. *Perfect columnar crystals*, with double pyramids, composed of 18 planes, in an hexangular column, terminated by an hexangular pyramid at each end. II. *Perfect crystals with double pyramids*, without a column, composed either of 12 or 16 planes, in two hexangular pyramids joined closely base to base, without the intervention of any column. III. *Imperfect crystals*, with single pyramids, composed either of 12 or 10 planes, in an hexangular or pentangular column, affixed irregularly at one end to some solid body, and terminated at the other by an hexangular or pentangular pyramid. These are all the general forms into which crystal, when pure, is found concreted;

concreted: but under these there are almost infinite varieties in the number of angles, and the length, thickness, and other accidents of the columns of the pyramids. IV. When crystal is blended with metalline particles at the time of its formation, it assumes a variety of figures wholly different from these, constituting a fourth order, under the name of metalline crystals: when the metal is lead, the crystal assumes the form of a cube; when it is tin, of a quadrilateral pyramid, with a broad base; when iron, the crystal is found concreted in rhomboidal figures: these crystals are very common about mines; but the common spars, which are liable to be influenced in the same manner by the metals, and to appear in the very same form, are to be carefully distinguished from them. There is one very easy test, viz. that all spars are subject to be dissolved by aquafortis, and effervesce violently only on its touching them: but it has no such effects on crystal. V. When crystals are found in the form of round pebbles, which is occasioned by their being tossed about and rubbed against one another by floods or by the sea, they are called by the English lapidaries pebble crystal. They come from the Indies, Siberia, and other places. VI. The pebble crystal is common in all parts of the world; but that which is formed of hexangular columns, affixed to a solid base at one end, and terminated by an hexangular column at the other, is infinitely more so: this is called sprig or rock crystal, and is the species described by most authors under the name of crystal of the shops, or that kept for medicinal uses. When the rock crystals are semitransparent, or intermixed with opaque veins, they are called by the Swedish lapidaries milk crystals. According to Bomare, they are generally formed upon or among quartz, which shews their great affinity, and are to be found in almost all parts of the world. The greatest quantity of them is brought from Mount Saint Gothard, in Switzerland. Large pieces of these weighing from 5 to 800 pounds, were found there, at Grinfelberg.

CRYSTALLINE HEAVENS, in ancient astronomy, two spheres, imagined between the primum mobile and the firmament, in the Ptolemaic system, which supposes the heavens solid, and susceptible of only a single motion. See **ASTRONOMY**.

CRYSTALLINE HUMOUR, in anatomy, a thick, compact humour, in form of a flattish convex lens, situated in the middle of the eye, serving to make that refraction of the rays of light, necessary to make them meet in the retina, and form an image thereon, whereby vision may be performed. See **ANATOMY** and **EYE**.

CRYSTALLIZATION. This word originally signified ice; but it was afterwards applied by the ancients to crystallized silica, or rock crystal; because, as Pliny informs us, they considered that body as nothing else than water congealed by the action of cold. Chemists afterwards applied the word to all transparent bodies of a regular shape; and at present it is employed to denote in general the regular figures which bodies assume when their particles have full liberty to combine according to the laws of cohesion. These regular bodies occur very frequently in the mineral kingdom, and have long attracted attention on account of their great beauty and regularity. The process by which these crystals are formed, is called crystallization. It takes place when the attraction of aggregation has been weakened, either by the application of heat, or of a chemical affinity, and is suffered to resume its force more slowly or equally. In this case, the particles are not united indiscriminately, but in uniting assume a particular arrangement; and thus form masses of regular figures, bounded by plain surfaces and determinate angles. Crystallization is of two kinds: first, as it takes place from the reduction of temperature in a body which has had fluidity communicated to it by the operation of heat; and, secondly, as it proceeds from the diminution of the solvent power of a fluid, which has communicated fluidity to a solid by having combined with it. Of the first kind of crystallization, water affords an example in passing into ice by a reduction of its temperature. At first long and slender spiculae form in the fluid, and from these others shoot out at a certain angle, and this continues till the interstices are filled with the crystals, and the whole becomes a solid transparent crystallized mass of ice. Also the metals, when melted and cooled slowly, assume symmetrical forms. Some inflammables, as sulphur, crystallize in a similar way. Of the second kind of crystallization, the principal examples are derived from the order of salts, and a few other solids, soluble in water. The solution of a solid in a fluid, is in almost every case increased by heat, which weakens cohesion: hence a larger quantity of the

solid is kept in solution at a high, than a low temperature. If, therefore, we prepare a solution of salt in hot water, the solution being saturated, or the fluid having dissolved as much of the salt as it can do, on allowing it to cool, the portion of the salt which the heat enabled the fluid to dissolve, will separate; and unless the cooling of the solution has been very rapid, the particles of the solid, in approaching to each other, will pass into those regular arrangements which constitute crystals. The same thing is effected by the evaporation of the fluid in which a solid body is dissolved. If the evaporation be spontaneous, the crystals will be frequently more regular, and of a larger size than those obtained by cooling or reducing the temperature, since, in this case, the particles are more at liberty to obey the laws of attraction, which unites them in regular forms. In general, it is found, that the slower the process of crystallization, the more perfect is the crystal in its arrangement; it is also larger, harder, and more transparent: whereas, when the process is too rapid, or is disturbed by agitation, or other causes, the arrangement is less regular, and the form incomplete. Hence the crystals formed by nature are so much more perfect than those produced by artificial processes. Another method of crystallizing salts, is, by adding to a solution of salt a substance which does not act upon the latter, but which has a greater affinity with the water, and will serve to deprive the salt of a portion of that liquid which holds it in a state of solution. Alcohol will effect this purpose in many salts; and, if judiciously added, will cause them to separate freely from the menstruum, or fluid, and form large and beautiful crystals. From a variety of experiments, it has been observed that crystallization may be remarkably promoted, by throwing into the vessel a few small crystals of the same nature. And on this Le Blanc has founded a method of obtaining large and perfect crystals. It consists in selecting very regular crystals of a salt that have been newly formed, and putting them into a saturated solution of the same salt. They increase in size; and as the side which is in contact with the vessel receives no increase, they are to be turned daily to preserve their regularity. After some time, the largest and most regular of these crystals are to be selected, and the same process repeated on them; and thus crystals much larger and more regular than are usually formed in a solution may be obtained. The access of the air has an important influence on this process. If a saturated solution of salt when hot, be put into a vessel from which the air is excluded, it does not crystallize even when cold. But if the air be admitted, the crystallization immediately commences and proceeds with rapidity. It has been shewn by Dr. Higgins, that any pressure, equivalent to that of the atmosphere, as the pressure of a column of mercury, has the same effect. During crystallization a quantity of heat is rendered sensible. In many cases the volume of the substance crystallizing is enlarged, as in the example of water, of iron, and of the greater number of salts; but in others the volume is diminished. Quicksilver, in congealing, contracts about $\frac{1}{3}$ of its whole bulk; yet it exhibits the crystalline texture; and when the congelation is partial, the crystalline figure can even be discovered. Crystals deposited from water always contain a part of it which is retained by the affinity of the solid, and has passed with it into the concrete form. It is termed water of crystallization. Its quantity is very various; sometimes it equals or exceeds the weight of the solid, and sometimes it amounts only to a few parts in the hundred. Much of the cold produced during the solution of salts in water, is owing to this water of crystallization passing into the fluid state: hence crystallized salts generally produce more cold than when they are uncrystallized. If the water of crystallization be expelled from a crystal, it loses its transparency, and at length its form. Crystals which part with their water of crystallization when exposed to the atmosphere, are said to effloresce, and to deliquesce when they attract water and become humid. As different bodies require very different quantities of water for their solution, it is possible when two such bodies are dissolved in one fluid, to obtain them separate by crystallization, the one which is least soluble, or most disposed to crystallize, first passing into the solid form; and by farther evaporation the other is obtained. A fact on this subject, somewhat singular, is noticed by Mr. Kirwan. If into a saturated solution of two salts in water, a crystal of either be put, that salt crystallizes in preference to the other. By crystallization, also, salts, the solubility of which is unequally promoted by heat, may be obtained separately from the same solution. Thus, if one salt be much more soluble in hot than

than in cold water, and another be equally soluble, or nearly so, at any temperature, on evaporating the solution sufficiently, the latter salt will crystallize while the solution is hot; on cooling, the other will shoot into crystals; and, by alternate evaporation and cooling, the two may be obtained uncombined, though generally with a little intermixture of each other. Sometimes, however, when two salts are in solution in the same fluid, and have even different tendencies to crystallization, their mutual affinity leads them to crystallize in one mass, and even to assume a form different from that in which separately they would have crystallized. In other cases this mutual affinity, between substances in solution, is sufficient to resist their crystallization, or to render it more difficult. Crystallization sometimes takes place, when bodies in the gaseous form become subject to the attraction of aggregation, as in sublimates; and even solids separated from a liquid by chemical action, in some instances at the moment of their separation, assume a crystallized form. Every substance in crystallizing is disposed to assume a particular figure. Thus, sea-salt crystallizes in the form of a cube; nitre in that of a hexaedral prism; sugar in that of a four or six-sided prism, with triedral terminations. The crystalline figure in any substance, however, is not invariable, but may be altered by circumstances affecting the crystallization; and we find the same substance crystallized under a variety of forms. Sea-salt crystallizes, not only in cubes, but also in octaedrons; and carbonate of lime is found in nature in the form of an hexaedral prism, an hexaedral, and a triedral pyramid. The effect of light upon the act of crystallization is very remarkable. It is found, in general, that the crystals of salts are larger and better formed in the dark than when light falls upon the solution. But this relates only to such crystals as are formed in the fluid. In many, and indeed most salts, there are crystals formed, during the spontaneous evaporation of the solution, which rise above the surface into the air, either in contact with the sides of the vessel, or supported by their own structure. It appears to have been well determined by experiments of Chaptal and others, that this phenomenon does not take place without the presence of light.

CRYSTALLOGRAPHY, [from δ $\kappa\rho\upsilon\varsigma\alpha\lambda\lambda\alpha\varsigma$, glass or crystal, and $\gamma\rho\alpha\phi\omega$, to describe,] the science by which we understand the structure and forms of crystals. It is remarkable that crystals not only assume regular figures, but are always bounded by plane surfaces. It is very rarely indeed that curved surfaces are observed in these bodies; and when they are, the crystals always give unequivocal proofs of imperfection. But this constant tendency towards plane surfaces is inconceivable, unless the particles of which the crystals are composed are themselves regular figures, and bounded by plane surfaces. If the figure of crystals depend upon the figure of their integrant particles, and upon the manner in which they combine, it is reasonable to suppose that the same particles, when at full liberty, will always combine in the same way, and consequently that the crystals of every particular body will be always the same. Nothing at first sight can appear farther from the truth than this. The different forms which the crystals of the same body assume are often very numerous, and exceedingly different from each other. Carbonate of lime, for instance, has been observed crystallized in no fewer than forty different forms, fluat of lime in eight different forms, and sulphate of lime in nearly an equal number. But this inconsistency is not so great as might at first sight appear. Romé de Lisle has shewn that every body susceptible of crystallization has a particular form which it most frequently assumes, or at least to which it does most frequently approach. Bergman has demonstrated, that this primitive form, as Haüy has called it, very often lies concealed in those very crystals which appear to deviate farthest from it. And Haüy has demonstrated, that all crystals either have this primitive form, or at least contain it as a nucleus within them; for it may be extracted out of all of them by a skilful mechanical division. Haüy made this discovery of mechanical division in examining a hexangular prism of calcareous spar, or carbonate of lime, which had been detached from a group of the same kind: he observed that a small portion of the crystal was wanting, and that the fracture presented a very smooth surface. Let HX , fig. 1, Plate LIII. be the crystal: the fracture lay obliquely as the trapezium $abgc$, and made an angle of 135 degrees, both with the remainder of the base, and with the remainder of the side of the prism. Observing that the segment $abgc$ thus cut off had for its vertex e of the edges of the base of the prism,

he attempted to detach a similar segment in the part to which the next edge belonged; he employed for that purpose the blade of a knife, directed in the same degree of obliquity as the trapezium $abgc$, and assisted by the strokes of a hammer. He could not succeed: but on making the attempt upon the next edge he detached another segment, precisely similar to the first. He could produce no effect on the next or fourth edge; but from the next following, he cut a segment similar to the other two. The sixth edge likewise proved refractory. He then went to the other base of the prism, and found that the edges which admitted sections similar to the preceding ones were not the edges corresponding with those which had been found divisible at the opposite base, but the intermediate edges, as represented in fig. 1, where $abgc$ shews the base, and ed the vertex of the segments cut off from the first, third, and fifth edges of the base at one end, and the intermediate ones at the other end of the prism. The sections on the opposite sides and opposite ends are parallel, since they are alike inclined to the side, or to the base of the prism; thus the section $abgc$ marked A is parallel to that marked D, also B is parallel to E, and C to F. These sections were, without doubt, the natural joinings of the layers of the crystal; and he easily succeeded in making others parallel to them, without its being possible for him to divide the crystal in any other direction. In this manner he detached layer after layer, approaching always nearer and nearer the axis of the prism, till at last the bases disappeared altogether, and the prism was converted into a solid, fig. 2. terminated by twelve pentagons parallel two and two; of which those at the extremities, that is, the three marked $acgcb$, at the upper extremity, and $mo in$, at the lower, were the results of mechanical division, and had their common vertices g and i in the axis of the prism. The six lateral pentagons, viz. $macbn$, and $am onb$, three of each were the remains of the six sides of the original prism. By cutting off sections parallel to the former till mn coincided with ab in each face of the prism, there remained nothing of the lateral pentagons but the triangles acb , mno , see fig. 3. By continuing the same sections, these triangles at last disappeared, and the prism was converted into the rhomboid GI , fig. 4, which is therefore the primitive form, or nucleus of the crystal. Struck with the important result of this experiment, Haüy applied the same method to other crystalline forms of the same substance, and obtained from them the same result; the crystal, whatever was its figure, being by this mechanical division converted into a rhomb. Thus in the dodecaedron, composed of two six-sided pyramids joined by the base, the primitive form may be obtained at once by making a first section, on the edges EO , OI , fig. 5; a second, on the edges IK , GK ; a third, on GH , EH ; a fourth, on OI , IK ; a fifth, on GK , GH ; and lastly, a sixth, on EH , EO ; and the result is, that these edges become the same with the lateral edges of the primitive form, as may be perceived from mere inspection of fig. 6, which represents this primitive form described in the dodecaedron. He then applied it to other crystalline substances, and found, that from these also, by discovering the joints by which the laminae composing the crystals were united, a certain primitive form might be extracted. That of fluor spar, is an octaedron; and that of the heavy spar, a prism with rhomboidal bases; of corundum, a rhomboid somewhat acute; of beryl, a hexaedral prism; and of the elba iron-ore, a cube. Each of these forms is constant with regard to the species, and is that from which all the forms of the varieties, often extremely numerous, are derived. The latter are denominated by Haüy secondary forms. Sometimes, though rarely, the primitive and secondary forms are the same. All crystallized substances, however, do not admit of this mechanical analysis. But with regard to those that have hitherto refused it, Haüy has remarked, that their surface striated in a certain direction, or the relation subsisting among the different secondary forms of the same substance, mark with much probability, their primitive forms. Thus Haüy establishes what he names the "Primitive Form of Crystals," and which he defines, "A solid of a constant form, inserted symmetrically in all the crystals of the same species, and the faces of which observe the directions of the layers which compose these crystals." The primitive forms hitherto observed are reducible to six: the parallelopipedon, which includes the cube, the rhomb, and all the solids which are terminated by six faces parallel two and two; the tetraedron; the octaedron; the regular hexaedral prism; the dodecaedron, with equal and similar rhomboidal

boidal planes; and the dodecaedron with triangular planes. The primitive form may always be still farther subdivided parallel to its different faces, and sometimes even in other directions. All the enveloping matter is equally divisible by sections parallel to the faces of the primitive forms; and the only limit to this possible division is that placed by the composition of the substance. The calcareous spar, to take it as an example, may be reduced to a particle beyond which the division cannot be carried, without resolving it into its elements, lime and carbonic acid; or at least it may be reduced to a particle, beyond which, if its minuteness allowed us to operate upon it, it is demonstrable its figure would not change. To these last particles, the result of the mechanical analysis, Haüy gives the name of integrant particles, and their union constitutes the crystal. Their forms, so far as experiment has been carried, are three: the tetraedron, the simplest of the pyramids; the triangular prisma, the simplest of prisms; and the parallelopipedon, the simplest of solids, which have their faces parallel, two and two. It is very probable that between these the attraction of cohesion is immediately exerted. In order to complete the theory of the structure of crystals, it is requisite now to explain by what arrangements the secondary forms, or, in other words, the actually existing crystals, are produced. The nucleus of the crystal is the symmetrical solid which constitutes its primitive form, arising from the union of the integrant particles, either by their faces or their edges; and the additional matter, which forms the crystal, consists of layers of these particles super-added to that nucleus, and arranged on its faces; and to account for the formation of the crystal under a figure different from that of its primitive form, these layers, as they recede from it, are supposed to decrease, in the space they occupy, from the regular abstraction of one or more ranges of the integrant particles. This decrease may take place in various modes; and according to these, different figures of crystallization will be produced. Thus, to take the simplest example, let us suppose the primitive form is a cube; it is easy to conceive, that on each of its six sides may be reared a series of decreasing layers, or laminae, composed entirely of cubical particles, each layer diminishing on each of its edges by one row of the minute cubes of which it consists. The laminae thus decreasing as they recede from the base on which they rest, until the apex consists of a single particle, it is obvious, that on each side of the cube a four-sided pyramid will be formed. Two of these are represented, fig. 7, ABCD, EBCG. We shall thus have, then, six four-sided pyramids, and of course 24 triangles, such as ABC, BCE, CEG, &c. But since the decrease is uniform on all the sides, as from the line BC to A, and from the same line to E, it must also be uniform from A to E; it is obvious, therefore, that the side ABC of the one pyramid will be found exactly in the same plane as the side BCE of the adjacent pyramid; so that the entire surface of these will be the rhomb ABEC. The case must be the same with all the others. The 24 triangles will therefore be reduced to twelve rhombs, and the figure will be a dodecaedron, very remote from the primitive form. Now a crystal of this figure, and having this primitive form, would be resolved into that form, merely by cutting off the six solid angles, by sections, in the direction of the small diagonals of the sides, which go to the formation of these angles. We should thus successively uncover six squares, which will be the faces of the primitive cube. In explaining the structure of a crystal, although the representation in the figure be such as to shew the decrease of the laminae by rows of particles of such a size as to give a surface uneven, similar to a succession of steps, it is obvious, that if we substitute for this the delicate structure of nature, the number of laminae may be so great, and the number of their cubical particles such, that the depression or channel at their edges will be altogether imperceptible to our senses, and the surfaces will appear perfect planes. Thus we see, that a body which has the cube for the primitive form of its crystals, may have a dodecaedron for its secondary form. The formation of secondary crystals, by the superposition of laminae gradually decreasing in size, was first pointed out by Bergman. But Haüy has carried the subject much farther: he has not only ascertained all the different ways by which these decrements of the laminae may take place, but pointed out the method of calculating all the possible varieties of secondary forms which can result from a given primitive form; and consequently of ascertaining whether or not any given crystal

can be the secondary form of a given species. The decrements of the laminae which cover the primitive nucleus in secondary crystals are of four kinds:

1. Decrements on the edges, that is, on the edges of the slices which correspond with the edges of the primitive nucleus.

2. Decrements on the angles; that is to say, parallel to the diagonals of the faces of the primitive nucleus.

3. Intermediate decrements; *i. e.* parallel to lines situated obliquely between the diagonals and edges of the primitive nucleus.

4. Mixed decrements. In these the superincumbent slices, instead of having only the thickness of one integrant particle, have the thickness of two or more integrant particles; and the decrement, whether parallel to the edges or angles, consists not of the abstraction of one row of particles, but of two or more. Haüy denotes these decrements by fractions, in which the numerator indicates the number of rows of particles which constitutes the decrement, and the denominator represents the thickness of the laminae. Thus $\frac{3}{2}$ denotes laminae of the thickness of three integrant particles, decreasing by two rows of particles. An example of the first law of decrement, or of decrement on the edges is given above in the conversion of the cubic nucleus to a rhomboidal dodecaedron. In that example the decrement consisted of one row of particles, and it took place on all the edges. But these decrements may be more rapid: instead of one, they may consist of two, three, four, or more rows; and instead of taking place on all the edges, they may be confined to one or two of them, while no decrement at all takes place on the others. Each of these different modifications must produce a different secondary crystal. Besides this, the laminae may cease to be added before they have reached their smallest possible size; the consequence of which must be a different secondary form. Thus, in the example given above, if the superposition of laminae had ceased before the pyramids were completed, the crystal would have consisted of 18 faces; six squares parallel to the faces of the primitive nucleus, and 12 hexaedrons parallel to the faces of the secondary dodecaedron. This is the figure of the barate of lime and magnesia found at Luneburg. The second law in which the decrement is on the angles, or parallel to the diagonals of the faces of the primitive nucleus, will be understood from the following example: Let it be proposed to construct around the cube ABGF, fig. 8, considered as a nucleus, a secondary solid, in which the laminae of superposition shall decrease on all sides by single rows of cubes, but in a direction parallel to the diagonals. Let ABCD, fig. 9, the superior base of the nucleus, be divided into 81 squares, representing the faces of the small cubes of which it is composed. Fig. 10 represents the superior surface of the first lamina of superposition; which must be placed above ABCD, fig. 9, in such a manner, that the points *a b c d*, fig. 10, answer to the points *a b c d*, fig. 9. By this disposition the squares *Aa, Bb, Cc, Dd*, fig. 9, which compose the four outermost rows of squares parallel to the diagonals AC, BC, remain uncovered. It is evident also, that the borders QV, ON, IL, GF, fig. 10, project by one range beyond the borders AB, AD, CD, BC, fig. 9; which is necessary, that the nucleus may be enveloped towards these edges: for if this were not the case, re-entering angles would be formed towards the parts AB, BC, CD, DA, of the crystal; which angles appear to be excluded by the laws which determine the formation of simple crystals, or, which comes to the same thing, no such angles are ever observed in any crystal. The solid must increase, then, in those parts to which the decrement does not extend. But as this decrement is alone sufficient to determine the form of the secondary crystal, we may set aside all the other variations which intervene only in a subsidiary manner; except when it is wished, as in the present case, to construct artificially a solid representation of a crystal, and to exhibit all the details which relate to its structure. The superior face of the second lamina will be AGLK, fig. 11. It must be placed so that the points *a, b, c, d*, correspond to the points *a, b, c, d*, fig. 10; which will leave uncovered a second row of cubes at each angle, parallel to the diagonals AC and BD. The solid still increases towards the sides. The large faces of the laminae of superposition, which in fig. 10 were octagons, in fig. 11 arrive at the form of a square; and when they pass that term they decrease on all sides; so that the next lamina has for its superior face the square RMLS, fig. 12, less by one range in every direction than the preceding lamina, fig. 11. This square must be placed so that the points *e,*

f, g, h, fig. 12, correspond to the points *e, f, g, h*, fig. 11. Figures 13, 14, 15, and 16, represent the four laminae which ought to rise successively above the preceding; the manner of placing them being pointed out by corresponding letters, as was done with respect to the first three laminae. The last lamina *z*, fig. 17, is a single cube, which ought to be placed upon the square *z*, fig. 16. The laminae of superposition, thus applied upon the side *ABCD*, fig. 9, evidently produce four faces, which correspond to the points *A, B, C, D*, and form a pyramid. These faces, having been formed by laminae which began by increasing, and afterwards decreased, must be quadrilaterals of the figure represented in fig. 18; in which the inferior angle *C* is the same point with the angle *C* of the nucleus, figs. 9 and 10, and the diagonal *LQ* represents *LG* of the lamina *AGLK*, fig. 11. And as the number of laminae composing the triangle *LQC*, fig. 18, is much smaller than that of the laminae forming the triangle *ZLQ*, it is evident that the latter triangle will have a much greater height than the former. The surface, then, of the secondary crystal thus produced, must evidently consist of 24 quadrilaterals, for pyramids are raised on the other five sides of the primary cube exactly in the same manner, disposed three and three around each solid angle of the nucleus. But in consequence of the decrement by one range, the three quadrilaterals which belong to each solid angle, as *C*, fig. 8, will be in the same plane, and will form an equilateral triangle *ZLN*, fig. 19. The 24 quadrilaterals then will produce eight equilateral triangles; and consequently the secondary crystal will be a regular octaedron. This is the structure of the octaedral sulphuret of lead, and of muriate of soda. The third law is occasioned by the abstraction of double, triple, &c. particles. Fig. 20 exhibits an instance of the subtractions in question: and the molecule which compose the range represented by that figure are asserted in such a manner as if of two there were formed only one; so that we need only to conceive the crystal composed of parallelopipedons having their bases equal to the small rectangles *abcd, edfghi*, &c. to reduce this case under that of the common decrements on the angles. This particular decrement, as well as the fourth law, which requires no farther explanation, is uncommon. Indeed Häuy has met with mixed decrements only in some metallic crystals. These different laws of decrement account for all the different forms of secondary crystals. But in order to see the vast number of secondary forms which may result from them, it is necessary to attend to the different modifications which result from their acting separately or together. These modifications may be reduced to seven:

1. The decrements take place sometimes on all the edges, or all the angles, at once.
2. Sometimes only on certain edges, or certain angles.
3. Sometimes they are uniform, and consist of one, two, or more rows.
4. Sometimes they vary from one edge to the other, or from one angle to another.
5. Sometimes decrements on the edges and angles take place at the same time.
6. Sometimes the same edge or angle is subjected successively to different laws of decrement.
7. Sometimes the secondary crystal has faces parallel to those of the primitive nucleus, from the superposition of laminae not going beyond a certain extent.

Hence Mr. Häuy has divided secondary forms into two kinds, namely, simple and compound. Simple secondary crystals are those which result from a single law of decrement, and which entirely conceal the primitive nucleus. Compound secondary crystals are those which result from several laws of decrement at once; or from a single law which has not reached its limit, and which of course has left in the secondary crystal faces parallel to those of the primitive nucleus. "If amidst this diversity of laws (observes Mr. Häuy) sometimes united by combinations more or less complex, the number of ranges subtracted was itself extremely variable: for example, were these decrements by 15, 20, 30, or 40 ranges, or more, as might absolutely be possible; the multitude of the forms which might exist in each kind of mineral would be immense, and exceed what could be imagined. But the power which effects the subtractions seems to have a very limited action. These subtractions, for the most part, take place by one or two ranges of molecules. I have found none which exceed four ranges, except in a variety of calcareous spar forming part of the collection of C.

Gillet Laumont, the structure of which depends on a decrement by six ranges: so that if there exist laws which exceed the decrements by four ranges, there is reason to believe they rarely take place in nature. Yet notwithstanding these narrow limits by which the laws of crystallization are circumscribed, I have found, by confining myself to two of the simplest laws, viz. those which produce subtractions by one or two ranges, that calcareous spar is susceptible of 2044 different forms, a number which exceeds more than 50 times that of the forms already known: and if we admit into the combination decrements by three or four ranges, calculation will give 8,388,604 possible forms in regard to the same substance. And even this number may be much augmented in consequence either of intermediate or mixed decrements being taken into account. In concluding this sketch of Crystallography, extracted from the "System of Chemistry" by Murray, we have also thought it proper, with him, to give the figures of the more usual forms of crystals, and their modifications. The planes, which are the surfaces of crystals, are distinguished into lateral, or those which are of the greatest extent, and which form its confines towards its smallest extent; and extreme or terminal, which are those of smallest extent, and form the bounds of the body towards its largest extent. Edges are formed by the junction of two planes under determinate angles; they also are lateral, or those formed by the junction of two lateral planes; and terminal formed by the junction of two terminal planes, or of a terminal with a lateral plane. Werrerr admits even primary figures of crystals which are susceptible of numerous modifications. These figures are the icosaedron, the dodecaedron, the hexaedron, which includes the cube and the rhomb, the prism, the pyramid, the table, and the lens. 1st. The icosaedron, fig. 21, is a solid, consisting of twenty equilateral triangular planes, united under equal angles. 2d. The dodecaedron, fig. 22, or solid of twelve equal or pentagonal faces. 3d. The cube, fig. 23, or solid, composed of six quadrilateral planes united at right angles. 4th. The rhomb, fig. 24, or solid, of six quadrilateral planes united at oblique angles. 5th. The prism, or solid, of two terminal planes, parallel, equal, and similar, connected by quadrangular lateral planes having one direction; the number of lateral planes may of course be various; the usual form observed in crystals are the four-sided rectangular prism, fig. 25; and the six-sided equiangular prism, fig. 27. 6th. The pyramid, or solid, the base of which is a plane of an indeterminate number of sides, and the sides triangles, the vertices of which meet in one point, forming the summit: the more common varieties of this figure, as forms of crystals, are the three-sided pyramid, or tetraedron, fig. 28, and the four-sided pyramid, fig. 29. 7th. The table, which, strictly speaking, is nothing but a very compressed prism; it is defined as composed of two parallel lateral planes, and of an indeterminate number of terminal planes, connected with the lateral planes and with each other, and small, compared with the lateral ones; the principal varieties are, the oblique-angular, or rhomboidal four-sided table, fig. 30; the rectangular four-sided table, fig. 31, and the six-sided table, fig. 32. Lastly, The lens, fig. 33, a solid, consisting only of two planes, which are curved; of which there are two varieties, one composed of two convex planes, and another composed of a convex and a concave plane. These simple figures are modified by combination, by truncation, by bevelment, and by acumination. The modification by combination is confined to the pyramids, and these are frequent, two pyramids being joined by the base; the lateral planes of the one being set either directly on the lateral planes of the other, as in the double four-sided pyramid, octaedron, fig. 36, or obliquely, as in the double four-sided pyramid, fig. 35. Fig. 34, is the double six-sided pyramid. A crystal is said to be truncated, when any or all of its solid angles or edges appear cut off, so that where there would have been an edge or angle we have a plane. Fig. 37, shews the cube with the angles and edges truncated: fig. 38, the six-sided prism, with truncated terminal edges. A crystal is said to be bevelled, when its edges, angles, or terminal planes, are so altered, that instead of an angle edge or terminal plane, there appear two smaller converging planes, which terminate in an edge: fig. 39, shews the cube with bevelled edges: fig. 40, the three-sided pyramid, with bevelled edges. Lastly, the forms of crystals are altered by acumination. This is that kind of alteration in which, in place of the angles or terminal planes of a crystal, there are three or more planes converging and forming a point or edge: fig. 41, shews the cube, with angles acuminated by three planes set

on the lateral planes: fig. 42, the rectangular four-sided prism, acuminate by four planes set on the lateral planes. The forms of crystals from the preceding modifications are frequently still more altered, and rendered complicated, by being super-added and combined; and by the extent of the modifications, one form frequently passes into another. The figures of crystals are likewise rendered complicated by aggregation, two or more crystals of the same substance being more or less closely united. A minute detail of this article may be found in Weaver's translation of the "External Characters of Minerals," by Werner; or in Professor Jameson's treatise on the same subject.

CRYPTANDRA, in botany, a genus of the class pentandria, and order monogynia. Calyx five-leaved; corolla tubular, with a five-cleft border; stigma three-cleft; capsule three-valved, three-celled, superior; seeds single, compressed. It has but one species a shrub, native of Australasia.

CTESIBUS, a mathematician of Alexandria, who flourished about B. C. 120. He was the first who invented the pump. He also invented a clepsydra, or water-clock. Water was let drop upon wheels which it turned: the wheels communicated their regular motion to a small wooden image, which by a gradual rise pointed with a stick to the proper hours and months, which were engraved on a column near the machine.

CTESIPHON, a celebrated Greek architect, who gave the designs for the famous temple of Ephesus, and invented a machine for bringing thither the columns to be used in that noble structure. He flourished B. C. 544.

CUB, in zoology. See **URSUS**.

CUB, NORTH, a small island of N. America, in James's Bay, E. of Hudson's Bay.

CUB, SOUTH, another island in James's Bay.

CUBA, a large and important island in the West Indies, belonging to Spain; 700 miles long and 87 broad. On the E. it begins at 20° 20' Lat. N. touches the tropic of Cancer on the N. and extends from 74° to 85° 15' Lon. W. It lies 60 miles W. of Hispaniola, 75 N. of Jamaica, 100 E. of Yucatan, and as many to the S. of Cape Florida. It was discovered by Columbus in 1492, who gave it the name of Ferdinando, in honour of king Ferdinand of Spain; but it soon after recovered its ancient name of Cuba.

CUBEA, in botany, a genus of the class decandria, and order monogynia. Calyx turbinate, five-parted, unequal, permanent; petals five, unequal; filaments villose, three shorter; legume villose, six, or seven-seeded. It has two species.

CUBAGUA, an island of S. America, eight miles long, near Cumana, between Margarita and Terra Firma, discovered by Columbus.

CUBAN, a large river of Russian Tartary, formed by the junction of many small streams, that rise in Mount Caucasus, between the Black Sea and the Caspian.

CUBATURE, [from *cube*,] is the finding of the solid content of any proposed body.

CUBE, [from *κύβος*, a die,] in geometry, a regular solid body, contained under six square and equal faces or sides, and the angles all right, and therefore equal, as fig. 28, Plate XLVII. See **GEOMETRY**, and **MENSURATION**.

CUBE, or **CUBIC NUMBER**, in arithmetic, that which is produced by the multiplication of a square number by its root, thus, 64 is a cube number, and arises by multiplying 16, the square of four, by the root four. See **ARITHMETIC**.

CUBE, or **CUBIC QUANTITY**, in algebra, the third power in a series of geometrical proportionals continued; as *a* is the root, *aa* the square, and *aaa* the cube. All cubic numbers may be ranged into the form of cubes; as 8 or 27, whose sides are two and three, and their bases four and nine; whence it appears, that every true cubic number, produced from a binomial root, consists of these parts, viz. The cubes of the greater and less parts of the root, and of three times the square of the greater part multiplied by the less, and of three times the square of the less multiplied by the greater, as,

$$\begin{aligned} & a + b \\ & aaa + 2aab + bbb \\ & \quad aab + 2abb + bbb \\ & aaa + 3aab + 3abb + bbb \end{aligned}$$

From hence it is easy to understand both the composition of any

cubic number, and the reason of the method for extracting the cube root out of any member given. See **ALGEBRA**.

CUBE ROOT OF ANY NUMBER, OR QUANTITY, such a number, or quantity, which, if multiplied into itself, and then, again, the product thence arising by that number or quantity, being the cube root, this last product shall be equal to the number or quantity whereof it is the cube root, as two is the cube root of eight, because two times two is four, and two times four is eight; and $a + b$ is the cube root of $a^3 + 3a^2b + 3ab^2 + b^3$. See **ALGEBRA**.

CUBE, DUPLICATION OF THE, is the finding of the side of a cube that shall be double in solidity a given cube, which is a celebrated problem, much discussed by ancient geometers. It was first proposed by the oracle of Apollo at Delphos, which declared that the plague, then raging at Athens, should cease when Apollo's altar, a cube, was doubled. Upon this the mathematicians applied themselves seriously to seek the duplicature of the cube; hence it is called the Delian problem. It cannot, however, be effected geometrically, as it requires the solution of a cubic equation, or requires the finding of two mean proportionals, viz. between the sides of the given cube and the double of the same, the first of which two mean proportions is the side of the double cube, as was first observed by Hippocrates of Chios. For, let *a* be the side of the given cube, and *z* the side of the double cube sought; then it is $z^3 = 2a^3$, or $a^2 : z^2 :: z : 2a$; so that, if *a* and *z* be the first and second terms of a set of continued proportionals, then $a^2 : z^2$ is the ratio of the square of the first to the square of the second, which, it is known, is the same as the ratio of the first term to the third, or of the second to the fourth, that is, of *z* to $2a$; therefore *z* being the second term, $2a$ will be the fourth. So that *z*, the side of the cube sought, is the second of four terms in continued proportion; the first and fourth being *a* and $2a$, that is, the side of the double cube is the first of two mean proportionals between *a* and $2a$. This problem has been frequently solved mechanically by Archimedes, Eutochius, Pappus, &c.

CUBIC, or CUBICAL, EQUATION, in algebra, one whose highest power consists of three dimensions, as $x^3 = a^3 - b^3$, or $x^3 + rxx = p$, &c. See **ALGEBRA**.

CUBIC FOOT OF ANY SUBSTANCE, so much of it as is contained in a cube, whose side is one foot.

CUBIT, [*cubitus*, Lat.] in the mensuration of the ancients, a long measure, equal to the length of a man's arm, from the elbow to the tip of the fingers. Dr. Arbuthnot makes the English cubit equal to 18 inches; the Roman cubit equal to one foot, 5,406 inches; and the cubit of the scripture equal to one foot, 9,888 inches.

CUBITEUS. See **ANATOMY**.

CUBITUS, [Lat.] in anatomy, a bone of the arm, reaching from the elbow to the wrist, otherwise called the ulna.

CUBOIDES, Os, or Os **CUBIFORME**, in anatomy, the 7th bone of the foot; so called from its being in form of a cube, from *κύβος*, cube, and *μοῖον*, likeness.

CUCKFIELD, a town in Sussex, 40 miles S. by W. of London.

CUCKING-STOOL, an engine invented for the punishment of scolds and unquiet women, which formerly was called tumble.

CUCKING-STOOL, in Doomsday, is called cathedra stercoris; and it was in use even in the Saxon time. It was anciently also a punishment inflicted upon brewers and bakers transgressing the laws; who were in such a stool immersed over head and ears in *stercore*, some stinking water. Some think it a corruption from ducking-stool; others from choking-stool, because the delinquents were nearly suffocated in the water.

CUCKOO, or **CUCKOW**. See **CUCULUS**.

CUCKOO-FLOWER. See **CARDAMINE**.

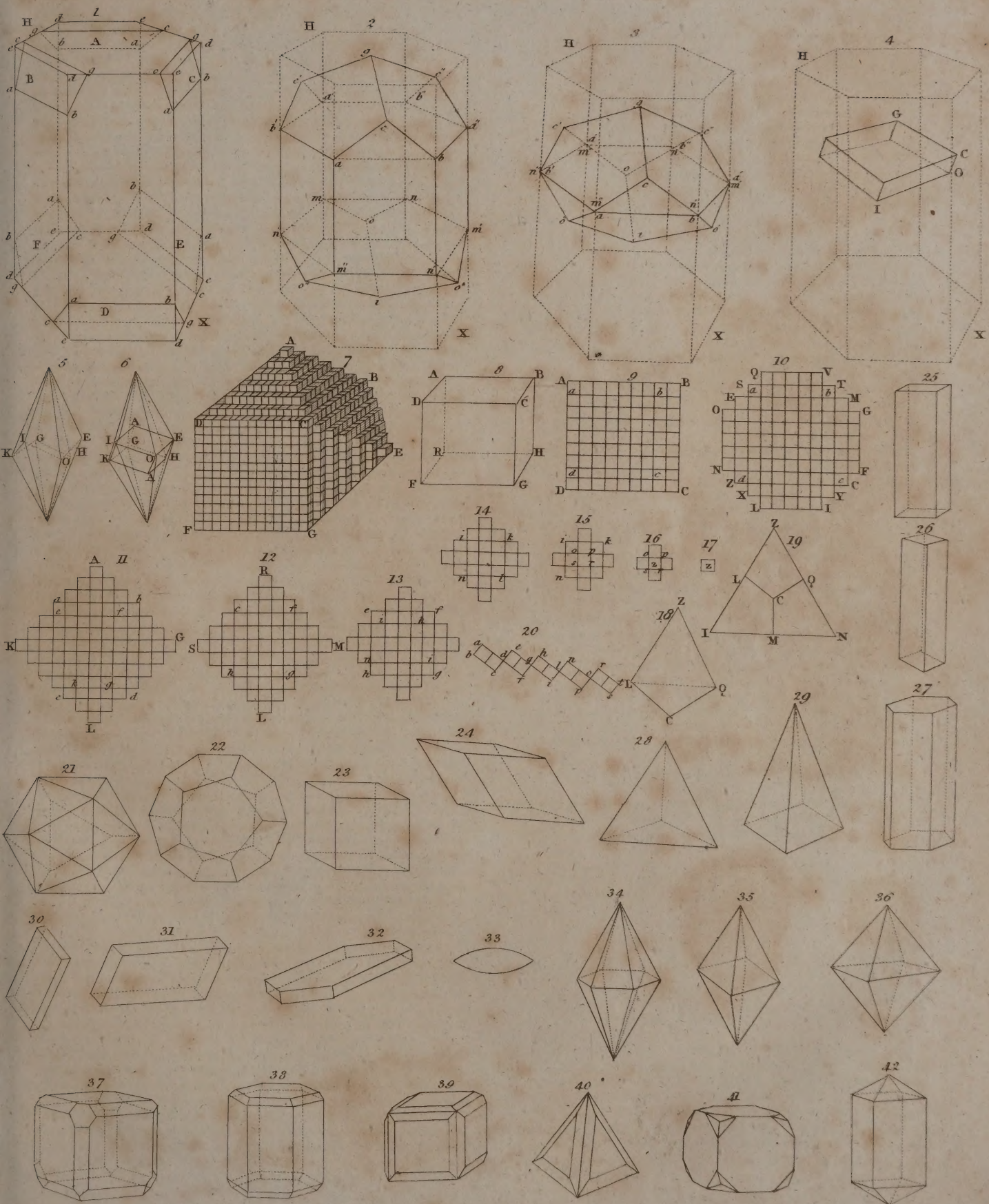
CUCKOO PINT. See **ARUM**.

CUCUBALUS, **BERRY-BEARING CHICKWEED**: a genus of the trigynia order, and decandria class of plants; natural order, Caryophyllae. Calyx inflated; petals five, unguiculated without a nectariferous corona at the throat; capsule trilocular. There are seventeen species.

CUCULUS, in natural history, a genus of the coleoptera order of insects: antenna filiform; feelers four, equal, the last joint truncate, thicker; lip short, bifid, the divisions linear and distant; body depressed. There are about thirteen species.

CUCULLARIA, in botany, a genus of the class and order, monandria monogynia. Calyx four-parted; corolla four-petaled, unequal, spurred; filaments petal-like; anthers with distinct cells. It has only one species, a native of Guiana.

CUCULLANUS,



CUCULLANUS, in natural history, a genus of the vermes intestina. Body sharp, pointed behind and obtuse before; mouth orbicular, with a striate hood. Most of this genus are viviparous, and generally intestinal. There are four sections: A, infesting the mammalia; B, infesting birds; C, infesting reptiles; and D, infesting fish. It has seven species besides varieties.

CUCULUS, the Cuckoo, in ornithology, a genus of the order pica. Bill smooth, and more or less bending; nostrils bounded by a small rim; tongue short and arrowed; toes two forward and two backward; tail wedge-formed of ten soft feathers. Gmelin enumerates fifty-five species, and Latham forty-six.

C. CANORUS, the COMMON CUCKOO, weighs about five ounces; and is in length 14 inches; in breadth 25. The bill is black, and about two-thirds of an inch in length. The head, hind part of the neck, coverts of the wings and rump, are of a dove colour; darker on the head and paler on the rump. The throat and upper part of the neck are of a pale grey; the breast and belly white, crossed elegantly with undulated lines of black. The tail consists of ten feathers of unequal lengths; the two middle tail feathers are black tipped with white; the others are marked with white spots on each side their shafts. On the natural history of this singular bird, a very curious paper was published by Dr. Jenner, in the Philosophical Transactions, for 1788, Part II. Art. 14. It is almost universally allowed, that the cuckoo does not hatch its own eggs. The hedge-sparrow, the water wagtail, the titlark, the red-breast, the yellow hammer, the green linnet, or the winchat; is generally the nurse of the young cuckoo: but Buffon enumerates twenty sorts of nests at least in which they have deposited their eggs. It may be supposed, that the female cuckoo lays her egg in the absence of the bird in whose nest she intends to deposit; as it has been known, that on sight of one of these a redbreast and its mate jointly attacked her on approaching the nest, putting her to flight; and so effectually drove her away, that she did not dare to return. Among the birds above-mentioned it generally, according to the Dr's. observations, selects the three first, but shews a much greater partiality to the hedge-sparrow. This last commonly takes up four or five days in laying her eggs. During this time (generally after she has laid one or two) the cuckoo deposits her egg among the rest, leaving the future care of it entirely to the hedge-sparrow. This intrusion often occasions some discomposure; for the old hedge-sparrow at intervals, whilst she is sitting, not unfrequently throws out some of her own eggs, and sometimes injures them in such a way that they become addle; so that it frequently happens that only two or three hedge-sparrow's eggs are hatched with the cuckoo's. But whether this be the case or not, she sits the same length of time as if no foreign egg had been introduced, the cuckoo's egg requiring no longer incubation than her own. When the hedge-sparrow has sat her usual time, and disengaged the young cuckoo and some of her own offspring from the shell, her own young ones, and any of her eggs that remain unhatched, are soon turned out, the young cuckoo remaining possessor of the nest, and sole object of her future care. The young birds are not previously killed, nor are the eggs demolished; but all are left to perish together, either being entangled about the bush which contains the nest, or lying on the ground under it. "The early fate of the young hedge-sparrows (says Dr. Jenner) is a circumstance that has been noticed by others, but attributed to wrong causes. A variety of conjectures have been formed upon it. Some have supposed the parent cuckoo the author of their destruction; while others, as erroneously, have pronounced them smothered by the disproportionate size of their fellow nestling. The following is one of the many curious observations of the Dr. to shew how this is effected. June 18, 1787, I examined the nest of a hedge-sparrow, which then contained a cuckoo's and three hedge-sparrow's eggs. On inspecting it the day following, I found the bird had hatched, but that the nest now contained only a young cuckoo and one young hedge-sparrow. The nest was placed so near the extremity of a hedge, that I could distinctly see what was going forward in it; and to my astonishment, saw the young cuckoo, though so newly hatched, in the act of turning out the young hedge-sparrow. The mode of accomplishing this was very curious. The little animal, with the assistance of its rump and wings, contrived to get the bird upon its back; and making a lodgement for the burden by elevating its elbows, clambered backward with it up the side of the nest till it reached the top; where resting for a moment, it threw off its load with a jerk, and quite disengaged it

from the nest. It remained in this situation a short time, feeling about with the extremities of its wings, as if to be convinced whether the business was properly executed, and then dropped into the nest again. With these (the extremities of its wings) I have often seen it examine, as it were, an egg and nesting before it began its operations; and the nice sensibility which these parts appeared to possess, seemed sufficiently to compensate the want of sight, which as yet it was destitute of. I afterwards put in an egg; and this, by a similar process, was conveyed to the edge of the nest and thrown out. These experiments I have since repeated several times in different nests, and have always found the young cuckoo disposed to act in the same manner. In climbing up the nest, it sometimes drops its burden, and thus is foiled, in its endeavours; but, after a little respite, the work is resumed, and goes on almost incessantly till it is effected. It is wonderful to see the extraordinary exertions of the young cuckoo, when it is two or three days old, if a bird be put in the nest with it that is too weighty for it to lift out. In this state it seems ever restless and uneasy. But this disposition for turning out its companions begins to decline from the time it is two or three till it is about twelve days old; when, as far as I have hitherto seen, it ceases. See Plate XXXVIII.

C. CAPENSIS, the CAPE CUCKOO of Buffon, is a little smaller than ours; the bill is a deep brown; the upper part of the body greenish brown; throat, cheeks, fore-part of the neck, and upper wing coverts, of a deep rufous colour; tail feather rufous, but paler, tipped with white; the breast, and all the under parts of the body, white, crossed with lines of black; the legs reddish brown. It inhabits the Cape of Good Hope; and is probably the same bird which is called Edolio, from its pronouncing that word frequently in a low melancholy tone.

C. INDICATOR, or the HONEY GUIDE, is a native of Africa. The following description is given of it by Dr. Sparrman, in the Philos. Trans. for 1777. "This curious species of cuckoo is found at a considerable distance from the Cape of Good Hope, in the interior parts of Africa, being entirely unknown at that settlement. The first place I heard of it was in a wood, called the Groot-vaader's Bosch, the Grand-father's Wood, situated in a desert near the river which the Hottentots call T'kant'kai. The Dutch settlers thereabouts have given this bird the name of honi-guyzer, or honey-guide, from its quality of discovering wild honey to travellers. Its colour has nothing striking or beautiful. Its size is considerably smaller than that of our cuckoo in Europe: but in return, the instinct which prompts it to seek its food in a singular manner is truly admirable. The honey being its favourite food, its own interest prompts it to be instrumental in robbing the hive, as some scraps are commonly left for its support. The morning and evening are its times of feeding, and it is then heard calling in a shrill tone, cherr, cherr; which the honey-hunters carefully attend to as the summons to the chace. From time to time they answer with a soft whistle; which the bird hearing, always continues its note. As soon as they are in sight of each other, the bird gradually flutters toward the place where the nest is situated, continually repeating its former call of cherr, cherr; nay, if it should happen to have gained a considerable way before the men (who may be easily hindered in the pursuit by bushes, rivers, or the like,) it returns to them again, and redoubles its note, as it were to reproach them with their inactivity. At last the bird is observed to hover for a few moments over a certain spot, and then silently retiring to a neighbouring bush or resting place, the hunters are sure of finding the bees nest in that identical spot: whether it be in a tree or in the crevice of a rock, or (as is most commonly the case) in the earth. While the hunters are busy in taking the honey, the bird is seen looking on attentively to what is going forward, and waiting for its share of the spoil. The bee-hunters never fail to leave a small portion for their conductor; but commonly take care never to leave so much as would satisfy its hunger. The bird's appetite being whetted by this parsimony, it is obliged to commit a second treason, by discovering another bee's nest, in hopes of a better salary.

C. NITENS, the SHINING CUCKOO, is the size of a small thrush: the bill is bluish: the upper part of the body green, with a rich gilded gloss; the under parts are white, transversely waved with green gold; the under tail coverts almost white; the quills and tail dusky brown; the legs are bluish. This inhabits New Zealand, where it is called Poopo-arowro. See Plate XXXVIII.

C. VETULA is a little bigger than a blackbird: the bill above

an inch and a half long: the upper mandible black; the lower whitish: crown of the head brown, the feathers of it soft and silky; the upper parts of the body and the quills cinereous olive. This species inhabits Jamaica, where it is common in the woods and hedges all the year round. It feeds on seeds, small worms, and caterpillars, and is very tame. It is called *tacco* from its cry, which is like that word; the first syllable is pronounced hardly, the other following in a full octave lower than the first. It has also another cry like *qua, qua, qua*; but that only when alarmed by an enemy.

CUCUMIS, a genus of the syngenesia order, and monœcia class of plants; natural order, Cucurbitaceæ. Male calyx quinque-dentated; corolla quinquepartite; filaments three; female calyx quinque-dentated; corolla quinquepartite; pistil trifid; pome with argute seeds. In this genus Linnaeus includes the Melon. There are thirteen species.

C. COLOCYNTHIS, the **COLOCYNTH**, **COLOQUINTIDA**, or **BITTER APPLE** of the shops, is brought to us from Aleppo, and the island of Crete, the leaves of the plant are large, placed alternate, almost round, and stand upon footstalks four inches long. The shelly or husky outside incloses a bitter pulp interspersed with flatish seeds. The pulp dried and powdered is commonly used as a purgative in this country. If taken in a large dose, it not only often brings away blood, but produces colics, convulsions, ulcers in the bowels, and fatal super-purgations. The most effectual corrector of these virulent qualities is to triturate it finely with sugar or sweet almonds.

C. SATIVA, the **COMMON CUCUMBER**, is well known: it has many varieties. Cucumbers in this country are raised at three different seasons of the year: 1. on hot-beds, for early fruits; 2. under bell or hand-glasses, for the middle crop; 3. on the common ground, which is for the late crop, or to pickle.

CUCURBIT, in chemistry, an earthen or glass vessel, so called from its resemblance to a gourd, arising gradually from a wide bottom, and terminating in a narrow neck.

CUCURBITA, the **GOURD** and **POMPION**, a genus of the syngenesia order, and monœcia class of plants; natural order, Cucurbitaceæ. Calyx of the male quinque-dentated; corolla quinquefid; filaments three: calyx of the female quinque-dentated; corolla quinquefid; pistil quinquefid; seeds of the pome with a tumid margin. Seven species, annuals, with trailing herbaceous stems, furnished with tendrils for climbing; they are very much like the cucumis.

CUCURBITACEÆ, in botany, the name of the thirty-fourth order in Linnaeus's fragments of a natural method, consisting of plants which resemble the gourd in external figure, habit, virtues, and sensible qualities. These are divided into two sections. 1. Those with hermaphrodite flowers, as the passion-flower. 2. Those with male and female flowers produced either on the same or distinct roots, as the cucumber, &c. See **BOTANY**.

CUDDALORE, a town of Hindostan, on the coast of Coromandel, 15 miles S. S. W. of Pondicherry.

CUDDAPA, a territory of Hindostan, west of the Carnatic.

CUDDAPA, the capital of the above territory, seated on the river Pennar, 95 miles W. by N. from its mouth.

CUDDY, in a first-rate man of war, is a place lying between the captain-lieutenant's cabin and the quarter-deck; and divided into partitions for the master and other officers.

CUDWEED. See **GNAPHALIUM**.

CUENCA, a considerable district of South America, in the province of Quito in Peru.

CUENCA, or **BAMBA**, the capital of the above district, 170 miles S. of Quito.

CUENCA, or **CUENZA**, a town of Spain, in New Castile, and in the territory of Sierra, with a bishop's see.

CUJAVIA, a territory of Great Poland, having the duchy of Prussia on the N. It contains two palatinates, the chief towns of which are Inowloez and Brest; as also Uladislav, the capital of the district.

CUIRASS, a piece of defensive armour, made of iron plate, well hammered, serving to cover the body, from the neck to the girdle, both before and behind. It was not brought into use till about A. D. 1300, though they were known both to the ancient Greeks and Romans in different forms.

CUL, [Fr. *i. e.* a bottom, *Cul de Sac*, a street that has no way out.] in geography, applied metaphorically, denotes a bay, and makes part of the names of several bays.

CULDEES, in church history, a sort of monkish priests, formerly inhabiting Scotland and Ireland. Being remarkable for the religious exercises of preaching and praying, they were called, by way of eminence, *cultores Dei*; whence is derived the word *culdees*. They made choice of one of their own fraternity to be their spiritual head, who was afterwards called the Scots bishop.

CULEMBACH, or **CULMBACH**, a marquise of Germany in the circle of Franconia. It is about 50 miles long from N. to S. and 30 broad from E. to W. and contains 54 towns. It is full of forests and high mountains, covered with pine-trees, and abounds with copper, iron, lead, alum, sulphur, antimony, and marble. Here are the sources of four large rivers, the Maine, the Sala, the Eger, and the Nab.

CULEMBACH, the capital of the marquise. It has good fortifications, and is seated 25 miles N. E. of Bamberg.

CULEUS, in Roman antiquity, the largest measure of capacity for things liquid, containing 20 amphora, or 40 urnæ. It contained 143 gallons 3 pints, English wine measure; and was 11,095 solid inches.

CULEX, the **GNAT**; a genus of insects of the order diptera. Mouth formed by a flexible sheath, inclosing bristles pointed like stings; antennæ of the males filiform; those of the females feathered. There are fourteen species. These insects, too well known by the severe punctures they inflict, and the itchings thence arising, afford a most interesting history. Before they turn to flying insects, they have been in some manner fishes, under two different forms. One may observe in stagnating waters, from the beginning of May till winter, small grubs with their heads downwards, their hinder parts on the surface of the water; from which part arises sideways a kind of vent-hole, or small hollow tube like a funnel, and this is the organ of respiration. The head is armed with hooks, that serve to seize on insects and bits of grass on which it feeds. On the sides are placed four small fins, by the help of which the insect swims about, and dives to the bottom. These larvæ retain their form during a fortnight or three weeks, after which period they turn to chrysalids. All the parts of the winged insect are distinguishable through the outward robe that shrouds them. The chrysalids are rolled up into spirals. The situation and shape of the windpipe is then altered; it consists of two tubes near the head, which occupy the place of the stigmata, through which the winged insect is one day to breathe. These chrysalids, constantly on the surface of the water in order to draw breath, abstain now from eating; but upon the least motion are seen to unroll themselves, and plunge to the bottom, by means of little paddles situated at their hinder parts. After three or four days fasting they pass to the state of gnats. A moment before, water was its element; but now, become an aerial insect, he can no longer exist in it. He swells his head, and bursts his inclosure. The robe he lately wore, turns to a ship, of which the insect is the mast and sail. If at the instant the gnat displays his wings there arise a breeze, it proves to him a dreadful hurricane; the water gets into the ship, and the insect, who is not yet loosened from it, sinks and is lost. But in calm weather, the gnat forsakes his slough, dries himself, flies into the air, seeks to pump the alimentary juice of leaves, or the blood of man and beasts. The sting which our naked eye discovers, is but a tube, containing five or six spicula of exquisite minuteness; some deputed at their extremity like the head of an arrow, others sharp-edged like razors. These spicula introduced into the veins, act as pump-suckers into which blood ascends by reason of the smallness of the capillary tubes. The insect injects a small quantity of liquor into the wound, by which the blood becomes more fluid, and is seen through the microscope passing through those spicula. The animal swells, grows red, and does not quit its hold till it has gorged itself. The liquor it has injected causes by its fermenting that disagreeable itching which we experience; and which may be removed by volatile alkali, or by scratching the part newly stung, and washing it instantly with cold water; for if later, the venom ferments, and the tumor and the itching are only increased by friction. Rubbing one's self at night with fuller's earth and water, lessens the pain and inflammation. Gnats perform their copulation in the air. The female deposits her eggs on the water; by the help of her moveable hinder part and her legs, placing them one by the side of another in the form of a little boat. This vessel, composed of two or three hundred eggs, swims on the water for two or three days, after which they are hatched. If a storm arises, the boats

boats are sunk. Every month there is a fresh progeny of these insects. Were they not devoured by swallows, and other birds, as well as by several carnivorous insects, the air would be darkened by them.

C. PAPIENS, the **MUSKETO FLY**, is the most troublesome species of the whole genus; and swarms in the West Indies. In the daytime or at night they come into the houses; and when the people are gone to bed they begin their disagreeable humming, approach always nearer to the bed, and at last suck up so much blood that they can hardly fly away. Their bite causes blisters in people of a delicate complexion. When the weather has been cool for some days, the musquitoes disappear; but when it changes again, and especially after a rain, they gather frequently in such quantities about the houses, that their numbers are astonishing. In sultry evenings they accompany the cattle in great swarms, from the woods to the houses or to town; and when they are driven before the houses, the gnats fly in wherever they can. In the greatest heat of summer, they are so numerous in some places that the air seems to be quite full of them, especially near swamps and stagnate waters, such as the river Morris in New Jersey. The inhabitants therefore make a fire before their houses to expel these disagreeable guests by the smoke.

CULIACAN, a province of Guadalupe, in Mexico.

CULIACAN, the capital of the province, 480 miles N. W. of Mexico. Lon. 108. 5. W. Lat. 24. 20. N.

CULLEN, **DR. WILLIAM**, an eminent physician, was born in the county of Lanark in Scotland in 1712, and served his apprenticeship to a surgeon at Glasgow. On the expiration of his time he went surgeon in a merchant-ship to the West Indies, and on his return, he established himself in business, in partnership with Dr. William Hunter. In 1740 he took his degree of M. D. and in 1746 he was chosen lecturer in chemistry at Glasgow. In 1761 he was appointed king's professor of medicine in the same university. In 1765 he was elected professor of chemistry at Edinburgh, where, in 1766, he was chosen to the medical chair, in which he raised the reputation of that university to an unequalled height in physical science. He died in 1790. His "First Lines of Physics," 4 vols. 8vo. are too well known to need praise in this place; besides which, he was the author of "Synopsis Nosologiae Methodicae," 2 vols. 8vo. a class book for medical students; "Lectures on Materia Medica," 2 vols. 4to.; and a pamphlet on the recovery of persons drowned and seemingly dead, 8vo. Dr. Cullen "was the first person in Scotland, who understood the Linnaean system of botany, and recommended it to his pupils, at a time when it met with much opposition from others."

CULLODEN MOOR, a heath in Inverness-shire, memorable for a victory gained over the adherents of the house of Stuart, on the 16th of April, 1746.

CULM, or **CULMUS**, in botany, a straw, or haulm, the proper trunk of grasses which elevates the leaves, flower, and fruit.

CULM, in geography, a town of the late Polish Prussia, capital of a palatinate of the same name, and the see of a bishop. It is 18 miles N. N. W. of Thorn. Lon. 18. 30. E. Lat. 53. 24. N.

CULMINATION, in astronomy, the passage of any heavenly body over the meridian, or its greatest altitude for that day.

CULMORE, a town of Ireland, in Londonderry, 5 miles N. of Londonderry.

CULPRIT, is not (as is vulgarly imagined) an opprobrious name given to the prisoner before he is found guilty, but it is the reply of the clerk of arraigns to the prisoner, after he had pleaded Not Guilty; which plea was anciently entered upon the minutes in an abbreviated form, non cul; upon which the clerk of the arraigns, on behalf of the crown, replies that the prisoner is guilty, and that he is ready to prove him so; which is done by a like kind of abbreviation, cul'prit, signifying that the king is ready to prove him guilty (from cul, that is, culpabilis, guilty; and prit, praesto sum, I am ready to verify it). 4 Black. 339.

CULROSS, a town of Scotland, on the river Forth, 23 miles N. W. of Edinburgh.

CULVERIN, a long slender piece of ordnance or artillery, serving to carry a ball to a great distance. Manege derives the word from the Latin *colubrina*; others from *coluber*, a snake; either on account of the length and slenderness of the piece, or of the ravages it makes. There are three kinds of culverins, viz. the extraordinary, the ordinary, and the least sized 1. The culverin

extraordinary has $5\frac{1}{2}$ inches bore; its length 32 calibres, or 13 feet; weighs 4800 pounds: its load above 12 pounds; carries a shot $5\frac{1}{2}$ inches diameter, weighing 20 pounds weight. 2. The ordinary culverin is 12 feet long; carries a ball of 17 pounds 5 ounces; calibre $5\frac{1}{2}$ inches; its weight 4500 pounds. 3. The culverin of the least size, has its diameter 5 inches; is 12 feet long; weighing about 4000 pounds; carries a shot $3\frac{1}{2}$ inches diameter, weighing 14 pounds 9 ounces.

CULVERTAIL, among ship-wrights, signifies the fastening or letting of one timber into another, so that they cannot slip out, as the corlings into the beams of a ship.

CUMA, a small island in the Mediterranean, near the coast of Italy, 5 miles W. of Naples.

CUMA, a town of the island of Gillo, situated at the bottom of a large bay.

CUMA, or **CUMÆ**, in ancient geography, a town of Æolia in Asia Minor.

CUMÆ, or **CUMA**, in ancient geography, a city of Campania near Puteoli, founded by a colony from Chalcis and Cumæ of Æolia before the Trojan war.

CUMANA, **COMANA**, or **NEW CORDOVA**, a town of South America, and capital of New Andalusia. Lon. 63. 39. W. Lat. 9. 46. N.

CUMBERLAND, or **CUMBRIA**, so denominated from the Cumbri, or Britons, who inhabited it; one of the most northerly countries in England. It was formerly a kingdom extending from the vallum of Adrian to the city of Dunbritton, now Dumbarton, on the frith of Clyde in Scotland. At present it is a county of England, bounded on the N. and N. W. by Scotland; on the S. and S. E. by part of Lancashire and Westmoreland. The county produces great quantities of coal, some lead, and abundance of the mineral earth called black-lead. It has several mines of lapis calaminaris, and an inconsiderable pearl-fishery on the coast near Raven-glass.

CUMBERLAND, a county and town of North America, in New Brunswick.

CUMBERLAND, a county of the United States, in the district of Maine, between York and Lincoln counties.

CUMBERLAND, a county of the United States, in New Jersey.

CUMBERLAND, a county of North Carolina.

CUMBERLAND, a county of Pennsylvania.

CUMBERLAND, a county of Virginia.

CUMBERLAND, an island of the United States, off the coast of Camden county, Georgia.

CUMBERLAND ISLAND, an island in the South Pacific ocean. Lon. 140. 36. W. Lat. 19. 18. S.

CUMBERLAND ISLANDS, a cluster of islands near the N. E. coast of New Holland. Lon. 148. 32. E. Lat. 20. 36. S.

CUMBERLAND RIVER, called by the Indians Shawanee, and by the French Shavanon, falls into the Ohio 10 miles above the mouth of Tennessee river.

CUMBRAES, **CIMBRAES**, **CAMBRAY**, or **CUMBRAY**, an island and parish of Scotland, in Ayrshire, lying in the Frith of Clyde.

CUMINUM, **CUMMIN**: a genus of the digynia order, and pentandria class of plants; natural order, Umbellatæ. Fruit ovate and striated; partial umbels four; involucre quadrifid. One species only is known.

CUNEIORM BONE is the same with the os basilare and os sphenoides. See ANATOMY.

CUNEUS, in antiquity, a company of infantry drawn up in form of a wedge, the better to break through the enemy's ranks.

CUNICULUS, in mining, a term used by authors in distinction from puteus, to express the several sorts of passages and cuts in these subterranean works. The cuniculi are those direct passages in mines where they walk on horizontally; but the putei are the perpendicular cuts or descents.

CUNICULUS, in zoology. See LEPUS.

CUNILA, in botany, a genus of the monogynia order, and monandria class; natural order, Verticillatæ. Corolla ringent, with its upper lip erect and plane; two filaments, castrated, or wanting antheræ; seeds four. There are four species.

CUNINA, in mythology, the goddess who had the care of little children.

CUNITZ, MARY, one of the greatest geniuses in the 16th century,

century, was born in Silesia. She learned languages with amazing facility; and understood Polish, German, French, Italian, Latin, Greek, and Hebrew. She attained a knowledge of the sciences with equal ease: she was skilled in history, physic, poetry, painting, music, and playing upon instruments; yet these were her amusements only. She more particularly applied herself to the mathematics, and especially to astronomy, which she made her principal study, and was ranked in the number of the most able astronomers of her time. Her Astronomical Tables acquired her a prodigious reputation: she printed them in Latin and German, and dedicated them to the emperor Ferdinand III. She married Elias de Lewin, M. D.; and died at Pistehen, in 1664.

CUNNINGHAM, ALEXANDER, a Scotch writer, was born at Etrick, near Selkirk, in 1654, and educated in Holland, from whence he came to England with the prince of Orange. He became travelling tutor to several noblemen and gentlemen; by which means he obtained the appointment of resident envoy at Venice, where he continued five years. He died in London in 1737. In 1787 appeared his "History of Great Britain, from the Revolution to the Accession of George I." two vols. translated from the Latin MS. by Dr. William Thompson. There was one Alexander Cunningham who published an edition of Horace at the Hague, in two vols. 8vo. 1721, which is held in great esteem. It is not certain whether he be the same person with the preceding or not; but the particulars in the characters are so much alike that it seems probable he was the same person.

CUNNINGHAMIA, in botany, a genus of the tetrandria monogynia class and order. Calyx very small, four-toothed; corolla four-cleft, with a short tube; berry crowned with a two-celled two-seeded nut. One species, viz. *C. sarmentosa*.

CUNOCEPHALI, in mythology, [from *κυν*, dog, and *κεφαλη*, head,] a kind of baboons, or animals with heads like those of dogs, which were wonderfully endowed, and were preserved with great veneration by the Egyptians in many of their temples. It is related, that by their assistance the Egyptians found out the particular periods of the sun and moon; and that one-half of the animal was often buried, while the other half survived; and that they could read and write. This strange history, Dr. Bryant imagines, relates to the priests of Egypt, styled *cahen*, to the novices in their temples, and to the examinations they were obliged to undergo, before they could be admitted to the priesthood.

CUNONIA, in botany, a genus of the digynia order, and decandria class. Corolla pentapetalous; calyx pentaphyllous; capsule bilocular, acuminate, polyspermous; styles longer than the flower. One species, a Cape plant.

CUP GALLS, in natural history, a name given to a curious kind of galls found on the leaves of the oak, and some other trees. They derive their name from their shape being that of a cup. The oak leaves furnish us with several other species, of various shapes and sizes, which appear on the leaves at different seasons of the year. They all contain the worm of some small fly, that passes through all its changes in this habitation, being sometimes found in the worm, sometimes in the nymph, and sometimes in the fly state, in the cavity.

CUP, in botany, calyx. See **BOTANY**.

CUPANIA, in botany, a genus of the monadelphia order, and monœcia class; natural order, Tricocœæ. Calyx of the male triphyllous; corolla pentapetalous; stamina five: calyx of the female triphyllous; corolla tripetalous; style trifid; seeds two. It has two species, natives of the West Indies.

CUPAR, a town of Scotland, seven miles S. of Dundee.

CUPEL, in metallurgy, a small vessel, which absorbs metallic bodies when changed by fire into a fluid scoria; but retains them as long as they continue in their metallic state. One of the most proper materials for making a vessel of this kind is the ashes of animal bones; there is scarcely any other substance which so strongly resists vehement fire, which so readily imbibes metallic scoriae, and which is so little disposed to be vitrified by them. Instead of these, some use vegetable ashes, freed by boiling in water from their saline matter, which would cause them to melt in the fire. The bones burnt to perfect whiteness, so that no particle of coaly or inflammable matter may remain in them, and well washed from filth, are ground into moderately fine powder; which, to form into cupels, is moistened with just as much water as is sufficient to make it hold together, when strongly pressed between the fingers.

Some mix glutinous liquids, as whites of eggs or gum water, to give the powder a great tenacity: but the inflammable matter, however small in quantity, which accompanies these fluids, and cannot be easily burnt out from the internal part of the mass, is apt to revive a part of the metallic scoria that has been absorbed, and to occasion the vessel to burst or crack. The cupel is formed in a brass ring, from three quarters of an inch to two inches diameter, and not quite so deep, placed upon some smooth support: the ring being filled with moistened powder, which is pressed close with the fingers; a round faced pestle, called a monk, is struck down into it with blows of a mallet, by which the mass is made to cohere, and rendered sufficiently compact, and a shallow cavity is formed in the middle. The figure of the cavity is nearly spherical, that a small quantity of metal melted in it may run together into a bead. To make the cavity the smoother, a little of the same ashes levigated into an impalpable powder, and not moistened, is commonly sprinkled on the surface, through a small fine sieve made for this purpose, and the monk again struck down upon it. The ring or mould is a little narrower at bottom than at top: so that by pressing it down on some of the dry powder spread upon a table, the cupel is loosened, and forced upwards a little; after which it is easily pushed out with the finger, and is then set to dry in a warm place free from dust.

CUPELLATION, the act of refining gold or silver by means of a cupel. For this purpose another vessel, called a muffle, is made use of, within which one or more cupels are placed. The muffle is placed upon a grate in a proper furnace, with its mouth facing the door, and as close as it may be. The furnace being filled up with fuel, some lighted charcoal is thrown on the top, and what fuel is afterwards necessary is supplied through a door above. The cupels are set in the muffle; and being gradually heated by the successive kindling of the fuel, they are kept red-hot for some time, that the moisture which they strongly retain may be completely dissipated: for if any vapours should issue from them after the metal is put in, they would occasion it to sputter, and a part of it to be thrown off in little drops. In the sides of the muffle are some perpendicular slits, with a knob over the top of each, to prevent any small pieces of coals or ashes from falling in. The door, or some apertures made in it being kept open, for the inspection of the cupels, fresh air enters into the muffle, and passes off through these slits: by laying some burning charcoal on an iron plate before the door, the air is heated before its admission; and by removing the charcoal or supplying more, the heat in the cavity of the muffle may be somewhat diminished or increased more speedily than can be effected by suppressing or exciting the fire in the furnace on the outside of the muffle. The renewal of the air also is necessary for promoting the scorification of the lead. The cupel being of a full red heat, the lead cast into a smooth bullet, that it may not scratch or injure the surface, is laid lightly in the cavity: it immediately melts; and then the gold or silver to be cupelled is cautiously introduced either by means of a small iron ladle or by wrapping them in paper, and dropping them on the lead with a pair of tongs. The quantity of lead should be at least three or four times that of the gold or silver: but when gold is very impure, it requires 10 or 12 times its quantity of lead for cupellation. It is reckoned that copper requires for its scorification about 10 times its weight of lead; that when copper and gold are mixed in equal quantities, the copper is so much defended by the gold as not to be separable with less than 20 times its weight of lead; and that when copper is in very small proportion, as a 20th or 30th part of the gold or silver, upwards of 60 parts of lead are necessary for one of the copper. The cupel must always weigh at least half as much as the lead and copper; for otherwise it will not be sufficient for receiving half the scoria: there is little danger, however, of cupels being made too small for the quantity of a gold assay. The mixture being brought into thin fusion, the heat is to be regulated according to the appearances; and in this consists the principal nicety in the operation. If a various coloured skin rises to the top, which, liquifying, runs off to the sides, and is there absorbed by the cupel, visibly staining the parts it enters; if a fresh scoria continually succeeds, and is absorbed nearly as fast as it is formed, only a fine circle of it remaining round the edge of the metal; if the lead appears in gentle motion, and throws up a fume a little way from its surface; the fire is of the proper degree, and the process goes on successfully. Such a fiery brightness of the cupel as prevents its colour from being distinguished

guished, and the fumes of the lead rising up almost to the arch of the muffle, are marks of too strong a heat: though it must be observed, that the elevation of the fumes is not always in proportion to the degree of heat; for if the heat greatly exceeds the due limits, both the fumes and ebullition will entirely cease. In these circumstances the fire must necessarily be diminished: for while the lead boils and smokes vehemently, its fumes are apt to carry off some part of the gold; the cupel is liable to crack from the hasty absorption of the scoria, and part of the gold and silver is divided into globules, which lying discontinued on the cupel after the process is finished, cannot easily be collected: if there is no ebullition or fumes, the scorification does not appear to go on. Too weak a heat is known by the dull redness of the cupel; by the fume not rising from the surface of the lead; and the scoria like bright drops in languid motion, or accumulated, or growing all over the metal. The form of the surface affords also an useful mark of the degree of heat; the stronger the fire, the more convex is the surface; and the weaker, the more flat: in this point, however, regard must be had to the quantity of metal; a large quantity being always flatter than a small one in an equal fire. Towards the end of the process, the fire must be increased; for the greatest part of the lead being now worked off, the gold and silver will not continue melted in the heat that was sufficient before. As the last remains of the lead are separating, the rainbow colours on the surface become more vivid, and variously intersect one another with quick motions. Soon after, disappearing all at once, a sudden luminous brightness of the button of gold or silver shews the process to be finished. The cupel is then drawn forwards towards the mouth of the muffle; and the button, as soon as grown fully solid, taken out.

CUPHEA, in botany, a genus of the dodecandria monogynia class and order. Calyx six-toothed, unequal; petals six, unequal; inserted into the calyx; capsule one-celled, with a three-sided follicle. There is but one species.

CUPID, in pagan mythology, the god of love. There were two cupids; one the son of Jupiter and Venus, whose delight it was to raise sentiments of love and virtue; and the other the son of Mars and the same goddess, who inspired base and impure desires. The first of these, called Eros, or true love, bore golden arrows, which caused real joy, and a virtuous affection; the other called Anteros, had leaden arrows that raised a passion founded only on desire, which ended in satiety and disgust. Cupid was always drawn with wings, to represent his inconstancy; and naked, to shew that he has nothing of his own.

CUPOLA, in architecture, a spherical vault; or the round top of the dome of a church, in form of a cup inverted. See **DOME**, and Plate LIV. fig. 4.

CUPPING, in surgery, the operation of applying cupping-glasses for the discharge of blood and other humours by the skin. See **SURGERY**.

CUPRESSUS, the **CYPRESS TREE**: a genus of the monadelphia order, and monœcia class of plants; natural order, Coniferae. Male calyx, a scale of the catkin; no corolla; anthera four, sessile, and without filaments: calyx of the female a scale of the strobilus, uniflorous; instead of styles there are hollow dots; fruit an angulated nut. There are seven species.

C. DISTICHA, the **DECIDUOUS AMERICAN CYPRESS**, has an erect trunk, retaining a large bulk, branching wide and regular; grows 50 or 60 feet high, fully garnished with small spreading deciduous leaves, arranged distichous, or along two sides of the branches. All these species are raised from seeds, and will sometimes also grow from cuttings; but those raised from seeds prove the hand-somest plants.

C. SEMPERVIRENS, with an upright straight stem, closely branching all around, almost from the bottom upwards, into numerous quadrangular branches; rising in the different varieties from 15 to 40 or 50 feet in height, and very closely garnished with small, narrow, erect, ever-green leaves, placed imbricatum; and flowers and fruit from the sides of the branches. The wood of this species is said to resist worms, moths, and putrefaction, and to last many centuries. The coffins in which the Athenians were wont to bury their heroes were made, says Thucydides, of this wood; as were likewise the chests containing the Egyptian mummies. The doors of St. Peter's church at Rome were originally of it. These, after lasting upwards of 600 years, at the end of which they did not discover the smallest tendency to corruption,

were removed by pope Eugenius IV. and the gates of brass substituted in their place. Cypress, says Mr. Pococke, is the only tree that grows towards the top of mount Lebanon, and being nipped by the cold, grows like a small oak. Noah's ark is commonly supposed to have been made of this kind of wood.

C. THYOIDES, the evergreen American cypress, commonly called white cedar, hath an upright stem, branching out into numerous two-edged branches, rising 20 or 30 feet high, ornamented with flat ever-green leaves imbricated like arbor vita, and small blue cones the size of juniper berries.

CUPRIUM, copper. See **COPPER**.

CURACOA, **CURASSOU**, or **QUERISOA**, an island in the West Indies, 9 or 10 leagues N. E. from Cape Roman, on the continent of Terra Firma. Lon. 68. 20. W. Lat. 11. 56. N.

CURATE the lowest degree in the church of England; he who represents the incumbent of a church, parson or vicar, and officiates divine service in his stead. In cases of pluralities of livings, or where a clergyman is old and infirm, a curate is requisite to perform the cure of the church. He is to be licensed and admitted by the bishop of the diocese, or by an ordinary having episcopal jurisdiction: and when he has the approbation of the bishop, he usually appoints the salary too; and in such case, if he be not paid, the curate has a proper remedy in the ecclesiastical court, by a sequestration of the profits of the benefice; but if the curate is not licensed by the bishop, he is put to his remedy at common law, where he must prove the agreement, &c.

CURATELLA, in botany, a genus of the digynia order, and polyandria class. Calyx pentaphyllous; petals four; styles two; capsule bipartite, with the cells dispermous.

CURATOR, in Roman antiquity, an officer under the emperors, who regulated the prices of all kinds of merchandise, and vendible commodities in the cities of the empire. They had likewise the superintendence of the customs and tributes; whence also they were called *Logistæ*.

CURATOR, in the civil law, a trustee nominated to take care of the affairs of a person emancipated or interdicted. In countries where the Roman law prevails, between the age of 14 and 24 years, minors have curators assigned them; till 14, they have tutors.

CURATOR OF AN UNIVERSITY, in the ci-devant United Provinces, an officer that had the direction of the affairs of the university, such as the superintendence of the professors, the management of the revenues, &c. these officers, being elective, were chosen by the states of each province. Leyden had three curators.

CURB, in the manege, a chain of iron, made fast to the upper part of the branches of the bridle, in a hole, called the eye, and running over the horse's beard.

CURCULIGO, in botany, a genus of the polygamia monœcia class and order. Calyx none; corolla six-petaled; filaments six; pistil one; capsule; seeds beaked. One species, viz. *C. orchiodes*, native of shady, uncultivated places about Samulcotah.

CURCULIO, **WEEVIL**, in natural history, a genus of insects of the order coleoptera: antennæ clavate, seated on the snout, which is horny and prominent; four feelers, filiform. It has from 800 to 1000 species. These have been separated into three sections, viz. A. jaw cylindrical, one-toothed. B. lip bifid; jaw bifid, short; snout short. C. lip rounded, horny; feelers very short. Of these the section A. is distinguished into *a*, snout longer than the thorax; thighs unarmed; *b*, snout longer than the thorax; thighs toothed; *c*, snout longer than the thorax; hind thighs formed for leaping; *d*, snout shorter than the thorax; thighs unarmed; *e*, snout shorter than the thorax; thighs toothed.

C. IMPERIALIS, or a **DIAMOND BEETLE**, is represented in Plate XXXVII. The larvæ of the curculiones differ not from those of most coleopterous insects. They bear a resemblance to oblong soft worms. They are provided anteriorly with six scaly legs, and their head is likewise scaly. But the places where those larvæ dwell, and their transformations, afford some singularities. Some species of them, that are dreaded for the mischief they do in granaries, find means to introduce themselves, while yet small, into grains of corn, and there make their abode. It is very difficult to discover them, as they lie concealed within the grain. There they grow at leisure, enlarging their dwelling places as they grow, at the expence of the interior meal of the grain on which they feed. Corn-lofts are often laid waste by these insects, whose numbers are sometimes so great as to devour and destroy all the corn. When the insect, after having eat up the meal, is come to

its full size, it remains within the grain, hidden under the empty husk, which subsists alone; and there transformed, it becomes a chrysalis, nor does it leave it till a perfect insect, making its way through the husk of the grain. It is no easy matter to discover by the eye the grains of corn thus attacked and hollowed out by these insects, as they outwardly appear large and full; but the condition the curculio has reduced them to, renders them much lighter; and on throwing corn infested by these insects into water, all the tainted grains will swim, and the rest sink to the bottom. Other larvæ of curculiones are not so fond of corn, but fix in the same manner on several other seeds. Beans, pease, and lentils, that are preserved dry, are liable to be spoiled by these little animals, which prey upon the inward part of the grain, where they have taken up their habitation, and do not come forth till they have completed their transformation, by breaking through the outward husk of the grain; this is discoverable by casting those grains into water; those that swim are generally perforated by the curculiones. Other species are lodged in the inside of plants. The heads of artichokes and thistles are often bored through and eaten away by the larvæ of large curculiones. Another species smaller, but singular, pierces and inwardly consumes the leaves of elms. It frequently happens that almost all the leaves of an elm appear yellow, and as it were dead towards one of their edges, while the whole remainder of the leaf is green. Upon inspecting those leaves, the dead part appears to form a kind of bag or small bladder. The two laminae or outward pellicles of the leaf, as well above as below, are entire, but distant and separated from each other, whilst the parenchyma that lies between them has been consumed by several small larvæ of the curculio, that have made themselves that dwelling, in which they may be met with. After this transformation they come forth, by piercing the kind of bladder, and give being to a curculio that is brown, small, and hard to catch, by reason of the nimbleness with which it leaps. The property of leaping, allotted to this single species, depends on the shape and length of its hinder legs.

CURCUMA, TURMERIC: a genus of the monogynia order, and monandria class of plants; natural order, Scitamineæ. Stamina four, barren, a fifth fertile; corolla four-parted; nectary three-lobed; filament flat. There are three species, of which *C. rotundo*, round-rooted turmeric has a perennial root, with a large ovate bulb, frequently as big as a goose's egg, covered with a thin pellicle, that has parallel rooting rings within, solid, fleshy, reddish yellow, of a bitterish taste, and slightly aromatic smell. Native of the East Indies, China, &c.

CURDISTAN, a country of Asia, seated between the Turkish empire and Persia, lying along the E. coast of the Tigris, and comprehending great part of the ancient Assyria.

CURDLING, the coagulating or fixing of any fluid body; particularly milk. See **CHEESE**. Pausanias says, that Aristæus son of Apollo, and Cyrene daughter of the river Peneus, were the first who found the art of curdling milk.

CURETES, ancient Cretan priests, called also Corybantes.

CURFEW, a signal given in cities, taken in war, &c. to the inhabitants to go to bed, and to advertise the people to secure themselves from the robberies and debaucheries of the night. The most eminent curfew in England, was that established by William the Conqueror, who appointed, under severe penalties, that, at the ringing of a bell, at eight o'clock in the evening, every one should put out their lights and fires, and go to bed: whence to this day, a bell rung about that time, is called a curfew-bell.

CURIA, among the ancient Romans, denoted a portion or division of a tribe. In the time of Romulus, a tribe consisted of ten curiæ, or 1000 men; each curia being 100. The legislator made the first division of his people into thirty curiæ. Afterwards, curia became used for the place where each curia held its assemblies as well as for the senate-house, and hence the moderns use the word curia, a court, for a place of justice, and for the judges, &c. there assembled. Varro derives the word from *cura*, care; *q. d.* an assembly of people charged with the care of public affairs. Others deduce it from the Greek; maintaining, that at Athens they called *xylia* the place where the magistrate held his assizes, and the people used to assemble; *xylia*, again, may come from *xylæ*, authority, or power; because here the laws were made.

CURIA CLAUDENDA, in law, is a writ that lies against him who should fence and inclose the ground, but refuses or defers to do it.

CURIA MARIA, an island in the Arabian sea, near the S. E. coast of Arabia, 40 miles long, and 16 broad.

CURACO, a bay in Terra Firma, S. America, on the North Sea.

CURING, a term used for the preserving of fish, flesh, and other animal substances, by means of certain additions of things, to prevent putrefaction. One method of doing this, is by smoaking the bodies with the smoke of wood; another and the chief one, is by rubbing them with salt, nitre, &c.

CURIO, the chief and priest of a curia. Romulus, upon dividing the people into curiæ, gave each division a chief, who was to be priest of that curia, under the title of curio and flamen curialis. His business was to provide and officiate at the sacrifices of the curia, which were called curionia.

CURRENT is a term used to express the present time: thus, the year 1810 is the current year; the 20th current is the 20th day of the present month. The price current is the known and ordinary price accustomed to be given for it. As applied to commerce, we say, "current coin," for the known and common coin of the country.

CURIOSUS, [from *cura*, care, Lat.] an officer of the Roman empire during the middle age, appointed to take care that no frauds and irregularities were committed; particularly in what related to the posts, the roads, &c.

CURRANS, or **CURRANTS**. See **RISES**.

CURRENTS also signify a smaller kind of grapes brought principally from Zante and Cephalonia. They are opening and peccol, but are more used in the kitchen than in medicine.

CURRENTS, in navigation, are certain settings of the stream, by which ships are compelled to alter their course or velocity, or both, and submit to the motion impressed upon them by the current. See **NAVIGATION**.

CURRENT ISLAND, a small island in the Pacific ocean. Lon. 134. 3. E. Lat. 4. 40. N.

CURRICULUS, in our ancient writers, denotes the year or course of a year.

CURRITUCK, a county of N. Carolina, on the sea-coast of Edenton district.

CURRODREPANUS, [from *currus*, a chariot, and *δρέπανον*, a scythe,] in antiquity, a chariot armed with scythes. The driver of these chariots was obliged to ride on one of the horses, as there was no other seat for him; the usual place for him being all armed with knives, as was likewise the hinder part of the chariot. There were no scythes pointing down to the earth either from the beam or axle-tree; but these were fixed on the axle-tree, so as to be moveable by means of a rope, and thereby could be raised or let down, and drawn forward or let fall backward, by relaxing the rope.

CURRYING, the method of preparing leather with oil, tallow, &c. The chief business is to soften and supple cow and calveskins, which make the upper-leathers and quarters of shoes, covering of saddles, coaches, and other things which must keep out water. 1. These skins, after coming from the tanner's yard, having many fleshy fibres on them, the currier soaks them some time in common water. 2. He takes them out and stretches on a very even wooden horse; then with a paring knife he scrapes off all the superfluous flesh, and puts them in to soak again. 3. He puts them wet on a hurdle, and tramples them with his heels till they begin to grow soft and pliant. 4. He soaks thereon train oil, which by its unctuous quality, is the best liquor for this purpose. 5. He spreads them on large tables, and fastens them at the ends. There with the help of an instrument, called a pummel, which is a thick piece of wood, the under side of which is full of furrows crossing each other, he folds, squares, and moves them forwards and backwards several times, under the teeth of this instrument, which breaks their too great stiffness. This is what is properly called currying. The order and number of these operations is varied by different curriers, but the material part is always the same. 6. After the skins are curried, there may be occasion to colour them. The colours most in use are black, white, red, yellow, green, &c. the other colours are given by the skimmers, who differ from curriers in this, that they apply their colours on the flesh side; the curriers on the hair side. In order to whiten skins, they are rubbed with lumps of chalk or white lead, and afterwards with pumice-stone. 7. When a skin is to be made black, after having oiled and dried it, he passes over it a puff dipt in water impregnated with iron; and after his first wetting, he gives it another in a water prepared with soot, vinegar, and gum-arabic. These

These different dyes gradually turn the skin black, and the operations are repeated till it be of a shining black. The grain and wrinkles, which contribute to the suppleness of calves and cows leather are made by the reiterated folds given to the skin in every direction, and by the care taken to scrape off all hard parts on the colour side.

CURSITOR, [Latin,] an officer or clerk belonging to the Chancery. Of these there are twenty-four in number, which have certain shires allotted to each of them, into which they make out such original writs as are required. They are a corporation among themselves.

CURSOLIERS, a small island of Greece, in the gulf of Patras, anciently called Echanades.

CURSOR, in mathematical instruments, is any small piece that slides: as the piece in an equinoctial ring-dial that slides to the day of the month; the little label of brass divided like a line of sines, and sliding in a groove along the middle of another label, representing the horizon in the analemma; and likewise a brass point screwed on the beam-compasses, which may be moved along the beam for the striking of greater or less circles.

CURTATE DISTANCE, in astronomy, the distance of a planet from the sun to that point where a perpendicular let fall from the planet meets with the ecliptic.

CURTEYN, **CURTANA**, in the British customs, king Edward the Confessor's sword, borne before the prince at coronations. Its point is said to be broken off, as an emblem of mercy.

CURTIN, **CURTAIN**, or **COURTIN**, in fortification, is that part of the rampart of a place which is betwixt the flanks of two bastions bordered with a parapet five feet high, behind which the soldiers stand to fire upon the covered way, and into the moat. See **FORTIFICATION**.

CURTISIA, in botany, a genus of the tetrandria monogynia class and order. Calyx four-parted; petals four; drupe superior, roundish, succulent, with a four or five-celled nut. It has one species, viz. *C. faginea*, beech-leaved curtisia, or hassagay-tree. This is one of the largest trees in the African woods, with very diminutive flowers. The Hottentots and Caffres make the shafts of their javelins, or assagays, from the wood of this tree.

CURTIUS, **QUINTUS**, a Latin historian, who wrote the life of Alexander the Great in ten books, of which the two first are not extant, but are so well supplied by Freinshemius, that the loss is scarcely regretted. Where this writer was born, or even when he lived, is not known. By his style he is supposed to have lived near the Augustan age; though some imagine the work to have been composed in Italy about 300 years ago, and the name of Quintus Curtius fictitiously prefixed. Cardinal de Perron was so great an admirer of this work, as to declare one page of it to be worth 30 of Tacitus's; yet M. le Clerc, at the end of his *Art of Criticism*, has charged the writer with great ignorance and many contradictions. He has nevertheless many qualities as a writer, which will always make him admired and applauded.

CURVATURE OF A LINE, is the peculiar manner of its bending or flexure, by which it becomes a curve of such and such peculiar properties. Any two arches of curve lines touch each other when the same right line is the tangent of both at the same point; but when they are applied upon each other in this manner, they never perfectly coincide, unless they are similar arches of equal and similar figures; and the curvature of lines admits of indefinite variety. Because the curvature is uniform in a given circle, and may be varied at pleasure in them by enlarging and diminishing their diameters, the curvature of circles serves for measuring that of other lines. Of all the circles that touch a curve in any given point, that is said to have the same curvature with it, which touches it so closely, that no circle can be drawn through the point of contact between them: and this circle is called the circle of curvature; its centre the centre of curvature; and its semi-diameter, the radius of curvature belonging to the point of contact. As in all figures, rectilinear ones excepted, the position of the tangent is continually varying, so the curvature is continually varying in all curvilinear figures, the circle only excepted. As the curve is separated from its tangent by its curvature, so it is separated from the circle of curvature in consequence of the increase or decrease of its curvature; and its curvature is greater or less, according as it is more or less inflected from the tangent, so the variation of curvature is greater or less, according as it is more or less separated from the circle of curvature. When any two curve lines touch each other in such a manner that no circle can pass between them, they

must have the same curvature; for the circle that touches the one so closely that no circle can pass between them, must touch the other in the same manner. And it can be made appear, that circles may touch curve lines in this manner; that there may be indefinite degrees of more or less intimate contact between the curve and the circle of curvature; and that a conic section may be described that shall have the same curvature with a given line at a given point, and the same variation of a curvature, or a contact of the same kind with the circle of curvature. The rays of curvature of similar arcs, in similar figures, are in the same ratio as any homologous lines of these figures, and the variation of curvature is the same.

CURVE, in geometry, a line which, running on continually in different directions, may be cut by a right line in more points than one. In a curve, the line *AD*, (See Plate LI. fig. 3,) which bisects all the parallel lines *MN*, is called a diameter, and the point *A*, where the diameter meets the curve, is called the vertex of the diameter; if *AD* bisect all the parallels at right angles, it is called the axis. The parallel lines *MN* are called ordinates, or applicates, and their halves, *PM*, or *PN*, semi-ordinates. The portion of the diameter *AP*, between the vertex, or any other fixed point, and an ordinate, is called the absciss; also the concurrence of all the diameters, if they meet all in one point, is the centre. This definition of the diameter, as bisecting the parallel ordinates, respects only the conic sections, or such curves as are cut only in two points by the ordinates; but in the lines of the third order, which may be cut in three points by the ordinates, then the diameter is that which cuts the ordinate so, that the sum of the two parts that lie on the one side of it, shall be equal to the part on the other side; and so on for curves of higher orders; the sum of the parts of the ordinates on one side of the diameter, being always equal to the sum of the parts on the other side of it. A line which meets the curve, and does not cut it, is called a tangent. Curve lines are distinguished into algebraical or geometrical, and transcendental or mechanical. Algebraical or geometrical curves are those in which the relation of the absciss *AP*, to the ordinates *PM*, can be expressed by a common algebraic equation. And transcendental or mechanical curves are such as cannot be so defined or expressed by an algebraical equation. Thus suppose, for instance, the curve be the circle (fig. 4,) and that the radius *AC* = *r*, the absciss *AP* = *x*, and the ordinate *PM* = *y*; then, because the nature of the circle is such, that the rectangle *AP* × *PB* is always = *PM*², therefore *x* · *2r* - *x* = *y*², or *2rx* - *x*² = *y*², is the equation, defining this curve, which is therefore an algebraical or geometrical line. Or suppose *CP* = *x*, then is *CM*² - *CP*² = *PM*², that is, *r*² - *x*² = *y*²; which is another form of the equation of the curve. The doctrine of curve lines in general, as expressed by algebraical equations, was first introduced by Des Cartes, who called algebraical curves geometrical ones, as admitting none else into the construction of problems, nor consequently into geometry. But Newton, Leibnitz, and Wolfius, think that in the construction of a problem, one curve is not to be preferred to another for its being defined by a more simple equation, but for its being more easily described. Algebraical or geometrical lines are best distinguished into orders according to the number of dimensions of the equation expressing the relation between its ordinates and absciss, or, which is the same thing, according to the number of points in which they may be cut by a right line. And curves of the same kind or order are those whose equations rise to the same dimension. Hence of the first order, there is the right line only; of the second order of lines, or the first order of curves, are the circle and conic sections, being four species only, viz. $dx - x^2 = y^2$ the circle, $\frac{c^2}{d^2} \cdot dx - x^2 = y^2$ the ellipse, $-\frac{c^2}{d^2} \cdot dx + x^2 = y^2$ the hyperbola, and $dx = y^2$ the parabola; the lines of the third order, or curves of the second order, are expressed by an equation of the third degree, having three roots; and so on. Of these lines of the third order, Newton wrote an express treatise, under the title of "Enumeratio Linearum Tertii Ordinis," shewing their distinctive characters and properties, to the number of seventy-two different species of curves; but Mr. Stirling afterwards added four more to that number, and Mr. Nic. Bernoulli and Mr. Stone added two more. As to the curves of the second orders, Sir Isaac Newton observes, they have parts and properties similar to those of the first: thus, as the conic sections have diameters and axes, the lines

cut by these are called ordinates, and the intersection of the curve and diameter, the vertex. So in curves of the second order, any two parallel lines being drawn so as to meet the curve in three points, a right line cutting these parallels, so as that the sum of the two parts between the secant and the curve on one side, is equal to the third part terminated by the curve on the other side, will cut in the same manner all other right lines parallel to these, and meet the curve in three parts, so as that the sum of the two parts on one side will be still equal to the third part on the other side. These three parts, therefore, thus equal, may be called ordinates or applicates; the second may be styled the diameter; the intersection of the diameter and the curve the vertex; and the point of concurrence of any two diameters the centre. And if the diameter be normal to the ordinates, it may be called axis; and that point where all the diameters terminate, the general centre. Again, as an hyperbola of the first order has two asymptotes, that of the second three, that of the third four, &c. and as the parts of any right line lying between the conic hyperbola and its true asymptote are every where equal, so in the hyperbola of the second order, if any right line be drawn, cutting both the curve and its three asymptotes in three points, the sum of the two parts of that right line being drawn the same way from any two asymptotes to two points of the curve, will be equal to a third part drawn a contrary way from the third asymptote to a third point of the curve. Again, as in conic sections not parabolical, the square of the ordinate, that is, the rectangle under the ordinates drawn to contrary sides of the diameter, is to the rectangle of the parts of the diameter which are terminated at the vertices of the ellipsis or hyperbola, as the latus rectum is to the latus transversum; so in nonparabolic curves of the second order, a parallelopiped under the three ordinates is to a parallelopiped under the parts of the diameter, terminated at the ordinates, and the three vertices of the figure, in a certain given ratio; in which ratio, if you take three right lines situated at the three parts of the diameter between the vertices of the figure, one answering to another, then these three light lines may be called the latera recta of the figure, and the parts of the diameter between the vertices, the latera transversa. And, as in the conic parabola, having to one and the same diameter but one only vertex, the rectangle under the ordinates is equal to that under the part of the diameter cut off between the ordinates and the vertex, and the latus rectum; so in curves of the second order, which have but two vertices to the same diameter, the parallelopiped under three ordinates, is equal to the parallelopiped under the two parts of the diameter cut off between the ordinates and those two vertices and a given right line, which therefore may be called the latus rectum. Moreover, as in the conic sections, when two parallels, terminated on each side of the curve, are cut by two other parallels terminated on each by the curve, the first by the third, and the second by the fourth; as here the rectangle under the parts of the first is to the rectangle under the parts of the third, as the rectangle under the parts of the second, is to that under the parts of the fourth; so when four such right lines occur in a curve of the second kind, each in three points, then shall the parallelopiped under the parts of the first right line, be to that under the parts of the third, as the parallelopiped under the parts of the second line, to that under the parts of the fourth. Lastly, the legs of curves, both of the first, second, and higher kinds, are either of the parabolic or hyperbolic kind; an hyperbolic leg being that which approaches infinitely towards some asymptote; a parabolic, that which has no asymptote. These legs are best distinguished by their tangents; for if the point of contact go off to an infinite distance, the tangent of the hyperbolic leg will coincide with the asymptote; and that of the parabolic leg recede infinitely, and vanish. The asymptote, therefore, of any leg is found by seeking the tangent of that leg to a point infinitely distant; and the bearing of an infinite leg is found by seeking the position of a right line parallel to the tangent, when the point of contact is infinitely remote; for this line tends the same way towards which the infinite leg is directed. For the other properties of curves of the second order, we refer the reader to Mr. Maclaurin's treatise "De Linearum Geometricarum Proprietatibus generalibus." Sir Isaac Newton reduces all curves of the second order to the four following particular equations, still expressing them all. In the first, the relation between the ordinate and the absciss, making the absciss a and the ordinary y , assumes this form, $xy^2 + cy = ax^3 + bx^2 +$

$cx + d$. In the second case, the equation takes this form, $xy = ax^3 + bx^2 + cx + d$. In the third case, the equation is $y^2 = ax^3 + bx^2 + cx + d$. And in the fourth case, the equation is of this form, $y = ax^3 + bx^2 + cx + d$.

CURVES, FAMILY OF, according to Wolfius, is a congeries of several curves of different kinds, all defined by the same equation of an indeterminate degree, but differently, according to the diversity of their kinds. For example: let the equation of an indeter-

minate degree be $x = y^m$. If $m = 2$, ax will be equal to y^2 . If $m = 3$, then will $a^2x = y^3$. If $m = 4$, then will $a^3x = y^4$, &c. all which curves are said to be of the same family. The equations, however, by which the families of curves are defined, must not be confounded with transcendental ones; though with regard to the whole family they be of an indeterminate degree, yet with respect to each several curve of the family, they are determinate; whereas transcendental equations are of an indefinite degree with respect to the same curve. The genesis and properties of particular curves, as the conchoid, cycloid, &c. see under their proper heads CONCHOID, CYCLOID, &c. See also CONIC SECTIONS, GEOMETRY, and EQUATIONS, CONSTRUCTION OF.

CURVET, or CORVET, in the manege, an air in which the horse's legs are raised higher than in the demi-volt; being a kind of leap up, and a little forwards, wherein the horse raises both his fore-legs at once, equally advanced, (when he is going straight forward and not in a circle) and as his fore-legs are falling, he immediately raises his hind-legs, equally advanced, and not one before the other: so that all his four legs are in the air at once; and as he sets them down, he marks but twice with them.

CURULE CHAIR, in Roman antiquity, a chair adorned with ivory, wherein the great magistrates of Rome had a right to sit and be carried.

CURULES, the curule magistrates were the ædiles, the prætors, censors, and consuls.

CURZOLA, an island of Dalmatia, belonging to the emperor, 30 miles long, and 8 broad.

CURZOLA, a town in the E. end of the above island.

CUSCO, the ancient capital of the Peruvian empire in South America, and formerly the residence of the Incas. It is 325 miles E. of Lima.

CUSCOWILLA, an Indian town of East Florida, the capital of the Alachua tribe.

CUSCUTA, DODDER: in botany, a genus of the digynia order, and tetrandria class of plants. Calyx quadrifid; corolla monopetalous; capsule bilocular. Four species; of which *C. Europæa*, dodder, hell-weed, or devil's guts, is a very singular plant, almost destitute of leaves, parasitical, creeping, fixing itself to whatever is next to it. It decays at the root, and afterwards is nourished by the plant which supports it. Hops, flax, and nettles, are its common support; but principally the common nettle.

CUSHION, in engraving, is a bag of leather filled with sand, commonly about nine inches square, and three or four thick, used for supporting the plate to be engraved.

CUSHION, in gilding, is made of leather, fastened to a square board, from 14 inches square to 10, with a handle. The vacuity between the leather and board is stuffed with fine tow or wool, so that the outer surface may be flat and even. It is used for receiving the leaves of gold from the paper, in order to its being cut into proper sizes and figures.

CUSP, [*cuspis*, Lat.] a term used to express the points or horns of the moon, or other luminary.

Cusp, in astrology, is used for the first point of each of the 12 houses, in a figure or scheme of the heavens.

CUSPATED, or CUSPIDATED, [from *cuspis*, Lat.] a word expressing the leaves of a flower ending in a point.

CUSPINIAN, JOHN, a German, born at Schweinfurt, in 1473. He was first physician to the emperor Maximilian I. and employed by him in several negotiations. He wrote in Latin, 1. A history of the Roman emperors from Julius Cæsar to the death of Maximilian I. Degory Wheare, in his *Methodus Legendæ Historiæ*, calls this "luculentum sane opus, et omnium lectione dignissimum." 2. An History of Austria; being a kind of continuation of the preceding. 3. An History of the Origin of the Turks, and of their Cruelties towards Christians. Gerard Vossius calls Cuspinian magnum suo ævo historiæ lumen. He died at Vienna, in 1529.

CUSSET,

CUSSET, a town of France, in the department of Allier, 17 miles N. of Roanne.

CUSSONIA, in botany, a genus of the pentandria digynia class and order: natural order Araliæ. Petals three-cornered; margin of the receptacle dilated into a five-toothed calyx. Two species, viz. *C. thysiflora*, and *C. spicata*, natives of the Cape of Good Hope.

CUSTOM, a very comprehensive term, denoting the manners, ceremonies, and fashions, of a people, which having turned into a habit, and passed into use, obtains the force of laws; in which sense it implies such usages as, though voluntary at first, are yet, by practice, become necessary. Custom is hence, both by lawyers and civilians, defined *lex non scripta*, a law, or right, not written, established by long usage, and the consent of our ancestors; in which sense it stands opposed to the *lex scripta*, or the written law. As no law can bind people without their consent, so, wherever that is had, and a certain rule used as a law, such rule gives it the force of a law; and if it be universal, then it is common law; but if restrained to this or that particular place, it is custom. Custom had its beginning, and received the sanction of the law, thus: when a reasonable act, once done, was found to be beneficial to the people, then they had frequent recourse to it; and by repetitions thereof, it became a custom, which being continued ultra *trivium*, time out of mind, without any interruption, it obtained the power of a law, and binds the places, persons, and things, concerned therein. All customs ought to have a reasonable commencement, be certain, not ambiguous, have uninterrupted continuance, and not be against the King's prerogative: these are incidents inseparable: yet a custom is not unreasonable for being injurious to private persons and interest, so as it tends to the general advantage of the people: but if any custom be contrary to the public good, or if it injures a multitude, and benefits only some certain persons, such a custom is repugnant to the laws of reason, and consequently void. Custom must always be alleged in many persons; and so it may be claimed by copyholders, or the inhabitants of a place, as within such a county, hundred, city, borough, manor, parish, &c. but regularly they shall not allege a custom against a statute: nor may custom be pleaded against custom; though acts of parliament do not always take away the force of customs. The general customs used throughout England being the common law, are to be determined by the judges, who can over-rule a custom that is against natural reason, &c.; but particular customs are determinable by jury. See PRESCRIPTION.

CUSTOM OF LONDON. It is a custom of London, that where a person is educated in one trade, he may set up another; that where a woman uses a trade without her husband, she is chargeable alone, as a femme sole merchant, and, if condemned, shall be put in prison till she pays the debt; likewise the bail for her are liable if she absent herself, and the husband, in these cases, shall not be charged. If a debtor be a fugitive, by the custom of London he may be arrested before the day, in order to find better security, &c. These are customs of this city, different from those of other places.

CUSTOM OF MERCHANTS. If a merchant give a character of a stranger to one who sells him goods, he may be obliged to satisfy the debt of the stranger for the goods sold, by the custom of merchants. And when two persons are found in arrears, upon an account grounded on the custom of merchants, either of them may be charged to pay the whole sum due, &c.

CUSTOM AND HABIT, in the human economy, are often confounded. By custom we mean a frequent reiteration of the same act: and by habit, the effect that custom has on the mind or body. See HABIT.

CUSTOMS. In political economy, the duties, toll, tribute, or tariff, payable to the king upon merchandize exported and imported, form a branch of the perpetual taxes. See TAX. The consideration upon which this revenue (or the more ancient part of it, which arose only from exports) was invested in the king, were said to be two: 1. Because he gave the subject leave to depart the kingdom, and to carry his goods along with him. 2. Because the king was bound of common right to maintain and keep up the ports and havens, and to protect the merchant from pirates. Some have imagined they are called with us customs, because they were the inheritance of the king by immemorial usage and the common law, and not granted by any statute: but Sir Edward Coke hath clearly shewn, that the king's first claim to them was by grant of parliament 3 Edw. I. And indeed this is in express words con-

fessed by statute 25 Edw. I. c. 7. wherein the king promises to take no customs from merchants, without the common assent of the realm, "saving to us and our heirs the customs on wool, skins, and leather, formerly granted to us by the commonalty aforesaid." These were formerly called hereditary customs of the crown; and were due on the exportation only of the said three commodities, and none other: which were styled the staple commodities of the kingdom, because they were obliged to be brought to those ports where the king's staple was established, in order to be there first rated, and then exported. They were denominated in the barbarous Latin of our ancient records, *custuma*, (an appellation which seems to be derived from the French word *coustum*, or *coûtum*, which signifies toll or tribute, and owes its own etymology to the word *cout*, which signifies price, charge, or, as we have adopted it in English, cost); not *consuetudines*, which is the language of our law whenever it means *in re* usages. The duties on wool, sheep-skins, or wool-fells, and leather, exported, were called *custuma antiqua sive magna*: and were payable by every merchant, as well native as stranger; with this difference, that merchant-strangers paid an additional toll, viz. half as much again as was paid by natives. The *custuma parva et nova* were an impost of 3*d* in the pound, due from merchant strangers only, for all commodities as well imported as exported; which was usually called the alien's duty, and was first granted in 31 Edw. I. But these ancient hereditary customs, especially those on wool and wool-fells, came to be of little account, when the nation became sensible of the advantages of a home manufacture, and prohibited the exportation of wool by statute 11 Edw. III. cap. 1. Other customs payable upon exports and imports were distinguished into subsidies, tonnage, poundage, and other imposts. Subsidies were such as were imposed by parliament upon any of the staple commodities before-mentioned, over and above the *custuma antiqua et magna*: tonnage was a duty upon all wines imported, over and above the prisage and butlerage aforesaid: poundage was a duty imposed ad valorem, at the rate of 12*d*. in the pound, on all other merchandize whatsoever: and the other imposts were such as were occasionally laid on by parliament, as circumstances and times required. These distinctions are now in a manner forgotten, except by the officers immediately concerned in this department; their produce being in effect all blended together, under the one denomination of the customs. By these we understand, at present, a duty or subsidy paid by the merchant at the quay upon all imported as well as exported commodities, by authority of parliament; unless where, for particular national reasons, certain rewards, bounties, or drawbacks, are allowed for particular exports or imports. The customs thus imposed by parliament are chiefly contained in two books of rates, set forth by parliamentary authority; one signed by Sir Harbottle Grimston, speaker of the house of commons in Charles II.'s time; and the other an additional one signed by Sir Spenser Compton, speaker in the reign of George I. to which also subsequent additions have been made. Aliens pay a larger proportion than natural subjects, which is what is now generally understood by the aliens duty; to be exempted from which is one principal cause of the frequent applications to parliament for acts of naturalization. These customs are then a tax immediately paid by the merchant, although ultimately by the consumer. And yet these are the duties felt least by the people; and, if prudently managed, the people hardly consider that they pay them at all. For the merchant is easy, being sensible he does not pay them for himself; and the consumer, who really pays them, confounds them with the price of the commodity: in the same manner as Tacitus observes, that the emperor Nero gained the reputation of abolishing the tax of the sale of slaves, though he only transferred it from the buyer to the seller; so that it was, as he expresses it, *remissum magis specie, quam vi: quia, cum venditor pendere juberetur, in partem pretii emptoribus accrescebat*. But this inconvenience attends it on the other hand, that these imposts, if too heavy, are a cramp upon trade; and especially when the value of the commodity bears little or no proportion to the quantity of the duty imposed. This in consequence gives rise also to smuggling, which then becomes a very lucrative employment: and its natural and most reasonable punishment, viz. confiscation of commodity, is in such cases quite ineffectual; the intrinsic value of the goods, which is all that the smuggler has paid, and therefore all that he can lose, being very inconsiderable when compared with his prospect of advantage in evading the duty.

duty. Recourse must therefore be had to extraordinary punishments to prevent it; perhaps even to capital ones; which destroys all proportion of punishment, and puts murderers upon an equal footing with such as are really guilty of no natural, but merely a positive offence. There is also another ill consequence attending high imposts on merchandize, not frequently considered, but indisputably certain; that the earlier any tax is laid on a commodity, the heavier it falls upon the consumer in the end; for every trader through whose hands it passes must have a profit, not only upon the raw material and his own labour and time in preparing it, but also upon the very tax itself, which he advances to the government; otherwise he loses the use and interest of the money which he so advances. To instance in the article of foreign paper. The merchant pays a duty upon importation, which he does not receive again till he sells the commodity, perhaps at the end of three months. He is therefore equally entitled to a profit upon that duty which he pays at the custom-house, as to a profit upon the original price which he pays to the manufacturer abroad; and considers it accordingly in the price he demands of the stationer. When the stationer sells it again, he requires a profit of the printer or bookseller upon the whole sum advanced by him to the merchants; and the bookseller does not forget to charge the full proportion to the student or ultimate consumer; who therefore does not only pay the original duty, but the profits of these three intermediate traders, who have successively advanced it for him. This might be carried much farther in any mechanical, or more complicated, branch of trade.

CUSTOS, [Lat. *i. e.* a keeper,] is a title of several offices; such as

1. **CUSTOS BREVIUM**, the principal clerk belonging to the court of common pleas, whose business it is to receive and keep all the writs made returnable in that court, filing every return by itself; and, at the end of each term, to receive prothonotaries all the records of the nisi prius, called the postea.

2. **CUSTOS ROTULORUM**, an officer who has the custody of the rolls and records of the sessions of peace, and also of the commission of the peace itself. He is usually a nobleman, and always a justice of the peace, of the quorum, in the county where he is appointed.

3. **CUSTOS SPIRITUALIUM**, he that exercises the spiritual jurisdiction of a diocese, during the vacancy of any see, which, by the canon law, belongs to the dean and chapter; but at present, in England, to the archbishop of the province by prescription.

4. **CUSTOS TEMPORALIUM**, the person to whom a vacant see or abbey was given by the king, as supreme lord. His office was, as steward of the goods and profits, to give an account to the exchequer, who did the like to the exchequer.

To **CUT A FEATHER**, in the sea-language, a phrase applied to a ship that has too broad a bow. In such a case, it is common to say, she will not cut a feather; that is, she will not pass through the water so swift as to make it foam or froth.

To **CUT THE SAIL**, to unfurl it, and let it fall down.

CUTCH, a country of Hindostan; bounded on the E. by Guzerat. The principal towns are Booge-booge and Tahej.

CUTH, or **CUTHAH**, a province of Assyria, which, as some say, lies upon the Araxes, and is the same with Cush; but others take it to be the country which the Greeks called Susiana, and which to this day, says Dr. Wells, is by the inhabitants called Chusistan. Calmet is of opinion that Cuthah and Scythia are the same place, and that the Cuthites who were removed into Samaria by Salmaneser (2 Kings xvii. 24.) came from Cush, or Cuth, mentioned in Gen. ii. They worshipped the idol Nergal. Calmet says, that they came from Cush, or Cutha upon the Araxes; and that their first settlement was in the cities of the Medes, subdued by Salmaneser and the kings of Syria his predecessors. The Scriptures inform us, that the Cuthites, upon their arrival in this new country, continued to worship the gods formerly adored by them beyond the Euphrates.

CUTICLE, [*cuticula*, Lat.] in anatomy, a thin membrane, closely lying upon the skin, or cutis, of which it seems a part, and to which it adheres very firmly, being assisted by the intervention of the corpus reticulare.

CUTIS, [Lat.] the skin, in anatomy, is that strong covering which envelopes the whole external surface of animals. It consists chiefly of a thin white elastic layer on the outside, called the epidermis

or cuticle, and a thicker layer, composed of fibres thickly interwoven, and disposed in different directions, which is the cutis or real skin. The epidermis is that part of the skin which is raised in blisters. It is easily separated from the cutis by maceration in hot water. It is very elastic and insoluble in water and alcohol. The fixed alkalies and lime dissolve it entirely. Mr Hatchett, from many experiments, has shewn that the epidermis resembles albumen in many of its properties, or rather that it is nothing more than a peculiar modification of coagulated albumen. The cutis is a thick dense membrane, composed of fibres interwoven like the texture of a hat. When it is macerated for some hours in water, and agitation and pressure are employed to accelerate the effect, the blood, and all the extraneous matter with which it was loaded, are separated from it, but its texture remains unaltered. On evaporating the water employed, a small quantity of gelatine may be obtained. No subsequent maceration in cold water has any farther effect. When distilled it yields the same products as fabrina. The concentrated alkalies dissolve it, converting it into oil and ammonia. Weak acids soften it, render it transparent, and at last dissolve it. Nitric acid converts it into oxalic acid and fat, while, at the same time, azotic gas and prussic acid are emitted. When heated it contracts, and then swells, exhales a fetid odour, and leaves a dense charcoal, difficult to incinerate. By spontaneous decomposition in water or moist earth, it is converted into a fatty matter, and into ammonia, which compose a kind of soap. When allowed to remain long in water, it softens and putrefies, being converted into a kind of jelly. When long boiled in water it becomes gelatinous, and dissolves completely, constituting a viscid liquor, which by proper evaporation is converted into glue. Hence the cutis of animals is commonly employed in the manufacture of glue. From these facts the cutis appears to be a peculiar modification of gelatine enabled to resist the action of water, partly by the compactness of its texture, and partly by the viscosity of the gelatine of which it is formed; for those skins which dissolve most readily in boiling water afford the worst glue. Mr. Hatchett has observed, that the viscosity of the gelatine obtained from skins is nearly inversely as their flexibility, the supplest hides always yielding the weakest glue; but this glue is very soon obtained from them by hot water. The skin of the eel is very flexible, and affords very readily a great proportion of gelatine. The skin of the shark also readily yields abundance of gelatine; and the same remark applies to the skins of the hare, rabbit, calf, and ox; the difficulty of obtaining the glue and its goodness always increasing with the toughness of the hide. The hide of the rhinoceros, which is exceedingly strong and tough, far surpasses the rest in the difficulty of solution, and in the goodness of its glue. When skins are boiled they gradually swell and assume the appearance of horn, then they dissolve slowly. It is from the skin or cutis of animals that leather is formed; and the goodness of the leather, or at least its strength, depends in some measure on the toughness of the hides. These easily soluble, as seal-skins, afford a weaker leather than those which are more difficultly soluble in water. The process by which the skins of animals are converted into leather is called tanning. See **ANATOMY**, **PHYSIOLOGY**, and **TANNING**.

CUTLER, one who makes or deals in edge tools.

CUTLERY. Though cutlery in the general sense comprises all those articles denominated edge-tools, it is more particularly confined to the manufacture of knives, forks, scissors, penknives, razors, and swords. Damascus was anciently famed for its razors, sabres, and swords. The latter are said to possess all the advantages of flexibility, elasticity, and hardness. These united distinctions are said to have been effected by blending alternate portions of iron and steel, in such a manner, that the softness and tenacity of the former could prevent the breaking of the latter. The Germans, it appears, were early acquainted with the art of making various cutlery. The steel employed by them is immediately made from the crude iron into bars, without requiring afterwards to be converted. Those articles of cutlery not requiring a fine polish, are generally made from blistered steel. Those articles which require the edge to possess great tenacity, when superior hardness is not required, are made from sheer-steel. The finer kinds of cutlery are made from steel which has been in a state of fusion, and which is termed cast steel, no other kinds being susceptible of a fine polish. See **STEEL**.

CUTTACK, or **CATTACK**, a city in the Decan of Hindostan,

dostan, the capital of Orissa, 220 miles S. W. of Calcutta. Lon. 86. 1. E. Lat. 20. 51. N.

CUTTER, in naval affairs, a small vessel, commonly navigated in the channel of England. It is furnished with one mast, and rigged as a sloop. Many of these vessels are used in an illicit trade, and others are employed by government to take them; the latter of which are either under the direction of the admiralty or custom-house. See *PLATE LIV.* fig. 1.

CUTTER OF THE TALLIES, an officer of the Exchequer, whose business is to provide wood for the tallies, to cut or notch the sum paid upon them; and then to cast them into court, to be written upon.

CUTTING, in coinage. When the laminae or plates of the metal, be it gold, silver, or copper, are brought to the thickness of the specie to be coined, pieces are cut out, of the thickness, and nearly of the weight of the intended coin; which are now called planchets, till the king's image hath been stamped upon them. The instrument wherewith they cut, consists of two pieces of steel, very sharp, and placed over one another; the lower a little hollow, representing a mortar, the other a pestle. See *COINAGE*. Medallions, where the relievio is to be great, are not cut, but cast or moulded.

CUTTING is particularly used in heraldry, where the shield is divided into two equal parts, from right to left, parallel to the horizon, or in the fesse-way. The word is also applied to the honourable ordinaries, and even to animals and moveables, when they are divided equally the same way; so, however, as that one moiety is colour, the other metal. The ordinaries are said to be cut, coupéd, when they do not come full to the extremities of the shield.

CUTTING, in painting, the laying of one strong lively colour over another, without any shade or softening. The cutting of colours has always a disagreeable effect.

CUTTING, in surgery, denotes the operation of extracting the stone out of the bladder by the knife.

CUTTING, in the manege, is when the horses feet interfere; or when with the shoe of one foot he beats off the skin from the pastern joint of another foot. This is more frequent in the hind-feet than the fore: the cause is commonly bad shoeing.

CUTTING IN WOOD, a particular kind of sculpture or engraving; denominated from the matter wherein it is employed. It is used for various purposes; as for figured letters, head and tail pieces of books; and even for schemes and other figures, to save the expences of engraving on copper; and for prints and stamps for paper, calicoes, linens, &c. The invention of cutting on wood, as well as that in copper, is ascribed to a goldsmith of Florence; but it is to Albert Durer and Lucas they are both indebted for their perfection. See *ENGRAVING AND PRINTING*. Hugo Da Carpi invented a manner of cutting in wood, by means whereof the prints appeared as if painted in clair-obscur. The art of cutting in wood was certainly carried to a very great pitch above 200 years ago; and might even vie, for beauty and justness, with that of engraving in copper. At present it is perhaps too much neglected, and the application of artists almost wholly employed on copper, as the more easy and promising province. In some respects wooden cuts have the advantage of those in copper; as in figures and devices for books; for they can be printed at the same time and in the same press with the letters; whereas for the other, there is required a particular impression. In the representation of plants and flowers, and in designs for paper hangings, where the outline only is wanted to be printed, in a bold full manner, this method is cheaper and more effectual than the use of copper-plates. The cutters in wood begin with preparing a plank or block of the size and thickness required, and very even and smooth on the side to be cut: for this, they usually take beech, pear-tree, or box; though the latter is the best, as being the closest, and least liable to be worm-eaten. The wood being cut into a proper form and size, should be planed as even and truly as possible: it is then fit to receive the drawing or chalking of the design to be engraved. But the effect may be made more apparent, and the ink, if any be used in drawing, be prevented from running, by spreading thinly on the surface of the wood white lead tempered with water, by grinding with a brush pencil, and afterwards rubbing it well with a fine linen rag whilst it is wet; and when it is dry, brushing off any loose or powdery part with a soft pencil. On this block they

draw their design with a pen or pencil, just as they would have it printed. Those who cannot draw their own design, as there are many who cannot, make use of a design furnished them by another; fastening it upon the block with paste made of flour and water, with a little vinegar or gum tragacanth; the strokes or lines turned towards the wood. When the paper is dry, they wash it gently over with a sponge dipped in water; which done, they take off the paper by little and little, still rubbing it a little first with the tip of the finger; till at length there be nothing left on the block but the strokes of ink that form the design, which mark out so much of the block as is to be spared or left standing. Figures are sometimes cut out of prints, by taking away all the white part or blank paper, and cemented with gum-water to the surface of the wood. The rest they cut off, and take away very curiously with the points of very sharp knives, or little chisels or gravers, according to the bigness or delicacy of the work; for they need no other instruments. It differs from engraving in copper, in that the impression comes off from the prominent parts or strokes left uncut; whereas in the copper-plates, it comes from the channels cut in the metal. The manner of printing with wooden prints is much more expeditious and easy than that with copper-plates, because they require only to be dipped in the printing ink, and impressed on the object in the same manner and with the same apparatus as the letter printing is managed; and for purposes that do not require great correctness, the impression is made by the hand only, a proper handle being fixed to the middle of the print, by which it is first dipped in the ink, spread by means of a brush on a block of proportionable size covered with leather; and then lifted up instantly, and impressed with some little force on the paper which is to receive the impression.

CUTTINGS, or **SLIPS**, in gardening, the branches or sprigs of trees or plants, cut or slipped off to set again; which is done in any moist fine earth. The best season is from August to April; but care is to be taken when it is done, that the sap be not too much in the top, lest the cut die before that part in the earth have root enough to support it: nor must it be too dry or scanty; the sap in the branches assisting it to take root. In providing the cuttings, such branches as have joints, knots, or burrs, are to be cut off two or three inches beneath them, and the leaves to be stripped off so far as they are set in the earth. Small top-branches, of two or three years growth, are fittest for this operation.

CUTTLE FISH. See *SERIA*.

CUTTUPDEA, an island in the north-east part of the bay of Bengal. Lon. 92. 0. E. Lat. 21. 53. N.

CUT-WATER, the sharp part of the head of a ship below the beak; so called because it cuts or divides the water before it comes to the bow, that it may not come too suddenly to the breadth of the ship, which would retard it.

CUZUMEL, an island on the bay of Honduras.

CYANELLA, in botany, a genus of the hexandria monogynia class and order; natural order, Coronariae. Corolla six-petaled; the three lower petals hanging forwards; stamens lower, declined, longer than the rest. Three species, natives of the Cape.

CYATHEA, in botany, a genus of the cryptogamia filices class and order. Fructification in roundish scattered dots, seated on a columnar receptacle, within the calyx-like involucre which opens at top; there are about nine species.

CYATHUS, in botany, a genus of the cryptogamia fungi: fungus campanulate or cylindrical, bearing lentiform capsules within. There are six species.

CYBELE, a name of Cybele; from *κυβηβαν*, because in the celebration of her festivals, men were driven to madness.

CYBELE, in Pagan mythology, the daughter of Coelus and Terra, wife of Saturn, and mother of Jupiter, Neptune, Pluto, &c. She is also called Rhea, Ops, Vesta, Bona Mater, Magna Mater, Berecynthia, Dindymere, &c. and by some is reckoned the same with Ceres; but most mythologists make these two distinct goddesses. In Phrygia the festivals of Cybele were observed with the greatest solemnity. Her priests, called Corybantes, Curetes, Galli, &c. it is said, were not admitted in the service of the goddess without a previous mutilation. In the celebration of the festivals, they imitated the manners of madmen, and filled the air with shrieks and howlings, mixed with the confused noise of drums, tabrets, bucklers, and spears.

CYCAS, in botany, a genus of the dicæcia polyandria class and order;

order; natural order, Palmae. Male, amentum strobile form, with the scales covered every where beneath with pollen. Female, spadix sword-form; germ immersed into the corners of it, solitary; style one; drupe with a woody nut. Two species, viz. *C. circinalis*, broad-leaved cycas, and *C. revoluta*, narrow-leaved cycas. The first is a valuable tree to the inhabitants of India, as it not only furnishes a considerable part of their constant bread, but also supplies them with a large article of trade. See SAGO, and Plate XXXV.

CYCEON, [from *κύνειν*, to mix,] a name given by the ancient poets and physicians to a mixture of meal and water, and sometimes of other ingredients. These constitute the two kinds of cyceon; the coarser being of water and meal alone; the richer and more delicate composed of wine, honey, flour, water, and cheese.

CYCINNIS, a Grecian dance, so called from its supposed inventor, one of the satyrs belonging to Bacchus. It consisted of a combination of grave and gay movements.

CYCLADES, in ancient geography, islands so called, as Pliny informs us, from the *cyclus* or orb in which they lie; beginning from the promontory Geraestum of Euboea, and lying round the island Delos. Strabo recites them after Artemidorus, as follows: Helena, Ceos, Cynthus, Seriphus, Melus, Siphus, Cimolus, Prepesinthus, Olearus, Naxus, Parus, Syrus, Myconus, Tenus, Andros, Gyarus; but he excludes from the number, Prepesinthus, Olearus, and Gyarus.

CYCLADES, GREAT. See HEBRIDES, NEW.

CYCLAMEN, SOWBREAD: a genus of the monogynia order and pentandria class of plants; natural order, Preciae. Corolla verticillated, with the tube very short, and the throat prominent; berry covered with the capsule. There are five species; many beautiful varieties. They are low, herbaceous, flowery perennials of the tuberous-rooted kind, with numerous, angular, heart-shaped, spotted, marbled leaves; and many fleshy foot-stalks six inches high, carrying monopetalous, five-parted, reflexed flowers of various colours. All the varieties are extremely ornamental, and some of the flowers very fragrant. They may be planted in any of the common borders, but require to be sheltered from hard frosts by being covered with mats. They should also have a light dry soil, otherwise their roots are apt to rot. The species are propagated by seeds, and the particular varieties by dividing their roots.

CYCLAS, a genus of testacea of the class of bivalves; shells somewhat transverse, without a fold on the anterior side; exterior ligament recurved; hinge of three teeth; lateral teeth elongated, lamelliform, and let into a groove in the opposite valve. This genus contains seven or eight species, mostly inhabiting fresh water pools. Animal acephalous, with two tubes projecting on one side, and on the other, a foot linguiform, or tongue-shaped. See Plate XXXVII.

CYCLAS, in botany, a genus of the decandria monogynia class and order; natural order, Lomentaceae. Calyx four-parted, spreading, with a short turbinate tube; corolla none; filaments inserted into the neck of the calyx; style flexuose; legume roundish, winged, one-seeded. There are two species, viz. *C. spicata*, and *C. aromatica*, both very tall trees, natives of Guiana.

CYCLE, [*κύκλος*, a circle,] in chronology, a certain period or series of years, which regularly proceed from the first to the last, and then return again to the first, and circulate perpetually. The most considerable cycles are those of the sun, of the moon, and of the Roman indiction. See CHRONOLOGY.

CYCLIDIUM, in natural history, a genus of vermes infusoria. Worm invisible to the naked eye, very simple, pellucid, flat, orbicular, or oval. There are seven species. *C. bulla*; orbicular, transparent; in infusions of hay; pellucid, white, with the edges a little darker; motion slow and circular. *C. milium*; elliptical, transparent; in vegetable infusions; pellucid, crystalline, membranaceous, with a line through the whole length.

CYCLOID, a curve of such importance, that the honour of its invention has been much contested among mathematicians. The French ascribe it to their countryman Roberval; but there is sufficient evidence that he was not the original inventor of it. Torricellius informs us, in a treatise containing a demonstration of one of the properties of this curve, viz. that its area is triple that of the

generating circle, and published in 1644, that this curve was known forty-five years before this period, or in 1599, to his master Galileo, and distinguished by the appellation of Cycloid. Besides, Dr. Wallis has discovered among the mathematical works of Bonvillus, published at several times between the years 1501 and 1510, that this curve had been considered in his time; and he has also found, that it was known to cardinal Cusanus, who gave an account of it in a copy of his works transcribed in 1451. But its various properties have been gradually discovered; and the method of regulating the motion of a pendulum by this curve, was the invention of Huygens in the last century. The cycloid is a curve generated by the motion of any point in the periphery of a circle, whilst the periphery revolves on a right line, till that point which touched the line at the beginning of the motion be brought to touch it again. Let the circle CDH, Plate LI, fig. 5, roll on the given straight line AB, so that all the parts of the circumference be applied to it one after another, the point C that touched the line AB in A, by a motion thus compounded of a circular and rectilinear motion, will describe the curve ACEB, called the cycloid or tochoid, from the manner of its formation. The circle CDH, by the revolution of which the curve is formed, is called the generating circle; the right line AB is the base; the line EF bisecting the base in F is the axis; and E is the vertex; a line KC parallel to the base, and intercepted between the curve and the axis, is an ordinate; and the space included by the curve and base, viz. AEBA, is the cycloidal space. If any point, which is not the centre of the generating circle, be taken in the diameter passing through the generating point; during the revolution of the circle it will describe a curve, which is called a prolate or inflected cycloid. But if the point be taken in the diameter produced, or without the circle, the curve, which it will describe, is called a curtate cycloid. The chief properties of the cycloid are, 1. If on the axis EF be described the generating circle EGF meeting the ordinate CK in G, the ordinate will be equal to the sum of the arc EG and its right sine GK; that is, CK will be equal to EG + GK. 2. The line CH parallel to the chord EG is a tangent to the cycloid in C. 3. The arch of the cycloid EL is double of the chord EM, of the corresponding arc of the generating circle EMF; hence the semi-cycloid ELB is equal to twice the diameter of the generating circle EF; and the whole cycloid ACEB is quadruple of the diameter EF. 4. If ER be parallel to the base AB, and CR parallel to the axis of the cycloid EF; the space ECR, bounded by the arc of the cycloid EC, and the lines ER and CR, shall be equal to the circle area ECK; hence it follows, if AT, perpendicular to the base AB, meet ER in T, the space ETACE will be equal to the semi-circle EGF; and since AF is equal to the semi-circumference EGF, the rectangle EFAT, being the rectangle of the diameter and semi-circumference, will be equal to four times the semi-circle EGF; and therefore the area ECAFE, will be equal to three times the area of the generating semi-circle EGF. Again, if you draw the line EA, the area intercepted betwixt the cycloid ECA, and the straight line EA, will be equal to the semi-circle EGF; for the area ECAFE is equal to three times EGF, and the triangle EAF = $AF \times \frac{1}{2}EF$, the rectangle of the semi-circle and radius, and consequently equal to 2 EGF; therefore their difference, the area ECAE, is equal to EGF. 5. Take Eb = OK, draw bZ parallel to the base, meeting the generating circle in X, and the cycloid in Z, and join CZ, FX; then shall the area CZEC be equal to the sum of the triangles GFK and bFX. Hence an infinite number of segments of the cycloid may be assigned, that are perfectly quadrable. For example, if the ordinate CK be supposed to cut the axis in the middle of the radius OE, then K and b coincide; and the area ECK becomes in that case equal to the triangle GKF, and EbZ becomes equal to bFX, and these triangles themselves become equal. The cycloid is the curve of quickest descent, i. e. a body falling in it, from any given point above, to another not exactly under it, will come to this point in a less time than in any other curve passing through those two points. See farther relating to the cycloid under MECHANICS and PENDULUM.

CYCLOPEDIA, [*κύκλος* and *παίδεια*,] a circle of knowledge; a course of the sciences.

CYCLOPEDIA, say the authors of the French Encyclopédie, ought to explain as much as possible the order and connection of human knowledge. See ENCYCLOPEDIA.

CYCLOPS, in fabulous history, the sons of Neptune and Amphitrite; the principal of whom were Polyphemus, Brontes, Steropes, and Pyracmon; but their whole number amounted to above one hundred. Jupiter threw them into Tartarus as soon as they were born; but they were delivered at the intercession of Tellus, and became the assistants of Vulcan. They were of prodigious stature, and had each only one eye, which was placed in the middle of their foreheads.

CYCLOPTERUS, the **SUCKER**, in ichthyology, a genus of the cartilaginous order; head obtuse, furnished with saw teeth; rays four in the gills; belly fins connected together in an orbicular form. There are ten species.

CYCLOPTERUS LIPARIS, the **LUMP FISH**, grows to the length of nineteen inches, and weighs seven pounds. The shape of the body is like that of the bream, deep and very thick, and it swims edgewise. The back is sharp and elevated; the belly flat, of a bright crimson colour. Along the body there run several rows of sharp and bony tubercles, and the whole skin is covered with small ones. The tail and vent-fins are purple. The pectoral fins are large and broad, almost uniting at their base. Beneath these is the part by which it adheres to the rocks, &c. It consists of an oval aperture, surrounded with a fleshy, muscular, and obtuse substance; edged with many small-threaded appendages, which concur as so many claspers. By means of this part it adheres with vast force to any thing it pleases. See Plate LV.

C. MINOR, the **LESSER SUCKING FISH**, is found in different parts of the British fens. It is about four inches in length; the skin without scales, slippery, and of a dusky colour. It has also an apparatus for adhering to stones and rocks similar to the others.

CYDER, or **CIDER**, a sharp, cool, and vinous beverage, made by fermenting the juice of apples. Some connoisseurs in this liquor are of opinion, that the juice of the more delicate table-fruit is generally more cordial and pleasant than that of the wild or harsh kinds; though others assert the latter to be in many respects preferable. The apples should remain on the tree till they are thoroughly ripe, when they ought to be gathered with the hand in dry weather, that they may be protected both from bruises and from moisture. They are then to be sorted, according to their various degrees of maturity, and laid in separate heaps, in order to sweat; in consequence of which they greatly improve. This practice, however, appears to be useful only for such fruit as is not perfectly ripe, though some recommend it as being proper for all apples. The duration of the time of sweating may be determined by the flavour of the fruit, as different kinds require various lengths of time; namely, from eight or ten days to six weeks. The harsher and more crude the apples are, the longer it is necessary that they should remain in a sweating state, and not only be well dried, but the rotten parts carefully pared, before they are exposed. The utility of the sweating practice is acknowledged in all the cyder countries, though various methods have been adopted in following it; as the apples are piled up either in the open air, or under cover in houses. In the South-hams, a middle way has been adopted to avoid the fermentation occasioned by piling them up in rooms, and which we recommend as the best, and most rational. Heaps of fruit are raised in an open part of the orchard, where, by means of a free air and less heat, the desired maturity is gradually effected, with an inconsiderable waste of the juice and decay of the fruit, which thus becomes almost totally divested of rancidity. And though a few apples will rot even in this manner, they are still fit for use; all of them continue plump and full of juice, and heighten in a considerable degree the colour of the liquor, without imparting to it any disagreeable smell or taste. The fruit is then to be ground till the rind and kernels are well bruised; a process which will considerably improve the flavour and strength of the liquor, when it should be allowed to stand for a day or two, in a large open vessel. It is next pressed between several hair-cloths, and the liquor received in a vat, whence it is removed into casks, which ought to be placed in a cool situation, or in the free air, with their bung-holes open. These casks are to be sedulously watched, till the cyder drops fine, when it is to be immediately racked off from the lees into other vessels. The first racking is a most important operation; as cyder, which is suffered to become foul again, by missing the first opportunity of racking it when fine, will never become what

is called a prime liquor. After the clear part has been racked off a quantity of lees or dregs remains, which, when filtered through coarse linen bags, yields a bright, strong, but extremely flat liquor: if this be added to the former portion, it will greatly contribute to prevent fermentation, an excess of which will make the cyder thin and acid. To avoid such an accident, the casks should neither be entirely filled, nor stopped down too close; and, if the whole incline to ferment, it ought again to be racked. This latter operation, however, should on no account be repeated, unless from absolute necessity; as every racking diminishes its strength. When there are no signs of any farther fermentation, the casks should be filled up with cyder of the best quality, and the bung-hole firmly closed with resin. This method of making cyder is that chiefly followed in Herefordshire. Considerable quantities of this liquor are also made in Devonshire, where the process varies but little from that pursued in the county before-mentioned. Several farmers, however, instead of racking, fine it with isinglass, steeped in white wine, dissolved over the fire, and then boiled in a quantity of liquor intended to be fined: in this state, it is added to that in the cask. Others, instead of dissolving the isinglass over the fire, digest it in white wine for the space of four or five weeks, during which time it acquires the consistence of a jelly; a quantity of this being beaten up with some of the liquor, the whole is worked into a froth, and mingled with the rest. As soon as the cyder becomes clear, it is drawn, or bottled off, as occasion may require. Those who are anxious to prepare good cyder, ought diligently to watch every change of weather, however slight; as the least neglect, at such times, is often detrimental to many hogsheads. In summer the danger is much greater than in winter. There is, however, scarcely any distemper incident to this liquor, which may not, by a timely application, be easily remedied. If it become somewhat tart, about half a peck of good wheat, boiled and hulled in a manner similar to rice, may be put into each hogshead, which will effectually restore it; and also contribute to preserve it, when drawn out of one cask into another. Such a remedy is doubtless far preferable to that odious custom practised by too many cyder merchants, who put animal substances into their liquors, namely, veal, pork, beef, mutton, and even horse-flesh, for the purpose of fining them. This singular expedient, though sanctioned by the usage of ancestors, we think it our duty to reprobate; because it is fraught with mischievous effects on the constitution of those, who are doomed to drink the cyder thus adulterated. By allowing a small quantity to stand in an open vessel for two or three days in a warm room, the fetid exhalation of the liquor will easily discover its ingredients. The best cyder is that made from a red-streak apple, grafted upon a gannet-moil stock. These two varieties of the apple-tree agree well together, and their trunks seldom canker, as others are apt to do, especially when the former is grafted on crab-trees. The fruit of the red-streak obtained from the former combination, is always larger and milder; and, when ripe, not only most delicious eating, but also affords a mellow liquor than the same fruit produced by the latter mixture. Many estates, where the soil is not proper for corn, might be greatly improved in value, by cultivating the different sorts of apples that are used in making cyder, which finds at all times a ready market, and requires no fuel in brewing it; besides that the labour occurs only once every year. The greater the quantities of cyder made together, the better it usually succeeds; but it will be necessary that the vessels in which the liquor is to be kept, be capacious and well seasoned. In this case, it will not only remain sound for a great number of years, but also progressively improve. An ingenious Treatise on Cyder, in 4to. was published about the year 1754, in which the reader will find several pertinent instructions relative to this subject. By the 27th Geo. III. c. 13, every hogshead of cyder or perry, made and sold by retail, pays a duty of 14s. 7d. to which are to be added, 4s. imposed by the annual malt-acts, the whole amounting to 18s. 7d. For every hogshead, made and sold in quantities of 20 gallons, or upwards, by any dealer or retailer, from fruit of his own growth, 6s. 11d.; and for every hogshead of such last-mentioned cyder or perry, received into the possession of any person, to be sold by him, 7s. 8d. are to be paid: the total of these duties, after adding the annual one of 4s., will amount to 18s. 7d. For every hogshead made in Great Britain, and sent or consigned to any factor or agent, who shall receive it for sale, to be paid by such factor,

19s. 2d.; but, if the latter have paid the annual malt-duty of 4s., this sum is to be deducted from the 19s. 2d. no cyder or perry being chargeable with a higher duty than 19s. 2d. All these duties are payable to the excise, and are drawn back on exportation; 3d. per ton being allowed. Cyder is a cooling, pleasant, and wholesome liquor during the heat of summer, if it has been prepared without foreign ingredients, and properly fermented. On the contrary, where it is too new, or tart, or has perhaps been kept in leaden vessels; or the apples and pears have, after grinding them, passed through leaden tubes, we can by no means recommend it as a salubrious beverage; because that poisonous metal is easily dissolved by the acid, and thus gradually introduced into the body. However agreeable such cyder, or perry, may stimulate the palate, it cannot fail, sooner or later, to produce painful and dangerous colics, as it not unfrequently generates the most desperate and incurable obstipations, among those who accustom themselves to the free use of these liquors.

CYDER SPIRIT, a spirituous liquor drawn from cyder by distillation, in the same manner as brandy from wine. The particular flavour of this spirit is not agreeable, but it may be entirely divested of it, and rendered perfectly pure by rectification. The traders in spirituous liquors are well acquainted with the value of such a spirit as this: they can give it the flavours of some other kinds, and sell it under their names, or mix it in large proportion with foreign brandy, and arrack, in the sale, without danger of detection.

CYDER WINE, a kind of wine made from the juice of apples taken from the press and boiled, and which being kept three or four years is said to resemble Rhenish. The method of preparing it, as communicated by Dr. Rush of America, where it is much practised, consists in evaporating in a brewing copper the fresh apple-juice till half of it be consumed. The remainder is then immediately conveyed into a wooden cooler, and afterwards put into a proper cask, with an addition of yeast, and fermented in the ordinary way. The process is evidently borrowed from what has long been practised on the recent juice of the grape, under the term of vin cuit, or boiled wine, in Italy, and the islands of the Archipelago, from time immemorial.

CYDERKIN PURKE, or **PERKIN**, is a liquor made of the muck, or lees remaining after the cyder is pressed: these are put into a large vat, with half the quantity of cold water, which has been previously boiled: if that proportion be exceeded, the cyderkin will be small. The whole is left to digest for forty-eight hours, when it should be well expressed: the liquor thus obtained is to be immediately barrelled, and closely stopped; it will be fit for use in a few days. Cyderkin easily clarifies, and is used in many families instead of small beer: if boiled after pressure, with a proper quantity of hops, it may be kept for any length of time.

CYDONIA, or **CYDON**, in ancient geography, one of the three most illustrious cities of Crete, situated in the N. W. of the island, with a locked port, or walled round.

CYGNUS, the **SWAN**, in astronomy, a constellation of the northern hemisphere, between Lyra and Cepheus. See **ASTRONOMY**.

CYGNUS, the **SWAN**, in ornithology. See **ANAS**.

CYLINDER, [κύλινδρος,] in geometry, a solid body, supposed to be generated by the rotation of the parallelogram. If the generating parallelogram be rectangular, the cylinder it produces will be a right cylinder, that is, it will have its axis perpendicular to its base. If the parallelogram be a rhombus, or rhomboides, the cylinder will be oblique or scalenous.

CYLINDER, PROPERTIES OF THE. 1. The section of every cylinder by a plane oblique to its base, is an ellipsis. 2. The superficies of a right cylinder is equal to the periphery of the base multiplied into the length of its side. 3. The solidity of a cylinder is equal to the area of its base, multiplied into its altitude. 4. Cylinders of the same base, and standing between the same parallels are equal. 5. Every cylinder is to a spheroid inscribed in it, as 3 to 2. 6. If the altitudes of two right cylinders be equal to the diameters of their bases, those cylinders are to one another as the cubes of the diameters of their bases. To find a circle equal to the surface of a cylinder, we have this theorem; the surface of a cylinder is equal to a circle, whose radius is a mean proportional between the diameter and height of the cylinder. The diameter of a sphere, and the altitude of a cylinder equal thereto, being given, to find the diameter of the cylinder, the theorem is, the

square of the diameter of the sphere is to the square of the diameter of the cylinder equal to it, nearly, as triple the altitude of the cylinder to double the diameter of the sphere. See **GEOMETRY**.

CYLISTA, in botany, a genus of the diadelphia decandria class and order; natural order papilionaceæ or leguminosæ. Calyx very large, four-parted; the upper division cleft at the end; corolla permanent. There is but one species, viz. *C. villosa*, hairy cylista. It is a shrub, and requires the heat of the stove to preserve it.

CYMBACHNE, in botany, a genus of the polygamia monœcia class and order; natural order Gramina. Inflorescence half-spiked; herm. calyx two-glumed, one-flowered, parallel to the rachis; outer valve linear, the opposite boat-form; female calyx one-glumed, ovate, opposite to the rachis. One species, viz. *C. ciliata*, a slender grass, a foot in height, with several culms. It is found in Bengal.

CYLINDER, LOADED, OR CYLINDER, ROLLING, a cylinder which rolls in an inclined plane. Its phenomena will be found explained under **MECHANICS**.

CYLINDROID, [from κύλινδρος, cylinder, and ὅμοιος, likeness,] in geometry, a solid body, approaching to the figure of a cylinder, but differing from it in some respects, as having the bases elliptical, but parallel and equal.

CYMATIUM, [Lat. from κυματιον, a little wave,] a member of architecture, whereof one-half is convex, and the other concave. There are two sorts, of which one is hollow below, as the other is above. See **ARCHITECTURE**.

CYMBAL, [κύμβαλον,] a musical instrument much used among the ancients. It was formerly made of brass, like our kettle-drums, and, as some think, in their form, but smaller and of different use. Ovid gives cymbals the epithet of genitalia, because they were used at weddings and other diversions. Cassiodorus and Isidore call this instrument acetabulum, the name of a cup or cavity of a bone wherein another is articulated; and Xenophon compares it to a horse's hoof; whence it must have been hollow; which appears, too, from the figure of several other things denominated from it; as a basin, caldron, goblet, cask, and even a shoe, such as those of Empedocles, which were of brass. The ancient cymbals appear to have been very different from our kettle-drums, and their use of another kind. To their exterior cavity was fastened a handle; whence Pliny compares them to the upper part of the thigh, and Rabanus to phials. They were struck against one another, in cadence, and made a very acute sound. Their invention was attributed to Cybele: whence their use in feasts and sacrifices. The modern cymbals is a mean instrument, chiefly in use among vagrants, gypsies, &c. it consists of steel wires, in a triangular form, whereon are passed five rings, which are touched and shifted along the triangle with an iron rod held in the left hand, while it is supported in the right by a ring, to give it the freer motion.

CYMBARIA, in botany, a genus of the didynamia angiospermia class and order; natural order, Personatæ. Calyx ten-toothed; capsule cordate, two-celled. There is but one species.

CYME, or **CUMA**, in ancient geography, a city built by Pelops on his return from Greece. It stood in Æolia, between the Myrina and Phocæa, and in Pentinger's map, is set down 9 miles from Myrina.

CYNANCHE, a species of quinzey, in which the tongue is inflamed and swelled, so that it hangs out beyond the teeth.

CYNANCHUM, **BASTARD DOGBANE**: a genus of the digynia order, and pentandria class of plants; natural order, Contortæ. Nectarium cylindrical, five-toothed. It has twenty-seven species, shrubs chiefly twining, and natives of hot climates.

CYNANTHROPY, [ὁ καὶ ἡ κύων, τὸ καὶ τῆς νόσος, and ἀνθρωπίνος,] a species of madness in which men have the qualities of dogs.

CYNARA, the **ARTICHOKE**, a genus of the polygamia æqualis order, and syngenesia class of plants. Calyx dilated, imbricated with carnosous squamæ, and emarginated with a sharp point. Of this genus there are six species: of which two are cultivated for use.

CYNICS, [κύνες,] a sect of ancient philosophers, who valued themselves upon their contempt of riches and state, arts and sciences, and every thing, in short, except virtue or morality. The cynic philosophers owe their origin and institution to Antisthenes of Athens, a disciple of Socrates, who, being asked of what use his philosophy had been to him, replied, "It enables me to live with myself." Diogenes was the most famous of his disciples, in whose life.

life the system of this philosophy appears in its greatest perfection. He led a most whimsical life, despising every kind of convenience, a tub serving him for a lodging, which he rolled before him wherever he went. Yet he was not the more humble on account of his ragged cloak, bag, and tub. One day entering Plato's house, at a time when there was a splendid entertainment for several persons of distinction, he jumped up, in all his dirt, upon a very rich couch, saying, "I trample on the pride of Plato." "Yes (replied Plato), but with still greater pride, Diogenes." He had the utmost contempt for all the human race; for he walked the streets of Athens at noon day with a lighted lantern in his hand, telling the people, "He was in search of an honest man." Amongst many excellent maxims of morality, he held some very pernicious opinions; for he used to say, that the uninterrupted good fortune of Harpalus, who generally passed for a thief and a robber, was a testimony against the gods. He regarded chastity and modesty as weaknesses: hence Laertius observes of him, that he did every thing openly, whether it belonged to Ceres or Venus; though he adds, that Diogenes only ran to an excess of impudence to put others out of conceit with it. But impudence was the characteristic of these philosophers; who argued that all what was right to be done, might be done at all times and in all places. The chief principle of this sect, in common with the stoics, was, that we should follow nature. But they differed from the stoics in their explanation of that maxim; the cynics being of opinion, that a man followed nature, who gratified his natural appetites; while the stoics understood right reason by the word nature.

CYNIC SPASM, a kind of convulsion, wherein the patient imitates the howling of dogs.

CYNIPS, **GALL-FLY**, a genus of insects of the order hymenoptera. Mouth with a short one-toothed membranaceous jaw, the mandibles vaulted; horny cleft, the lip entire, feelers four, short, unequal, capitate; antennæ moniliform; stigm spiral, often concealed within the body. There are thirty-five species. The numerous excrescences, or galls, found on the roots, branches, and leaves of various trees are produced by the puncture of these insects: the larva is without feet, soft, cylindrical, and inhabits within the gall, feeding on the juices of the tree: the pupa resembles the perfect insect, except in having only the rudiments of wings. *C. querci*, or oak-leaf cynips, is of a burnished shining brown colour. It is found in the hard galls under oak-leaves, generally fastened to the fibres. *C. rosæ* is represented in Plate XXXVII.

CYNOGLOSSUM, **HOUND'S TONGUE**: a genus of the monogynia order, and pentandria class of plants; natural order, Asperifolia. Corolla funnel-shaped, with its throat closed up by little arches formed in it; seeds depressed, and affixed to the style or receptacle only on their inner side. Twelve species have been noticed, none of them remarkable for beauty.

C. OFFICINALE, the **COMMON GREATER HOUND'S TONGUE** was formerly used in medicine, and its root supposed to possess narcotic virtues; but it is discarded from the present practice.

CYNOMETRA, in botany, a genus of the monogynia order, and decandria class of plants. Calyx tetraphyllous; antheræ, bifid at top; legumen carnosus, crescent-shaped, and monospermous. Two species are found in India.

CYNOMORIUM, in botany: a genus of the monandria order, and monœcia class of plants; natural order, Amentaceæ. Male calyx, an imbricated catkin; no corolla; calyx of the female in the same catkin; no corolla; one style; and one roundish seed. It has three species.

CYNOPHONTIS, in antiquity, a festival observed in the dog-days at Argos, and so called *ἀπὸ τῶν κύωνος φονεῖν*, i. e. from killing dogs; because it was usual on this day to kill all the dogs they met with.

CYNOREXY, an immoderate appetite, to the degree of a disease; called also *fames canina* and *bulimy*.

CYNOSURA, in astronomy, a denomination given by the Greeks to *ursa minor*, or the little bear, from *κυνόρρα*, *q. d. ἡ τῆς κύωνος ὅρα*, the dog's tail.

CYNOSURA, in mythology, a nymph of Ida in Crete, said to have nursed Jupiter, who changed her into a star.

CYNOSURUS, **DOG'S-TAIL GRASS**, in botany, a genus of the digynia order, and triandria class of plants; natural order, Gramina. Calyx bivalved, multiflorous; receptacle proper, unila-

teral, foliaceous. There are twenty species, most of them natives of the East or West Indies.

CYNTHIA, an epithet of Diana.

CYNTHIUS, an epithet of Apollo.

CYNTHUS, in ancient geography, a mountain of the island Delos, so high as to overshadow the whole island. On this mountain Larona was fabled to have brought forth Apollo and Diana; hence called Cynthus and Cynthia.

CYNURIA, or **CYNURIUS AGER**, in ancient geography, a district of Laconia, on the confines of Argolis, that proved a perpetual bone of contention between the Argives and Spartans.

CYPERUS, in botany, a genus of the monogynia order, and triandria class of plants; natural order, Calamariæ. Glumes paleaceous, imbricated towards each side; corolla wanting; seed one, naked. There are fifty-three species, chiefly natives of the East or West Indies.

CYPHER. See **CIPHER**, and **ARITHMETIC**.

CYPHON, in antiquity, a kind of punishment used by the Athenians. It was a collar made of wood; so called because it constrained the criminal to bow down his head.

CYPHONISM, or **CYPHONISMUS**, [from *κύφω*, derived from *κύβης*, crooked,] a kind of torture or punishment, in use among the ancients.

CYPRÆA, the **GOWRIE**, a genus of insects of the order vermes testacea. Animal, a slug; shell one, involuted, subovated, obtuse, smooth valve; aperture on each side linear, longitudinal, and toothed. There are 44 species, distinguished by the form of their shells. See Plate XXVII.

CYPRESS. See **CUPRESSUS**.

CYPRIAN QUEEN, a title of Venus.

CYPRIANUS, **THASCIUS-CÆCILIUS**, a principal father of the Christian church, born at Carthage, about the end of the second, or beginning of the third century. His parents were heathens; and he himself continued such till the last 12 years of his life. He applied himself early to the study of oratory; and some of the ancients, particularly Lactantius, informs us, that he taught rhetoric in Carthage with the highest applause. Cyprian's conversion is fixed by Pearson to A.D. 246. He was at Carthage, where, as St. Jerom observes, he had often employed his rhetoric in the defence of paganism. It was brought about by one Cæcilius, a priest of the church of Carthage, whose name Cyprian afterwards took; and between whom there ever after subsisted so close a friendship, that Cæcilius at his death committed to Cyprian the care of his family. Cyprian was also a married man himself; but as soon as he was converted, he resolved upon a state of continence, which was then foolishly thought a high degree of piety. As a proof of the sincerity of his conversion, he wrote in defence of Christianity, and composed his piece "De Gratia Dei," which he addressed to Donatus. He next composed a piece "De Idolorum Vanitate," upon the vanity of idols. Cyprian's behaviour, both before and after his baptism, was so highly pleasing to the bishop of Carthage, that he ordained him a priest a few months after, though it was rather irregular to ordain a man thus in his very noviciate. But Cyprian was so extraordinary a person, and thought capable of doing such singular service to the church, that the usual period of probation was dispensed with. He consigned over all his goods to the poor, and gave himself up entirely to divine things. When, therefore, the bishop of Carthage died the year after, viz. A.D. 248, none was judged so proper to succeed him as Cyprian. The repose, which the Christians had enjoyed during the last 40 years, had greatly corrupted their manners; and therefore Cyprian's first care, after his advancement to the bishopric, was to reform abuses. Luxury was prevalent among them; and many of their women were not strict in the article of dress. This led him to draw up his piece "De Habitu Virginum," concerning the dress of young women; in which, besides what he says on that particular, he inculcates many lessons of modesty and sobriety. In 249, Decius issued very severe edicts against the Christians; and in 250, the heathens, in the circus and amphitheatre of Carthage, insisted upon Cyprian's being thrown to the lions. Cyprian upon this withdrew from Carthage, to avoid the fury of his persecutors. He wrote, in the place of his retreat, pious and instructive letters to those who had been his hearers; and also to the Libellatici, or those pusillanimous Christians, who procured certificates of the heathen magistrates, to shew that they had complied

complied with the emperor's orders, in sacrificing to idols. At his return to Carthage he held several councils on the repentance of those who had fallen off during this persecution, and other points of discipline; he opposed the schemes of Novatus and Novatianus; and contended for the re-baptizing of those who had been baptised by heretics. At last he died a martyr in the persecution under Valerian and Gallienus, in 258. Cyprian wrote 81 letters, and several treatises. The best editions of his works are those of Pamelius in 1568; of Rigaltius in 1648; and of Oxford in 1682. His works have also been translated into English by Dr. Marshall.

CYPRINUS, the **CARP**, in natural history, a genus of fishes of the order abdominales. Mouth small and without teeth; gill membrane, with three rays; ventral fins often, and, perhaps, generally nine-rayed. There are fifty species, of which *C. carpio*, or the common carp, inhabits the slow and stagnant waters of many countries of Europe, in which it is found extremely to vary in size, from sixteen inches, to the length of three or four feet. In Persia the carp is not unfrequently found of this length, and will weigh from 30 to 40 pounds. It was introduced into England in the sixteenth century. It feeds on herbs, worms, and water insects: it is extremely prolific; the roe having been occasionally found to weigh as much as the real substance of the fish: the principle of vitality in the carp is uncommonly strong: it may be kept alive in a damp situation for a very considerable time after being taken from the water; and if wrapped in wet moss, and plunged in water every four hours, and fed on bread and milk, will not only continue to exist, but will thrive and fatten: it has been ascertained to live to a very considerable age, when they become completely white. The carp was classed by the ancients among sea-fish; it is, however, generally found in ponds and rivers; and now considered as a fresh-water fish. For a variety of this species, called the large-scaled carp, see Plate LV.

C. AURATUS, the **GOLDEN-FISH**, a small fish domesticated by the Chinese, and generally kept for ornament by great people in their courts and gardens. They breed them in small ponds made for the purpose, in basons, and even in porcelain vessels. This fish is no larger than our pilchard. The male is of a bright red colour from the top of the head to the middle of the body: the rest is of a gold colour; but it is so bright and splendid, that the finest gilding, according to F. le Comte, cannot approach it. The female is white; but its tail and half of its body resemble the lustre of silver. F. du Halde, however, observes, that a red and white colour are not always the distinguishing marks of the male and female; but that the females are known by several white spots which are seen round the orifices that serve them as organs of bearing, and the males, by having these spots much brighter. Gold fish are light and lively; they love to sport on the surface of the water, soon become familiarized, and may be even accustomed to come and receive their food on sounding a small rattle.

C. BARBUS, the **BARBEL**, is extremely coarse. They frequent the still and deep parts of rivers, and live in society, rooting like the swine with their noses in the soft banks. They are so tame as to suffer themselves to be taken by the hand; and people have been known to take numbers by diving for them. In summer they move about during the night in search of food; but towards autumn, and during winter, confine themselves to the deepest holes.

C. BRAMA, the **BREAM**, is an inhabitant of lakes, or the deep parts of still rivers. It is a fish that is very little esteemed, being extremely insipid.

C. CEPHALUS, the **CHUB**, is a very coarse fish and full of bones. It frequents the deep holes of rivers; and in summer commonly lies on the surface, beneath the shade of some tree or bush.

C. GOBIO, the **GUDGEON**, is generally found in gentle streams, and is of a small size, the largest not exceeding half a pound weight. They bite eagerly; and are assembled by raking the bed of the river; to this spot they immediately crowd in shoals, in expectation of food.

C. LEUCISCUS, the **DACE**, is gregarious, haunts deep still waters, is a great breeder, very lively, and during summer is very fond of frolicing near the surface of the water. It never exceeds the weight of a pound and an half; the scales are smaller than those of the roach.

C. RUTILUS, the **ROACH**, is a common fish found in many of the deep still rivers of this country. They are gregarious, keeping in large shoals.

C. TINCA, the **TENCH**, has by some been called the physician of the fish; and its slime has been said to be of so healing a nature, that the wounded fishes apply it as a styptic. In this country it is reckoned a wholesome and delicious food; but the Germans are of a different opinion. By way of contempt they call it the shoemaker.

CYPRIPEDIUM, the **LADY'S SLIPPER**, in botany, a genus of the diandria order, and gynandria class of plants; natural order, Orchidæ. Nectarium ventricose, inflated, hollow. There are five species.

CYPRUS, an island situated in the Levant, or most easterly part of the Mediterranean sea, between 33° and 36° lon. E. and 30° and 34° lat. N. It is 220 miles long, 65 broad, and about 600 in circumference; and is divided from E. to W. by a chain of mountains, the highest of which are St. Croix, Buffavent, and Olympus. In ancient times this island was known by the names of Acamis, Aërosa, Amathus, Aspalia, Cerastis, Colinia, Cryptos, Macaria, Paphia, Salamina, and Sphecia. The name by which it was most generally known is Cyprus, said to be derived from Cypros, a shrub or tree, with which the island abounded; supposed to be the cypress.

CYPRUS, KNIGHTS OF, an order instituted by Guy de Lusignan, titular king of Jerusalem, to whom Richard I. of England, after conquering Cyprus, made over his right.

CYRENAICA, an ancient kingdom of Africa, corresponding to the present kingdom and desert of Barca and Tripoli.

CYRENAICS, a sect of ancient philosophers, so called from their founder Aristippus of Cyrene, a disciple of Socrates. See **ARISTIPPUS**. The great principle of their doctrine was, that the supreme good of man in this life is pleasure; whereby they not only meant a privation of pain, and a tranquillity of mind, but an assemblage of all mental and sensual pleasures, particularly the last.

CYRENE, in ancient geography, the capital of Cyrenaica, and one of the five cities called Pentapolis, distant from Apollonia, its sea-port, 10 miles.

CYRILL, St. bishop of Jerusalem, succeeded Maximus in 350. He was afterwards deposed for a most praise-worthy action; viz. selling the treasures of the church, and applying the money to the support of the poor during a great famine. But the spirit of Antichrist, which led the clergy to prefer the grandeur of the church to the good of the people, was then beginning to work. Under Julian he was restored to his see, and firmly established in all his honours under Theodosius; in which he continued unmo- lested to his death, in 386. The remains of this father consist only of 23 catecheses, and one letter to the emperor Constantius.

CYRILL, St. patriarch of Alexandria, succeeded Theophilus, his uncle, in 412. Scarce was he installed, when he began to exert his authority with great vigour; he drove the Novations and Jews from Alexandria, permitting their wealth and synagogues to be taken from them. This proceeding highly displeased Orestes, the governor, who saw, that if the bishop's authority was not soon suppressed, it might grow too strong for that of the magistrate. Upon which a kind of civil war broke out between Orestes and the bishop; many tumults were raised, and some battles fought in the very streets of Alexandria. St. Cyrill also distinguished himself by his zeal against Nestorius, bishop of Constantinople, who, in some of his homilies, had asserted that the Virgin Mary ought not to be called the mother of God. The dispute at first proved unfavourable to Cyrill, whose opinion was not only condemned, but himself deprived of his bishopric and thrown into prison. But he was soon after released, and gained a complete victory over Nestorius, who in 431 was deposed from his see of Constantinople. Cyrill returned to his see at Alexandria, where he died in 444. St. Cyrill also wrote against Theodorus of Mopsuestia, Diodorus of Tarsus, and Julian the apostate. He composed commentaries on St. John's Gospel, and wrote several other books. His works were published in Greek and Latin in 1638, in six volumes folio.

CYRUS the **GREAT**, the founder of the united empire of the Medes and Persians. The two chief historians, who have written the life of Cyrus, are Herodotus and Xenophon; but their accounts of him are extremely different. The former tells us, that Astyages, king of the Medes, dreamed, that a vine sprung from the womb of his daughter Mandane, the branches whereof overshadowed all Asia; whereupon, having consulted the soothsayers, he was told that this dream portended the future power and greatness

of a child who should be born of his daughter; and further, that this child should deprive him of his kingdom. Astyages, to prevent the accomplishment of this prediction, married his daughter to Cambyzes, a Persian of mean condition, who had no capacity for forming any important design, nor for supporting the ambition of his son, by his own riches and authority. And lest Mandane's son should find that assistance in his own courage, or some lucky circumstances, which his family was not able to supply him with, he commanded one of his officers, named Harpagus, to destroy the infant as soon as it came into the world. Harpagus, fearing the resentment of Mandane, put the child into the hands of one who was the king's shepherd. The shepherd's wife was so extremely touched with the beauty of Cyrus, that she desired her husband rather to expose her own son, who was born some time before, (a story equally unnatural and incredible,) and preserve the young prince. Thus Cyrus was preserved, and brought up among the king's shepherds. One day, as the neighbouring children were at play together, Cyrus was chosen king; and having punished one of his play-fellows with some severity, for disobeying his commands, the child's parent complained of Cyrus to Astyages. This prince sent for young Cyrus, and observing something great in his air, together with a great resemblance of his daughter Mandane, he made particular inquiry into the matter, and discovered that Cyrus was his grandson. Harpagus, who was the instrument of preserving him, was punished with the death of his own son; but Astyages believing that the royalty which the soothsayers had promised to the young prince, was only that which he had lately exercised among the shepherds' children, laid aside his fears. Cyrus being grown up, Harpagus disclosed the secret of his birth to him, with the manner wherein he had delivered him from his grandfather's cruelty. He encouraged him to come into Media, and promised to furnish him with forces, in order to make him master of the country, and depose Astyages. Cyrus hearkened to their propositions, engaged the Persians to take arms against the Medes, marched at the head of them to meet Astyages, defeated him, and possessed himself of Media. He carried on many other wars; and at length sat down before Babylon, which, after a long siege he took. Xenophon's account of Cyrus's life is more credible, and has less of the miraculous in it. Astyages, king of Media, married his daughter Mandane to Cambyzes, king of Persia, son and successor to Achæmenes. Cyrus was born at his father's court, and was educated with all the care his birth required. When he was about the age of 12, his grandfather Astyages sent for him to Media, together with his mother Mandane. Some time after, the king of Assyria's son having invaded Media, Astyages, with his son Cyaxares, and his grandson Cyrus, marched against him. Cyrus distinguished himself in this war, and defeated the Assyrians. Cambyzes afterwards recalled him, that he might have him near his own person; and Astyages dying, his son Cyaxares, uncle by the mother's side to Cyrus, succeeded him in the kingdom of Media. Cyrus, at the age of 30, was, by his father Cambyzes, made general of the Persian troops; and sent at the head of 30,000 men to the assistance of his uncle Cyaxares, whom the king of Babylon, and his allies, the Cappadocians, Carians, Phrygians, Cilicians, and Paphlagonians, were preparing to attack. Cyaxares and Cyrus prevented them, by falling upon them and dispersing them. Cyrus advanced as far as Babylon, and spread terror throughout the country. From this expedition he returned to his uncle, towards the frontiers of Armenia and Assyria, and was received by Cyaxares in the tent of the Assyrian King whom he had defeated. After this, Cyrus carried the war into the countries beyond the river Halys, entered Cappadocia, and subdued it entirely. From thence he marched against Cræsus king of Lydia, beat him in the first battle; then besieged him in Sardis his capital; and after a siege of 14 days, obliged him to surrender. See Cræsus. After this, Cyrus having almost reduced all Asia, repassed the Euphrates, and made war upon the Assyrians. He marched directly to Babylon, took it, and there prepared a palace for his uncle Cyaxares, whither he might retire, if at any time he had an inclination to come to Babylon; for he was not then in the army. After all these expeditions, Cyrus returned to his father and mother into Persia, where they were still living; and going some time after to his uncle Cyaxares into Media, he married his cousin, the only daughter and heiress of all Cyaxares's dominions, and went with her to Babylon, from whence he sent men of the first rank and quality to govern all the several

nations which he had conquered. He engaged again in several wars, and subdued all the nations that lie between Syria and the Red Sea. He died at the age of 70 years, after a reign of 30; but authors differ very much concerning the manner of his death. Daniel (viii. 3—29.) in the famous vision wherein God shewed him the ruin of the four great empires, which were to precede the birth of the Messiah, represents Cyrus, or rather his extensive empire, under the idea of "a ram, which had two horns; the one was higher than the other, and the higher came up last." The ram's two horns signify the two empires which Cyrus united in his person; that of the Medes, and that of the Persians. The latter was greater and more powerful than the former. Cyrus succeeded his father Cambyzes in the kingdom of Persia, and his uncle Darius the Mede, by Xenophon called Cyaxares, in the kingdom of the Medes, and empire of Babylon. He was monarch of all the East; or as he himself speaks (2 Chr. xxxvi. 22, 23, and Ezra, i. 1, 2.) "of all the earth," when he permitted the Jews to return into their own country; A.M. 3466, and B. C. 538. The enemies of the Hebrews, making use of this prince's affection to his own religion, prevailed with him to put a stop by his orders to the building of the temple at Jerusalem; (Ezra iv. 5.) The prophets frequently foretold the coming of Cyrus; and Isaiah (xlv. 28.) is so particular as to declare his name above 100 years before his birth. Josephus (Antiq. I. II. c. 2.) says, that the Jews of Babylon shewed this passage of the prophet to Cyrus, which is extremely probable: and that this prince, in the edict which he granted them for their return, acknowledged that he received the empire of the world from the God of Israel; and that the same God had described him by name in the writings of the prophets, and foretold that he should build a temple to him at Jerusalem. Cyrus is expressly stiled in scripture "the righteous man, the Lord's anointed, and the shepherd of Israel;" (Isaiah xli. 2, xlv. 1, and xlv. 28.) Notwithstanding this, God says of him, (Isa. xlv. 5.) "I girded thee, though thou hast not known me." And Jeremiah calls Cyrus and his people, who overthrew the Babylonish empire, thieves and robbers; as indeed most great conquerors may be justly stiled. The taking of Babylon by Cyrus, was clearly foretold by the prophets. Abp. Ussher fixes the birth of Cyrus to A.M. 3405; his first year at Babylon to 3466, and his death to 3475. The eastern people say, that Cyrus by the mother's side was descended from some of the Hebrew prophets; and that his wife was a Jewess, which they assign as the reasons of his favouring the Jews.

CYRUS the YOUNGER, son of Darius Nothus, and brother of Artaxerxes. He was sent by his father at the age of 16, to assist the Lacedæmonians against Athens. Artaxerxes succeeded to the throne at the death of Nothus; and Cyrus, mad with ambition, attempted to assassinate him. He was discovered, and would have been punished with death, had not his mother Parysatis saved him by her tears and intreaties. This circumstance did not check the ambition of Cyrus; he was appointed over Lydia and the sea-coasts, where he secretly fomented rebellion and levied troops under various pretences. At last he took the field with an army of 100,000 barbarians; and 13,000 Greeks under the command of Clearchus. Artaxerxes met him with 900,000 men near Cunaxa. The battle was long and bloody; and Cyrus might have perhaps obtained the victory, had not his uncommon rashness proved his ruin. It is said that the two royal brothers met in person, and their engagement ended in the death of Cyrus, 401 years before the Augustan age.

CYTHERA, in ancient geography, an island opposite to Boiæ a town of Laconia; sacred to Venus, with a very ancient temple of that goddess. It is now called CERIGO.

CYTHERA, a town in the above island. It has a good port, called Scandea.

CYTHEREA, in mythology, the surname of Venus, so called from Cythera, her birth place, where she had a temple.

CYTHERIADES, an epithet of the Graces who attended Venus on the shore of Cythera.

CYTINUS, in botany, a genus of the dodecandria order, and gynandria class of plants; natural order, Sarmenaceæ. Calyx quadrifid, superior; no corolla; antheræ are 16, sessile; fruit an octolocular polyspermous berry. One species.

CYTISUS, LABURNUM, a genus of the decandria order, and diadelphica class of plants; natural order, Papilionacæ. Calyx bilabiated, with the upper lip bifid; inferior, tridentate; legumen attenuated

attenuated at the base. Eighteen species, shrubs without spine; most of them proper for plantations.

CYZICUM, in ancient geography, an island of the Propontis, on the coast of Mysia.

CYZICUM, or CYZICUS, one of the noblest cities of the Hither Asia; situated in the above island. It was a colony of the Milesians, and is famous for its siege by Mithridates, which was raised by Lucullus.

CZACKTHURN, a town of Germany, in Austria, near the frontiers of Hungary. It seems to be the same with Csakathurn. Lon. 17. 19. E. Lat. 46. 24. N.

CZACSANICH, a town of Poland, in the palatinate of Bracław; 38 miles S. of Bracław.

CZAR, [a Slavonian word, written more properly *tzar*,] the title of the emperor of Russia.

CZAR is pronounced *tzar*, or *zaar*, by the Russians; and this, by corruption (it has been fancied) from *Cesar*, emperor, from some imagined relation to the Roman emperors. But this etymology does not seem correct. When the Czar Peter formally required of the European courts an acknowledgment of his imperial titles, and that the appellation of Emperor should never be omitted, there was great difficulty made about it, especially at the court of Vienna. At the same time it occasioned a curious controversy among the learned, concerning the rise and progress of the titles by which the monarchs of this country have been distinguished. From their researches, it appeared that the early sovereigns of Russia were called great dukes, and that Vassili Ivanovitch was probably the first who styled himself *tzar*, an expression which, in the Slavonian language, signifies *king*; and that his successors continued to bear, within their own dominions, that title, as the most honourable appellation, until Peter the Great first took that of Povelitel, or emperor. After many delays and objections, the

principal courts of Europe consented, about 1772, to address the sovereign of Russia with the title of Emperor; without prejudice, nevertheless, to the other crowned heads of Europe.

CZARNOKOZYNECZIE, a town of Poland, in the palatinate of Kaminić; 12 miles W. of Kaminić.

CZASLAU, or TCHASLAU, a circle of Bohemia.

CZASLAU, the capital of the above circle, 42 miles E. S. E. of Prague.

CZENSTOKOW, or CZESTOCHOW, a town of Poland, in the palatinate of Cracovia, with a fort, in which they keep a rich treasure, called the treasure of the Virgin Mary. The town is situated on the river in Wartę, 50 miles N. N. W. of Cracow.

CZERNIC CZERNICK, or CZIRNITZ, a town of Germany, in the circle of Austria, and province of Carniola.

CZERNIGOF, or CZERNIKOU, a duchy of Russia; also the capital of the duchy, 76 miles N. by E. of Kiow.

CZIRNITZER ZEE, a very extraordinary lake of Austria, in Carniola, 15 miles long and five broad, which annually produces both fish and corn: for in summer being dry, its bottom is cultivated, and it produces corn, grass, &c.; but about the 29th of September the water rushes in from several subterraneous passages, through large apertures; which with the rains and streams that fall from the mountains, quickly fill it again for the winter season. These subterraneous passages are probably connected with some gulf, the ebbing or flowing of whose waters depend upon periodical winds or currents.

CZONGRODT, a territory of Upper Hungary.

CZONGRODT, the capital of the territory. Lon. 20. 17. E. Lat. 46. 50. N.

CZUDNOW, a town of Poland, in that part of the Ukraine, seized by Catherine II. in 1793, and annexed to Russia.

D.

D Is a consonant nearly approaching in sound to T, but formed by a stronger appulse of the tongue, to the upper part of the mouth. The sound of D in English is uniform, and it is never mute. It is the fourth of the alphabet, and the third consonant. Grammarians generally reckon D among the lingual letters, as supposing the tongue to have the principal share in the pronunciation thereof; tho' the Abbot de Dangeau seems to have reason in ranking it with those of the palate. The letter D is the fourth in the Hebrew, Chaldee, Samaritan, Syriac, Greek, and Latin alphabets; in the five first of which languages it has nearly the same name; *e. g.* in Hebrew, Chaldee, and Samaritan, *Daleth*, in Syriac *Dolet*, and in Greek *Delta*. The form of our D is the same with that of the Latins, as appears from all the ancient medals and inscriptions; and the Latin D is only the Greek Δ, rounded a little by making it quicker and at two strokes. The Δ of the Greeks, again, is borrowed from the ancient character of the Hebrew *Daleth*; which form it still retains, as is shewn by the Jesuit Souciet, in his Dissertation on the Samaritan Medals. As a numeral, D signifies 500; D, with a dash or line above it thus $\overline{D}$, denotes 5000. As an abbreviation, D, has various significations: thus D stands for Doctor; as, M. D. for Doctor of Medicine; D. T. Doctor of Theology; D. D. Doctor of Divinity, or *dono dedit*; D. D. D. *dat, dicat, dedicat*; and D. D. D. D. for *dignum Deo donum dedit*.

DA, in music books, signifies for or by.

DAB. See PLEURONECTES.

DABUL, a town of Hindostan, on the coast of Malabar, S. of the gulf of Cambaye, 75 miles S. W. of Bombay.

DACCA, a city of Hindostan, in the E. quarter of Bengal, seated on a branch of the Ganges. Dacca is 160 miles N. E. of Calcutta.

DACE is a species of Cyprinus, which see.

DACHAU, or DACHAW, a town of Bavaria in Germany. Lon. 11. 30. E. Lat. 48. 20. N.

DACHSTEIN, a town of France, in the department of the Lower Rhine, 8 miles W. of Strasburg.

DACIA, in ancient geography, a country which Trajan, who reduced it to a province, joined to Moesia by an admirable bridge. This country lies extended between the Danube and the Carpathian mountains, from the river Tibiscus, quite to the N. bend of the Danube.

DACIA AURELIANA, a part of ancient Illyricum, which was divided into the eastern and western; Sirium being the capital of the latter, and Sardica of the former.

DACIER, ANDREW, a learned Frenchman, was born of Protestant parents at Castres, in 1651, and educated at Saumur under Tanaquil Faber, or Le Fevre, whose learned daughter he married. He published at Paris, in 1681, an edition of Pompeius Festus, for the use of the dauphin. His translation of Horace came out the same year. In 1691 he published his translation of the reflections of Marcus Antoninus; and the next year Aristotle's Poetics. For his services to literature he was appointed perpetual secretary to the academy, rewarded with a pension of 2000 livres, and made keeper of the cabinet of the Louvre. He died in 1722. Dacier and his wife renounced the Protestant religion in 1685. Besides the works abovementioned, he translated the works of Plato into French; the Lives of Plutarch; the Manual of Epictetus; &c.

DACIER, ANNE, wife of the preceding, and daughter of Le Fevre, professor of Greek at Saumur, where she was born in 1651. Her father discovering her turn for learning, gave her a liberal education. In 1674 she published an edition of Callimachus, which gave

gave so much satisfaction, that she was employed to prepare editions of Latin authors for the dauphin, the first of which was Florus. In 1681 she published a translation of Anacreon and Sappho, which was followed by versions of some of Plautus's comedies, and of the Plutus and Clouds of Aristophanes. In 1683 she married M. Dacier, and soon after they renounced the Protestant religion. In 1711 appeared her translation of the Iliad; and in 1714 she defended Homer against M. de la Motte, in a book, entitled *The Causes of the Corruption of Taste*; this was followed in 1716 by another against father Hardouin. The same year was printed her version of the Odyssey, which closed her literary labours. She died in 1720. She had two daughters and a son. One of the daughters became a nun, the other died at the age of 18, and the son when he was a child. Madame Dacier was as remarkable for her modesty as her erudition. A learned German having paid her a visit, begged that she would write her name and a sentence in his book. She excused herself as long as she could, but being strongly importuned she complied, and added to her signature a verse from Sophocles, importing that silence is the ornament of the female sex.

DACRYDIUM, in pharmacy, the juice of scamony, prepared and hardened in a quince made hollow; called also *Lachrymula*.

DACRYODES, or **DACRYOIDES**, [from *δάκρυον*, a tear, and *εἶδος*, form,] a name given to ulcers, which continually yield a putrid matter, resembling tears.

DACTYLE, [*δάκτυλος*, a finger,] a poetical foot consisting of one long syllable and two short, like the joints of a finger; as *cādidūs, us pārit*. The dactyle is said to be the invention of Dionysius or Bacchus, who delivered oracles in this measure at Delphos, before Apollo. The Greeks call it *πολιτικός*. The dactyl and spondee are the most considerable of the poetical feet: as being the measures used in heroic verse, by Homer, Virgil, &c. These two are of equal time, but not equal motion. The spondee has an even, strong, and steady pace, like a trot: the dactyl resembles the nimble strokes of a gallop.

DACTYLETHRA, or **DACTYLITHRA**, **DIGITALE**, a medicine used by the ancient physicians, to excite vomiting.

DACTYLIC VERSES are hexameter verses, ending in a dactyl instead of a spondee; as *Spondaic Verses* are those which have a spondee in the fifth foot instead of a dactyl. An instance of a dactylic verse occurs in Virgil; *Æn. vi. 33*.

Bis patriæ cecidere manus: quin protinus omniâ.

DACTYLI IDÆI, [*q. d.* the Fingers of Mount Ida,] in Pagan mythology, are personages very differently described by ancient authors. The Cretans paid divine worship to them, as to those who had nursed and brought up the god Jupiter; whence it appears, that they were the same as the Corybantes and Curetes. Nevertheless Strabo makes them different; and says, that the tradition in Phrygia was, that the "Curetes and Corybantes were descended from the Dactyli Idæi: that there were originally 100 men in the island, who were called Dactyli Idæi; from whom sprang nine Curetes, and each of these nine produced ten men, as many as the fingers of a man's two hands: and that this gave the name to the ancestors of the Dactyli Idæi." He relates another opinion, which is, that there were but five Dactyli Idæi; who, according to Sophocles, were the inventors of iron: that these five brothers had five sisters, and that from this number they took the name of fingers of mount Ida, because they were in number ten; and that they worked at the foot of this mountain.

DACTYLIOMANCY, or **DACTYLIOMANTIA**, [from *δάκτυλος*, a ring, and *μαντεία*, divination,] a sort of divination performed by means of a ring. It consisted in holding a ring, suspended by a fine thread, over a round table, on the edge whereof were made divers marks with the letters of the alphabet. The ring in shaking, or vibrating over the table, stopped over certain of the letters, which, being joined together, composed the answer required.

DACTYLIS, **Cock's-Foot GRASS**, a genus of the digynia order, and triandria class of plants; natural order, Gramina. Calyx bivalved, compressed, with the one valve longer than the other, carinated, or having the rachis prominent and sharp. There are seven species.

DACTYLOGY, [from *δάκτυλος*, a finger, and *λόγος*, a discourse,] the art of communicating our thoughts by signs made by the fingers.

DACTYLONOMIA, or **DACTYLONOMY**, [from *δάκτυλος*, and *νόμος*, a rule,] the art of numbering by the fingers. The rule is this: The left thumb is reckoned one; the index or fore-finger two; and so on to the right thumb, which stands for the cypher.

DACTYLUS, in antiquity, a dance among the Greeks, chiefly performed, Hesihius observes, by the athletes.

DACTYLUS, in poetry. See **DACTYLE**.

DADO, [Ital.] in architecture, the plain part between the base and cornice of a column: the *dye*.

DADUCHI, [*αἱ δαδυχίαι*, torch-bearers,] in antiquity, priests of Ceres. The goddess having lost her daughter Proserpine, say mythologists, began to make search for her at the beginning of the night. In order to do this in the dark, she lighted a torch, and thus set forth on her travels throughout the world: for which reason she is represented with a lighted torch in her hand. In commemoration of this pretended exploit, it became a custom for the priests, at the feasts and sacrifices of this goddess, to run about in the temple, with torches after this manner; one of them took a lighted torch from off the altar, and holding it with his hand, ran with it to a certain part of the temple, where he gave it to another, saying to him, *Tibi trado*; this second ran after the like manner to another part of temple, and gave it to the third, and so of the rest.

DÆDALA, two festivals in Boeotia; one of them observed in Alalcomenos by the Plataeans in a large grove, where they exposed in the open air pieces of boiled flesh, and carefully observed whether the crows that came to prey upon them directed their flight. All the trees upon which any of these alighted were immediately cut down, and with them statues were made, called *Dædala*, in honour of Dædalus. The other festival was of a more solemn kind. It was celebrated every sixty years by all the cities of Boeotia, as a compensation for the intermission of the smaller festivals, for that number of years, during the exile of the Plataeans.

DÆDALUS, in fabulous history, the son of Eupalamus, descended from Erechtheus king of Athens. He was the most ingenious artist of his age; and to him we are indebted for the invention of the wedge, with many other mechanical instruments, and the sails of ships. He made statues which moved of themselves, and seemed to be endowed with life. Talus his sister's son promised to be as great as himself by the ingenuity of his inventions; and therefore from envy he threw him down from a window and killed him. After this murder, Dædalus, with his son Icarus, fled from Athens to Crete, where Minos gave him a cordial reception. Dædalus made a famous labyrinth for Minos, and assisted Pasiphae the queen, to gratify her unnatural passion for a bull. For this action Dædalus incurred the displeasure of Minos, who ordered him to be confined in the labyrinth which he had constructed. Here he made himself wings with feathers and wax, and carefully fitted them to his body and that of his son, who was the companion of his confinement. They took their flight in the air from Crete; but the heat of the sun melted the wax on the wings of Icarus, whose flight was too high, and he fell into that part of the ocean, which from him has been called the Icarian Sea. The father by a proper management of his wings alighted at Cumæ, where he built a temple to Apollo, and thence directed his course to Sicily, where he was kindly received by Cocalus, who reigned over part of the country.

DÆDIS, [from *δαδύς*, a torch,] in Grecian antiquity, a solemn festival, that lasted three days during which the torches were constantly keep burning.

DÆMON, [*ἃ καὶ ἡ δαίμων*,] a name given by the ancients to certain spirits or genii, which appeared to men, either to do them service or to hurt them. The word is derived (according to Plato, in his *Cratylus*, p. 398. ed. Serrani, vol. i.) from *δαίμων*, knowing or intelligent: but according to others from *δαίωμαι*, to distribute. Either of these derivations agree with the office ascribed to dæmons by the ancient heathens, as the spirit entrusted with the inspection and government of mankind. For, according to the philosophers, dæmons held a middle rank between the celestial gods and men on earth, and carried on all intercourse between them; conveying the addresses of men to the gods, and the divine benefits to men. It was the opinion of many, that the celestial divinities did not themselves interpose in human affairs, but committed the entire administration of the government of this lower world to these sub-

altern deities. Hence they became the objects of idolatrous worship. Hesiod and other poets, who have recorded the ancient history of traditions, on which the public faith and worship were founded, assert, that the men of the golden age, who were supposed to be very good, became daemons after death, and dispensers of good things to mankind. Though daemon is often used in a general sense, as equivalent to a deity, and is accordingly applied to fate or fortune, or whatever else was regarded as a god; yet these daemons who were the more immediate objects of worship amongst the heathens were human spirits; as is shewn by Farmer on Miracles, chap. iii. sect. 2. The word daemon is used indifferently in a good and in a bad sense. In the former sense, it was very commonly used among the ancient heathens. But they are mistaken who affirm, that daemon never signified an evil being till after the time of Christ. Pythagoras held that daemons sent diseases to men and cattle. (Diogen. Laert. Vit. Pythag.) Zaleucus, in his preface to his Laws, supposes that an evil daemon might be present with a man, to influence him to justice. The daemons of Empedocles were evil spirits, and exiles from heaven. And Plutarch in his life of Dion says, "It was the opinion of the ancients, that evil and mischievous daemons, out of envy and hatred to good men, oppose whatever they do." Scarce did any opinion more generally prevail in ancient times than this, viz. that as the departed souls of good men became good daemons, so the departed souls of bad men became evil daemons. It has been generally thought, that by daemons we are to understand devils, in the Septuagint version of the Old Testament. Others think the word is in that version applied to the ghosts of such dead men as the heathens deified. That daemon often bears the same meaning in the New Testament, and particularly in Acts xvii. 18. 1 Cor. x. 21. 1 Tim. iv. 1. Rev. ix. 20. is shewn at large by Mr. Joseph Mede. (See his Works. p. 625. et seq.) That the word is applied always to human spirits in the New Testament, Mr. Farmer has attempted to shew in his Essay on Demoniacs, p. 208, et seq. As to the meaning of the word daemon in the fathers of the Christian church, it is used by them in the same sense as it was by the heathen philosophers, especially the latter Platonists; that is, sometimes for departed human spirits, and at other times for such spirits as had never inhabited human bodies. In the fathers indeed the word is more commonly taken in an evil sense, than in the ancient philosophers. Besides the two forementioned kinds of daemons, the fathers, as well as the ancient philosophers, held a third, viz. such as sprang from the congress of superior beings with the daughters of men. In the theology of the fathers, these were the worst kind of daemons. Different orders of daemons had different stations and employments assigned them by the ancients. Good daemons were considered as the authors of good to mankind; evil daemons brought innumerable evils both upon men and beasts. Amongst evil daemons there was a great distinction with respect to the offices assigned them; some compelled men to wickedness, others stimulated them to madness. See DEMONIAIC.

DEMONES, among ancient medical authors, diseases, which could not be assigned to any natural cause, and proceeded, or were supposed to proceed, from the influence or possession of the devil. See DEMONIAIC.

DEMONIAIC, [from *daemon*,] a human being whose volition and other mental faculties are overpowered and restrained, and his body possessed and actuated, by some created spiritual being of superior power. The Greeks and Romans imagined, that their deities, to reveal future events, frequently entered into the prophet or prophetess who was consulted, overpowered their faculties, and uttered responses with their organs of speech. Apollo was believed to enter into the Pythoness, and to dictate the prophetic answers received by those who consulted her. Other oracles besides that of Delphi were supposed to unfold futurity by the same machinery. And in various other cases, either malignant daemons or benevolent deities were thought to enter into and to actuate human beings. The Lymphatici, the Cerriti, the Larvati, of the Romans, were all of this description; and the Greeks, by the use of the word *δαίμονες*, shew that they referred to this cause the origin of madness. Among the ancient heathens, therefore, it appears to have been a generally received opinion, that superior beings entered occasionally into men, overpowered the faculties of their minds, and actuated their bodily organs.

DEMONIAIC, ARGUMENTS AGAINST THE EXISTENCE OF. Those who are unwilling to allow that angels or devils have ever intermed-

dled with the concerns of human life, urge a number of specious arguments. The Greeks and Romans of old, say they, did believe in the reality of demoniacal possession. They supposed that spiritual beings did at times enter into the sons or daughters of men, and distinguish themselves in that situation by capricious freaks, deeds of wanton mischief, or prophetic enunciations. But in the instances in which they supposed this to happen, it is evident that no such thing took place. Their accounts of the state and conduct of those persons whom they believed to be possessed in this supernatural manner, shew plainly that what they ascribed to the influence of daemons were merely the effects of natural diseases. Whatever they relate concerning the larvati, the cerriti, and the lymphatici, shews that these were merely people disordered in mind, in the same unfortunate situation with those madmen and idiots and melancholy persons whom we have among ourselves. Festus describes the Larvati as being furiosi et mentemoti. Plato, in his Timæus, says, *δαίς γὰρ ἐννοῦς ἐρᾷπλεται μαντικῆς* — *ἀληθῆς*. Lucian describes demoniacs as lunatic, and as starting with their eyes, foaming at the mouth, and being speechless. It appears still more evidently, that all the persons spoken of as possessed with devils in the New Testament, were either mad or epileptic, and precisely in the same condition with the madmen and epileptics of modern times. The Jews, among other reproaches which they threw out against our Saviour, said, "He hath a devil, and is mad; why hear ye him?" The expressions he hath a devil, and is mad, were certainly used on this occasion as synonymous. With all their virulence, they would not surely ascribe to him at once two things that were inconsistent and contradictory. Those who thought more favourably of the character of Jesus, asserted concerning his discourses, in reply to his adversaries, These are not the words of him that hath a daemon; meaning, no doubt, that he spoke in a more rational manner than a madman could be expected to speak. The Jews appear to have ascribed to the influence of daemons, not only that species of madness in which the patient is raving and furious, but also melancholy madness. Of John, who secluded himself from intercourse with the world, and was distinguished for abstinence and acts of mortification, they said, He hath a daemon. The youth, whose father applied to Jesus to free him from an evil spirit, describing his unhappy condition in these words, "Have mercy on my son for he is lunatic, and sore vexed with a daemon: for oft-times he falleth into the fire, and oft into the water," was plainly epileptic. Every thing indeed that is related in the New Testament concerning demoniacs, proves that they were people affected with such natural diseases as are far from being uncommon among mankind in the present age. When the symptoms of disorders cured by our Saviour and his apostles as cases of demoniacal possession, correspond so exactly with those of diseases well known as natural in the present age, it would be absurd to impute them to a supernatural cause. It is much more consistent with common sense and sound philosophy to suppose, that our Saviour and his apostles wisely, and with that condescension to the weakness and prejudices of those with whom they conversed, which so eminently distinguished the character of the author of our holy religion, and must always be a prominent feature in the character of the true Christian, adopted the vulgar language in speaking of those unfortunate persons who were groundlessly imagined to be possessed with daemons, though they well knew the notions which had given rise to such modes of expression to be ill-founded, than to imagine that diseases which arise at present from natural causes, were produced in days of old by the intervention of daemons, or that evil spirits still continue to enter into mankind in all cases of madness, melancholy, or epilepsy. Besides, it is by no means a sufficient reason for receiving any doctrine as true, that it has been generally received through the world. Error, like an epidemical disease, is communicated from one to another. In certain circumstances too, the influence of imagination predominates, and restrains the exertions of reason. Many false opinions have extended their influence through a very wide circle, and maintained it long. On every such occasion as the present, therefore it becomes us to enquire, not so much how generally any opinion has been received, or how long it has prevailed, as from what cause it has originated, and on what evidence it rests. When we contemplate the frame of nature, we behold a grand and beautiful simplicity prevailing through the whole. Notwithstanding its immense extent, and though it contains such numberless diversities of being: yet the simplest

simplest machine constructed by human art does not display greater simplicity, or an happier connection of parts. We may therefore infer, by analogy, from what is observable of the order of nature in general to the present case; that to permit evil spirits to inter-meddle with the concerns of human life, would be to break through that order which the Deity appears to have established through his works; it would be to introduce a degree of confusion unworthy of the wisdom of Divine Providence.

DÆMONIACS, ARGUMENTS FOR THE EXISTENCE OF. In opposition to these arguments the following are urged by the Dæmonianists. In the days of our Saviour, it would appear that dæmoniacal possession was very frequent among the Jews and the neighbouring nations. Many were the evil spirits whom Jesus is related in the gospels to have ejected from patients that were brought unto him as possessed and tormented by those malevolent dæmons. His apostles too, and the first Christians, who were most active and successful in the propagation of Christianity, appear to have often exerted the miraculous powers with which they were endowed on similar occasions. The dæmons displayed a degree of knowledge and malevolence which sufficiently distinguish them from human beings: and the language in which the dæmoniacs are mentioned, and the actions and sentiments ascribed to them in the New Testament, shew that our Saviour and his apostles did not consider the idea of dæmoniacal possession as being merely a vulgar error concerning the origin of a disease or diseases produced by natural causes. The more enlightened cannot always avoid the use of metaphorical modes of expression; which though founded upon error, yet have been so established in language by the influence of custom, that they cannot be suddenly dismissed. But in descriptions of characters, in the narration of facts, and in the laying down of systems of doctrine, we require different rules to be observed. Should any person, in compliance with popular opinions, talk in serious language of the existence, dispositions, declarations, and actions, of a race of beings whom he knew to be absolutely fabulous, we surely could not praise him for integrity; we must suppose him to be either exulting in irony over the weak credulity of those around him, or taking advantage of their weakness, with the dishonesty and the selfish views of an impostor. And if he himself should pretend to any connection with this imaginary system of beings; and should claim in consequence of his connection with them, particular honours from his contemporaries; whatever might be the dignity of his character in all other respects, nobody could hesitate to brand him as an impostor. In this light must we regard the conduct of our Saviour and his apostles, if the idea of dæmoniacal possession were to be considered merely as a vulgar error. They talked and acted as if they believed that evil spirits had actually entered into those who were brought to them as possessed with devils, and as if those spirits had been actually expelled by their authority out of the unhappy persons whom they had possessed. They demanded too, to have their possessions and declarations believed, in consequence of their performing such mighty works, and having thus triumphed over the powers of hell. The reality of dæmoniacal possession stands upon the same evidence with the gospel system in general. Nor is there any thing unreasonable in this doctrine. It does not appear to contradict those ideas, which the general appearances of nature and the series of events, suggest, concerning the benevolence and wisdom of the Deity, by which he regulates the affairs of the universe. We often fancy ourselves able to comprehend things to which our understanding is wholly inadequate: we persuade ourselves, at times, that the whole extent of the works of the Deity must be well known to us, and that his designs must always be such as we can fathom. We are then ready, whenever any difficulty arises to us, in considering the conduct of Providence, to model things according to our own ideas; to deny that the Deity can possibly be the author of things which we cannot reconcile; and to assert, that he must act on every occasion in a manner consistent with our narrow views. This is the pride of reason; and it seems to have suggested the strongest objections that have been at any time urged against the reality of dæmoniacal possession. But the Deity may surely connect one order of his creatures with another. We perceive mutual relations and a beautiful connection to prevail through all that part of nature which falls within the sphere of our observation. The inferior animals are connected with mankind, and subjected to their authority, not

only in instances in which it is exerted for their advantage, but even where it is tyrannically abused to their destruction. Among the evil to which mankind have been subjected, why might not their being liable to dæmoniacal possession be one? While the Supreme Being retains the sovereignty of the universe, he may employ whatever agents he thinks proper in the execution of his purposes: he may either commission an angel, or let loose a devil; as well as bend the human will, or communicate any particular impulse to matter. All that revelation makes known, all that human reason can conjecture, concerning the existence of various orders of spiritual beings, good and bad, is perfectly consistent with, and even favourable to, the doctrine of dæmoniacal possession. It is mentioned in the New Testament in such language, and such narratives are related concerning it, that the gospels cannot well be regarded in any other light than as pieces of imposture, and Jesus Christ must be considered as a man who took advantage of the weakness and ignorance of his contemporaries, if this doctrine be nothing but a vulgar error; it teaches nothing inconsistent with the general conduct of Providence. In short, it is not the caution of philosophy, but the pride of reason, that suggests objections against this doctrine.

DÆMONIACS, in church history, a branch of the Anabaptists; whose distinguishing tenet is, that the devils shall be saved at the end of the world.

DAFFODIL, in botany. See **NARCISSUS**.

DAGHESTAN, a province of Asia, bounded by Circassia on the N.; by the Caspian sea on the E.; by Schirvan, in Persia, on the S.; and by mount Caucasus and Georgia on the W. Its chief towns are Tarku and Derbent, both situated on the Caspian Sea. It is inhabited by Tartars, who are subject to Russia.

DAGISTAN, a town of Persia, 240 miles N. W. of Meschid.

DAGNO, a town of Turkey in Europe, in Albania, 13 miles S. E. of Scutari.

DAGO, or **DAGHO**, an island in the Baltic Sea, on the coast of Livonia, between the gulf of Finland and Riga.

DAGON, the idol of Ashdod or Azotus. He is commonly represented as a monster, half man and half fish; whence most learned men derive the name from the Hebrew דַּג, *dag*, which signifies "a fish." Those who make him to have been the inventor of bread corn, derive his name from the Hebrew דַּגֵּן, *Dagon*, signifying corn; whence Philo-Biblicus calls him *Ζεύς Ἀπαργεῖος*, *Jupiter Aratrius*. This deity continued to have a temple at Ashdod to the time of the Maccabees: for the author of the first book of Maccabees tells us, that "Jonathan, one of the Maccabees, having beaten the army of Apollonius, Demetrius's general, they fled to Azotus, and entered into Bethdagon (the temple of their idol;) but Jonathan set fire to Azotus, and burnt the temple of Dagon, and all those who were fled into it." Dagon according to some was the same with Jupiter, according to others Saturn or Venus; but according to most Neptune.

DAGYSA, in zoology, a genus of the vermes mollusca. Body loose, nayant, angular, tubular, and open at each extremity. One species, viz. *D. notata*, found in the Spanish sea, is about three inches long and one thick. This genus is very like the *Salpa*, which see.

DAHHLAK, DALAKA, or DALACCA, an island in the Red Sea, near the coast of Abyssinia, about 22 leagues in length, and four in breadth, celebrated for its pearl fishery.

DAHL, or **DAL**, a river of Sweden, which runs through the provinces of Dalecarlia and Gestrícia, and falls into the gulph of Bothnia.

DAHOME, DAHOMY, or DAUMA, a kingdom of Africa, on the coast of Guinea, N. of Whidah. It is said to extend from 150 to 200 miles inland. The soil is rich, and produces all the tropical fruits and vegetables. There is not a stone to be found as large as an egg in this country, so far as Europeans have hitherto travelled.

DAIRI, or **DAIRO**, in Japan, is the sovereign pontiff of the Japanese; or, according to Kämpfer, the hereditary ecclesiastical monarch of Japan.

DAIRY-HOUSE, in rural economy, a place appropriated to the management of milk, butter, cheese, &c. A dairy ought to be so situated, that the windows, or lattices, may never front the south, south-east, or south-west; and it should at all times be kept in the neatest order. Lattices are also far preferable to glazed lights,

lights, as they admit a free circulation of the air. It has, however, been objected, that the former afford access to the cold air of winter, and to the sun in summer; but either may be easily remedied, by making the frame somewhat larger than the lattice, and constructing it so as to slide backward and forward at pleasure. Across this frame, packthread may be stretched, and oiled paper pasted on it, which will thus admit the light, and effectually keep out the sun and wind. During the summer, dairy-houses cannot be kept too cool; they ought therefore to be erected, if possible, near a cold spring, or running water; and, where it is practicable to conduct a small stream through the premises, it will much contribute to the convenience and utility of the place. Dr. Anderson observes, in his practical essay on the management of the dairy (published in the 3d and 4th vols of his ingenious "Recreations in Agriculture," &c.) that, if the water can be introduced by means of a pipe, so as to fall from some height on the floor, it will be productive of many advantages, particularly by preserving a continual freshness and purity of the air. Dairy-houses should therefore be neatly paved, either with red brick, or smooth hard stone, and laid with a proper descent, so that no water may stagnate. This pavement should be well washed every day during the summer; and all the utensils, here employed, be kept with unremitting attention to cleanliness. Nor should the churns be at any time scalded in the dairy; as the steam arising from hot water, tends greatly to injure the milk. For similar reasons, neither the cheese and rennet, nor the cheese-press, must be suffered to taint the atmosphere; as the whey and curd will diffuse their acidity over the whole building. All the utensils of the dairy should be made of wood, in preference either to lead, copper, or cast-iron; for these metals are easily soluble in acids; the solutions of the two first are in a high degree poisonous; and, though the latter is in itself harmless, the taste of it renders the productions of the dairy very disagreeable. The cream-dishes, when perfectly clean and cool, ought to be filled with the milk, as soon as it is drawn from the cow, and has been carefully strained through a cloth, or cloth-sieve made of hair or silver-wire; the latter of which, as Dr. Anderson justly remarks, is more wholesome than those of other metals. These dishes should never exceed three inches in depth, but may be so wide as to contain a gallon and a half of milk—when filled, they ought to be placed on shelves, to remain there till the cream be completely separated. Now it is to be taken off with nicety, by a skimming-dish (without lifting or removing the milk; or shedding any of it on the floor, which would soon corrupt the air of the room), and then deposited in a separate vessel, till a proper quantity be collected for churning. A firm, neat, wooden barrel, which is open at one end, and has a lid closely fitted to it, appears to be well calculated for this purpose; a cock or spigot, ought also to be fixed near the bottom, to draw off the thin, or serous part, that may drain from the cream; and the inner side of the opening should be covered with a piece of fine silver wire-gauze, in order to prevent the latter from escaping, while the former is allowed to pass. But, if notwithstanding the fatal consequences arising from the use of metallic utensils, or of earthen vessels glazed with lead, farmers still persist in employing them, it ought to be a constant and indispensable rule, to scald and scour them properly with salt and water, every day, and to dry them thoroughly, before the milk is deposited in them. Lastly, it is sincerely to be wished, that all the utensils employed in the dairy, of whatever materials they may consist, should be cleaned with similar care, previously to their being used; and, as long as the least acid smell is perceptible, they ought to undergo repeated scourings, till they are completely sweetened.

DAIS, in botany, a genus of the monogynia order, and decandria class of plants, and natural order, Veprecula. Involucrum tetraphyllous; corolla quadrifid, or quinquefid; berry one-seeded. Three species.

DALBERGIA, in botany, a genus of the diadelphia decandria class and order; natural order, Papilionaceæ; or Leguminosæ. Filaments two, four-cleft at top. Fruit pedicelled, not opening, leguminose, membranaceous, compressed. There are two species, viz. *D. lanceolaria* and *D. monetaria*; the former is native of Malabar and Ceylon, the latter of Surinam.

DAISY. See **BELLIS**.

DAKIR, in our statutes, is used for the 20th part of a last of hides. According to the statute of 15 Hen. III. De composi-

tione ponderum & mensurarum, a last of hides consists of 20 dakirs, and every dakir of ten hides. But by 1 Jac. cap. 33, one last of hides or skins is 12 dozen.

DALEA, **DALIA**, or **DAAL**, a province of Sweden bounded on the N. by Dalecarlia, on the E. by the Wermeland and the lake Wenner, on the S. by Gothland, and the W. by Norway and the sea.

DALEBURG, a town in Sweden, capital of Dalia, 50 miles north of Gottenburg.

DALECARLIA, a province of Sweden, bounded on the N. by Hisingland; on the E. by Gestrica; on the S. by Warmland, and on the W. by Norway. It is divided into two parts, which they call valleys; and is about 175 miles in length and 100 in breadth. It is full of mountains, which abound in mines of copper and iron, some of which are of a prodigious depth.

DALECARLIA, a river of Sweden.

DALECHAMPIA, in botany, a genus of the monadelphia order, and monœcia class of plants; natural order, Tricocceæ. Involucrum of the male common, quadripartite; calyces hexaphyllous; corolla none; nectarium laminated or scaly; female involucre common and triphyllous; corolla none; style one; capsule tricocceous. Two species: *D. Scandens*, a climbing plant, native of Jamaica; and *D. Colorata*, found in New Granada.

DALEM, or **DALEN**, a town of France, in the department of Ourte, 5 miles N. E. of Liege.

DALKEITH, a town in Scotland, 6 miles S. E. of Edinburgh.

DALKEY, a small island, in St. George's channel, near the coast of Ireland, a little to the S. of Dublin bay. Lon. 6. 5. W. Lat. 53. 20. N.

DALMANUTHA, in ancient geography, a city of Judæa, on the E. side of the sea of Tiberias, either the same with Magdala, or situated near it. Hence Mark says, (Ch. viii. 10,) that our Saviour and his disciples landed in the parts of Dalmanutha; while Matthew, (xv. 39,) recording the same fact, says that he came into the coasts of Magdala.

DALMATIA, a country of Europe, bounded on the N. by Bosnia and Croatia, on the E. by Servia, and on the S. and W. by the Adriatic. The air is wholesome, and the soil fruitful. It abounds in wine, corn, and oil. Its rivers have no long course, but are mostly navigable. The mountains abound with minerals, and are covered with sheep and black cattle. Gold and silver mines are in some of them.

DALRYMPLE, Sir **DAVID**, of Hailes, Bart. a late eminent and learned judge of Scotland, was born in Edinburgh, Oct. 28, 1726. His father Sir James Dalrymple, Bart. was the son of Sir David, Lord Advocate under K. George I. and grandson of the first earl of Stair. His mother, Lady Christian Hamilton, was daughter of the E. of Hadinton. He was educated at Eton and at Utrecht. In 1748 he was called to the Scotch bar, and in 1766 appointed a judge, on which occasion he took the title of lord Hailes. He died in 1792, leaving two daughters. He published a number of books, as "Memoirs and Letters relating to the History of Britain in the Reigns of James I. and Charles I." in two vols. "Remarks on the History of Scotland," 12mo.; "Annals of Scotland," 4to: 2 vols.; "Remains of Christian Antiquity," 3 vols. several Memoirs intended for a Biographia Scotica; "Papers in the World and Mirror," &c. He has also left many valuable MSS.

DALTON, a town of England in Lancashire. Lon. 30. 0. W. Lat. 54. 18. N.

DAMA, in zoology. See **CERVUS**.

DAMAN, or **DAMAUN**, a sea-port town of the East Indies, at the entrance of the gulph of Cambay. Lon. 72. 25. E. Lat. 20. 20. N.

DAMAR, a town of Arabia, in the country of Oman, 70 miles N. of Oman.

DAMASCENE. See **PRUNUS**.

DAMASCENUS, **JOHN**, an illustrious father of the church in the 8th century, born at Damascus, where his father, though a Christian, enjoyed the office of counsellor of state to the Saracen caliph; to which the son succeeded. He retired afterwards to the monastery of St. Sabas, and spent the remainder of his life in writing books of divinity. His works have been often printed: but the Paris edition in 1712, two vols. folio, is esteemed the best.

DAMASCIUS,

DAMASCIUS, a celebrated heathen philosopher, born at Damascus, A. D. 540, when the Goths reigned in Italy. He wrote the life of his master Isidorus; and dedicated it to Theodora, a very learned and philosophical lady, who had also been a pupil to Isidorus. In this life, which was copiously written, he frequently made oblique attacks on the Christian religion. We have nothing remaining of it but some extracts preserved by Photius. Damascius succeeded Theon in the rhetorical school, and Isidorus in that of philosophy, at Athens.

DAMASCUS, [דמשק, Heb.] a very ancient city of Syria in Asia. Some of the ancients suppose this city to have been built by one Damascus, from whom it took its name; but the most generally received opinion is, that it was founded by Uz the eldest son of Aram. It is certain, from Gen. xiv. 15, that it was in being in Abraham's time, and consequently may be looked upon as one of the most ancient cities in the world. In the time of king David it seems to have been a very considerable place; as the sacred historian tells us, that the Syrians of Damascus sent 20,000 men to the relief of Hadadezer king of Zobah. We are not informed whether at that time it was governed by kings, or was a republic. Afterwards, however, it became a monarchy which proved very troublesome to the kingdom of Israel, and would even have destroyed it entirely, had not the Deity miraculously interposed in its behalf. This monarchy was destroyed by Tiglath-Pileser, king of Assyria, and Damascus was never afterwards governed by its own kings. Notwithstanding the tyranny of the Turkish government, Damascus is still a considerable place. It is situated in a plain of so great extent, that one can but just discern the mountains which compass it on the other side. The fruit-tree called the damascene, and the flower called the damask rose, were transplanted from the gardens belonging to this city; and the silks and linens known by the name of damasks, were probably invented by the inhabitants. Damascus is 112 miles S. of Antioch, 130 N. N. E. of Jerusalem, and 270 S. S. W. of Diarbeck. Lon. 37. 0. E. Lat. 33. 45. N.

DAMASIA, in ancient geography, a town of Vindelicia, on the Licus; afterwards called Augusta; now Augsburg in Suabia.

DAMASK, a silk-stuff, with a raised pattern, so as that the right side of the damask, is that which has the flowers raised or satined. Damasks should be of dressed silk, both in warp and woof; and in France, half an ell in breadth: they are made at Chalons in Champagne, and in some places in Flanders, as at Tournay, &c. entirely of wool, three-eighths of an ell wide, and 20 ells long.

DAMASK is also applied to a very fine steel, in some parts of the Levant, chiefly at Damascus in Syria; whence its name. It is used for sword and cutlass-blades, and is finely tempered.

DAMASKEENING, or **DAMASKING**, the art or operation of beautifying iron, steel, &c. by making incisions therein, and filling them up with gold and silver wire; chiefly used for adorning sword-blades, guards, and grips, locks of pistols, &c.

DAMBEA, or **DEMBEA**, a province of Abyssinia. It is a flat country, and subject to inundations. It is situated N. of Dambea, an extensive lake of Abyssinia, containing many fertile islands, with plenty of fish and river-horses. It is 100 miles from the source of the Nile.

DAMBEA, the capital of Abyssinia, is seated in the above province, at the head of the lake, 320 miles W. of the Red Sea. Lon. 34. 20. E. Lat. 14. 40. N.

DAMEL, or **KAYO**, a country of Africa, on the coast of the Atlantic, between the rivers Senegal and Gambia.

DAMELEN, a town of Germany, in the circle of Upper Saxony, and Middle Mark of Brandenburg, 6 miles W. of Belitz.

DAMIANISTS, in church history, a branch of the ancient Acephali Severita. They agreed with the Catholics in admitting the sixth council, but disowned any distinction of persons in the Godhead; and professed one single nature, incapable of any difference: yet they called God "the Father, Son, and Holy Ghost."

DAMIANO, Str. a town of Italy in Montserrat, 18 miles W. by N. of Vercelli.

DAMICOTTA, a town of Hindostan, in the Coimbatore

country, 30 miles N. of Coimbatore, and 60 miles S. of Seringapatam.

DAMIETTA, a port town of Egypt, situated on the E. mouth of the Nile, four miles from the sea-coast. The present town stands upon a different site from the ancient Damietta so repeatedly attacked by the European princes. The latter, according to Abulfeda, was a "town surrounded by walls, and situated at the mouth of the eastern branch of the Nile." The present Damietta is rounded in a semicircle on the E. bank of the Nile, 7½ miles from the mouth of it. Lon. 31. 50. E. Lat. 31. 15. N.

DAMM, a town of Germany, in Upper Saxony, and duchy of Pomerania, 5 miles E. of Stettin.

DAMME, a town of Holland, in Groningen, on the river Damster.

DAMNII, an ancient people of Britain, who inhabited the district, situated between the territories of the Selgovæ on the S. and the Caledonii on the N. now called Clydesdale.

DAMOCLES, one of the flatterers of Dionysius the Elder of Sicily. He admired the tyrant's wealth, and pronounced him the happiest man on earth. Dionysius prevailed upon him to undertake for a while the charge of royalty, and be convinced of the happiness which a sovereign enjoyed. Damocles ascended the throne, and while he gazed upon the wealth and splendor that surrounded him, he perceived a sword hanging over his head by a single horse-hair. This so terrified him that all his imaginary felicity vanished at once; and he begged Dionysius to remove him from a situation which exposed his life to such fears and dangers.

DAMON and **PYTHIAS**, two illustrious friends of antiquity, who have immortalized their names, by the strength and sincerity of their friendship. Damon was a Pythagorean philosopher, who, having incurred the displeasure of Dionysius, tyrant of Syracuse, was condemned to death. Whereupon he required a short respite till he should settle some domestic business of the utmost importance to his family, but which required his personal presence at some distance from Syracuse. Dionysius agreed to grant his request, but upon a condition, which he supposed impossible to be complied with; viz. that Damon should find some person who was willing to suffer death in his stead, provided he did not return at the time appointed. Pythias, to the surprise of the tyrant, cheerfully surrendered himself as a pledge for his friend Damon; who, after his settling business, astonished the tyrant still more by returning punctually at the hour fixed for his execution. Dionysius was so struck with the fidelity of those two friends, that he remitted the punishment, and intreated them to permit him to share their friendship, and enjoy their confidence. See an elegant embellishment of this piece of ancient history, in Brookes's "Fool of Quality."

DAMOT, a province of Abyssinia, situated in the S. W. part of that empire, about 40 miles long from N. to S. and 20 broad from E. to W.

DAMPS, in natural history, are certain noxious exhalations issuing from some parts of the earth, and which prove almost instantly fatal to those who breathe them. These damps are chiefly observed in mines and coal-pits, though vapours of the same kind often issue from old lavas of burning mountains; and in those countries where volcanoes are common, will frequently enter houses, and kill people suddenly without the least warning of their approach. See GAS.

DAMPIER, WILLIAM, a famous navigator, descended from a respectable family in Somersetshire, and born in 1652. Losing his father when very young, he was sent to the sea, where he soon distinguished himself, particularly in the South Sea. His voyage round the world is well known, and has gone through many editions. He appears afterward to have engaged in an expedition concerted by the merchants of Bristol to the South Sea, commanded by Captain Woods Rogers; who sailed in August 1768, and returned in Sept. 1711: but no farther particulars of his life or death are recorded.

DAMSON TREE. See PRUNUS.

DAMSONG, a town of Asia, in the country of Bootan, 54 miles S. W. of Tassasudon.

DAMVILLIERS, a town of France, in the department of Meuse, 11 miles N. of Verdun.

DAN, [דן, Heb. i. e. judgement,] one of the twelve patriarchs,

triarchs, the fifth son of Jacob, and the eldest by Bilhah. Of his history nothing is recorded, except that he had but one son named Hushim; though his posterity was afterwards very numerous.

DAN, or, **THE DANITES**, one of the twelve tribes of Israel, descended from the patriarch Dan. Their number, at the emigration from Egypt, amounted to 62,700, and in the wilderness they increased to 64,400. After their settlement in Canaan, a party of them, who went to take Laish, in their way robbed Micah the Ephraimite of his idol, which they continued to worship till they were carried captive by Tiglath-Pileser. Samson, the heroic judge of Israel, was of this tribe; and 28,600 of them attended at David's coronation. The Danites appear to have been early acquainted with commerce, for they had ships in the time of Jabin, king of the Canaanites. See Judges v. 17. The territory of the Danites extended W. of Judah, and was terminated by Azotus and Dora on the Mediterranean.

DAN, in ancient geography, a city of the Danites, situated on the E. side of the springs of Jordan, which was so named from the tribe, and on the S. of Mount Lebanon. It was early built by the Canaanites, and originally named Laish or Lesheim; till 600 of the Danites took it, and named it after their progenitor. This city and Beersheba were the two extremities of the kingdom of Israel; where Jeroboam established idolatry by setting up his golden calves. It was taken and pillaged by Benhadad king of Syria; notwithstanding which it made some figure after the captivity.

DANAE, in antiquity, a coin somewhat more than an obolus, used to be put into the mouths of the dead, to pay their passage over the river Acheron.

DANAE, in fabulous history, the daughter of Acrisius king of Argos, by Eurydice. She was confined in a brazen tower by her father, who had been told by an oracle that his daughter's son would put himself to death. But Jupiter, who was enamoured of Danae, introduced him to her bed by changing himself into a shower of gold. From his embraces Danae had a son, with whom she was exposed to the sea by her father. The wind drove the bark which carried her to the coasts of the island of Seriphus; where she was saved by some fishermen, and carried to Polydectes king of the place, whose brother, Dictys, educated the child, who was named Perseus, and tenderly treated the mother. Polydectes fell in love with her; but being afraid of her son, he sent him to conquer the Gorgons, pretending that he wished Medusa's head to adorn his nuptials with Hippodamia the daughter of Ctenomans. When Perseus had victoriously finished his expedition, he retired to Argos with Danae to the house of Acrisius, whom he inadvertently killed. Virgil says that Danae after this came to Italy, and founded the city of Ardea. See **ARDEA**. Some suppose that it was Proetus, the brother of Acrisius, who introduced himself to Danae in the brazen tower; but whoever was her seducer, the fable of the golden shower plainly implies that the keepers of the tower were bribed. Against such showers, indeed, towers of brass, and bars of iron, are no defence. As to Jupiter, a certain poet justly remarks,

"But what though these things tradition but jests?

"What is fabled of Jove may be true of his priests."

DANEA, in botany, a genus of the cryptogamia filices class and order: fructification oblong, linear, transversely immersed in the front, parallel, many-celled; cells in a double row, opening upwards; seeds numerous, very minute. There are two species, viz. the nodosa and alata.

DANAIDES, in fabulous history, the fifty daughters of Danaus king of Argos. When their uncle Egyptus came from Egypt with his fifty sons, they were promised in marriage to their cousins; but before the celebration of their nuptials, Danaus, who had been informed by an oracle that he was to be killed by the hands of one of his sons-in-law, made his daughters solemnly promise that they would destroy their husbands. They were provided with daggers, and all except Hypermnestra proved but too obedient to their father's bloody injunctions, as a proof of which they presented him with the heads of their murdered husbands, on the morning after their nuptials. Hypermnestra was summoned to appear and answer for her disobedience in suffering her husband Lynceus to escape; but the unanimous voice of the people declared her innocent, and she dedicated a temple to the goddess

of Persuasion. The 49 sisters were condemned to hell, to fill with water a vessel full of holes, so that their labour was infinite, and their punishment eternal.

DANAUS, in fabulous history, a son of Belus and Anchinoe, who after his father's death reigned conjointly with his brother Egyptus on the throne of Egypt. Some time after, a difference arose between the brothers, and Danaus set sail with his 50 daughters in quest of a settlement.

DANCE, or **DANCING**, a movement of the body, performed according to rule, and adjusted to the measures of music, either sung or played. However, dancing in a general sense is applied to certain anomalous motions of the body. Dancing was by the ancients divided into cubistic, spheristic, and orchestric: the cubistic dance was performed with certain wrestlings and contortions of the body; the spheristic with a sort of ball, or bowl play; but the orchestric was most usual, and what indeed was dancing properly so called. Dancing is usually an effect and indication of joy, though Mr. Palleprat assures us, that there are nations in South America, who dance, to shew their sorrow. It has been in use among all nations civilized and barbarous, though held in esteem among some, and in contempt among others. It has often been, and still is, sometimes, made an act of religion. Thus David danced before the ark to honour God, and express his excess of joy for its return into Zion. Among the Pagans it made a part of the worship paid to the gods, it being usual to dance round the altars and statues; and at Rome, the salii, who were priests of Mars, danced through the streets in honour of that god. The poets made the gods themselves dance. The Christians are not free from this superstition, for in popish countries certain festivals, particularly those of the sacrament, and passion of our Lord, are celebrated with dancing. Sudden joy seems to be the general, and almost the only natural, stimulus to dancing, according to the general sense of the term; but that it should naturally incite the mind, to direct the motions of the body according to the measures of music, we can by no means conceive. This seems to be a refinement which puts a restraint upon nature, and in some cases is carried to such excess as to be truly scandalous. Violent dancing, especially in the heated atmosphere of a crowded assembly, produces a temporary fever, even in the bye-standers, who inspire an air exceedingly vitiated by the breath of persons apparently in a semi-delirious trance, and by the suffocating vapour of candles. The blood is unnaturally propelled to the breast and head—hence arise frequent colds, coughs, and periodical head-achs; perspiration is wantonly checked; the lungs are forcibly expanded, and the foundation is laid for that avenging disease, consumption, which spares neither rank, age, nor sex, and often exterminates whole families.

DANCETTE, in heraldry, is when the outline of any bordure, or ordinary, is indented very largely, the largeness of the indentures being the only thing that distinguishes it from indented.

DANDA, a province and river of Angola.

DANDAR, a circar of Hindostan, in the country of Guzerat.

DANDELION, in botany. See **LEONTODON**.

DANEGLT, a tax, or tribute on every hide of land, imposed on our ancestors the Saxons, by the Danes, on their frequent invasions, as the arbitrary terms of peace and departure. It was first imposed as a continual yearly tax upon the whole nation, under King Ethelred. It was levied by William I. and II. but was released by Henry I. and finally abolished by King Stephen. No church, or church-land paid the danegelt, because, as is set forth in the ancient Saxon law, the people of England placed more confidence in the prayers of the church, than in any military defence they could make.

DANICHA, a town of Russia, in the government of Tobolsk, on the Chatanga.

DANIEL, [דניאל, Heb. i. e. my judge is God,] the fourth of the greater prophets, was born in Judea of the tribe of Judah, about the 25th year of the reign of Josiah; A. M. 3398. He was led captive to Babylon, with other young Hebrew lords, after the taking of Jerusalem by Nebuchadnezzar, who took them into his service. That prince gave them masters to instruct them in the language and sciences of the Chaldeans, and ordered them to be fed with the most delicate viands; but they, fearing that they should eat meat forbidden by the law of Moses, desired the king's officers

officers to allow them only pulse. The wisdom and conduct of Daniel pleasing Nebuchadnezzar, that monarch gave him several posts of honour. He explained Nebuchadnezzar's dream of the mysterious statue, which foretold the four great monarchies on which account he was made prefect of the province of Babylon. He afterwards explained that monarch's other dream, which foretold his lunacy. In the reign of Darius the Mede, he refused to obey the wicked decree of the king, and was cast into the lion's den, when those beasts, though pinched with hunger, did him no hurt. And he explained the characters written on the wall of the room where Belshazzar was feasting. It is believed that Daniel died in Chaldea, and that he did not take advantage of the permission granted by Cyrus to the Jews of returning to their own country. St. Epiphanius says he died at Babylon; and herein he is followed by the generality of historians. The prophecies of Daniel concerning the coming of the Messiah, and the other great events of after-times, are so clear and explicit, that, as St. Jerom tells us, Porphyry objected to them, that those which related to the kings of Syria and Egypt, chap. xi. must have been written after the times of Antiochus Epiphanes; whereas this prophecy was translated into Greek 100 years before his time, and the translation was in the hands of the Egyptians, who had no great kindness for the Jews and their religion. Josephus says, the prophecies foretelling the successes of Alexander, chaps. viii. 5. xi. 3. were shewn to him by the Jews, in consequence of which they obtained several privileges from him; (Antiq. lib. xi. c. 8.) The style of Daniel is not so lofty and figurative as that of the other prophets; but it is more clear and concise, and his narrations and descriptions are simple and natural: in short, he writes more like a historian than a prophet. The first six chapters of the book of Daniel are a history of the kings of Babylon, and what befel the Jews under their government. In the last six he is altogether prophetic, foretelling not only what should happen to his own church and nation, but events in which foreign princes and kingdoms were concerned; some of which now are evidently fulfilling; See Dan. vii. 11; 26.

DANIEL, GABRIEL, a celebrated Jesuit, and one of the best French historians, was born at Rouen in 1649. He taught polite literature, philosophy, and divinity, among the Jesuits; and was superior of their house at Paris, where he died in 1728. There are a great number of his works published in French, of which the principal are, 1. An History of France, of which he also wrote an abridgment, in 9 vols. 12mo. 2. An History of the French Militia, in 2 vols. 4to. 3. An Answer to the Provincial Letters. 4. A Voyage to the World of Descartes. 5. Letters on the Doctrines of the Theorists, and on Probability. 6. New Difficulties relating to the Knowledge of Brutes; And, 7. A theological Treatise on the Efficacy of Grace.

DANKALI, or DANCALI, a kingdom of Abyssinia, lying along the coast of the Red Sea.

DANMONII, an ancient British nation, supposed to have inhabited the tract of country, now called Cornwall and Devonshire, bounded on the S. by the British Ocean, on the W. by St. George's Channel, on the N. by the Severn Sea, and on the E. by the country of the Durotriges.

DANNENBERG, DANNEBERG, or DANEBURG, a county of Germany, in the late circle of Lower Saxony, and Lunenburg.

DANNENBERG, a town in the above county, seated on the Jetze; near the Elbe.

DANTE, JOHN BAPTIST, a native of Perugia, and an excellent mathematician, called the new Dædalus, for the wings he made himself, and with which he flew several times over the lake Thrasy-menus. He fell in one of his enterprises; the iron work with which he managed one of his wings having failed; by which accident he broke his thigh: but it was set by the surgeons, and he was afterwards called to Venice to profess mathematics.

DANTZICK, or DANTZIG, the capital of the late Polish Prussia, is seated on a branch of the Vistula, about four miles above where it falls into the Baltic. It is 68 miles W.S.W. of Königsberg. Lon. 18. 40. E. Lat. 54. 22. N.

DANUBE, the largest and most considerable river in Europe, rising in the Black Forest, near Zunberg; and running N.E. through Swabia by Ulm, the capital of that country; then running E. through Bassaria and Austria, passes by Ratisbon, Passau,

Ens, and Vienna. It then enters Hungary, and runs S.E. from Presburg to Buda, and so on to Belgrade; after which it divides Bulgaria from Morlachia and Moldavia, discharging itself by several channels into the Black Sea, in the province of Bessarabia. Towards the mouth, it was called the Ister by the ancients; and it is now said, that four of the mouths are choked up with sand, and that there are only two remaining. It begins to be navigable for boats at Ulm, and receives several large rivers as it passes along. It is so deep between Buda and Belgrade, that the Turks and Christians have had men of war upon it; and yet it is not navigable to the Black Sea, on account of the cataracts. The Danube was generally supposed to be the northern boundary of the Roman empire in Europe. It was worshipped as a deity by the Scythians.

DANVILLE, a town of Kentucky, in Mercer county, pleasantly situated in a large, fertile plain, on the SW. side of Dick's river, 35 miles S.S.W. of Lexington.

DAPHNE, in ancient geography, a small district on the lake Samachonitis, in the Higher Galilee, very pleasant and plentifully watered with springs, which feed the Lesser Jordan.

DAPHNE, SPURGE LAUREL, a genus of the monogynia order, and octandria class of plants; natural order, Vepreculæ. No calyx; corolla quadrifid, marcescent, inclosing the stamina; berry one-seeded. There are 28 species, shrubs about five feet high.

D. MEZEREUM, the **MEZEREON**, or **SPURGE OLIVE**, is a low deciduous shrub. It is a native of Germany, and has also been discovered in some woods near Andover in Hampshire. Of this elegant plant there are four varieties: 1. The white: 2. The pale red: 3. The crimson: and 4. The purple flowering.—Hanbury says, "these shrubs have every perfection to recommend them as flowering shrubs. 1. They are of low growth, seldom arising to more than three or four feet in height, and therefore are proper even for the smallest gardens. 2. They will be in bloom when few trees, especially of the shrubby tribe, present their honours. It will be in February, nay, sometimes in January; then will the twigs be garnished with flowers all around from one end to the other. Each twig has the appearance of a spike of flowers of the most consummate lustre; and whether beheld near or at a distance, it has a most enchanting appearance. The sense of smelling is peculiarly regaled by the flowers; their spicy sweetness is diffused around, and the air is perfumed with their odours to a considerable distance. Besides the beauty of the leaves, which come out after the flowers are fallen, and which are of a pleasant green colour and an oblong figure, it will be full of red berries in June, which will continue growing till the autumn. Of these berries the birds are very fond; so that whoever is delighted with those songsters, should have a quantity of them planted all over the outskirt of his wilderness quarters." The root of the mezereon was long used in the Lisbon diet-drink, a remedy said to be good for several complaints, particularly nodes and other symptoms resisting the use of mercury. The composition of this diet-drink is described in the Edinburgh Physical Essays, by Dr. Donald Monro of London. On chewing the root it proves very pungent, and its acrimony is accumulated about the fauces, and is very durable. It is employed chiefly under the form of decoction; and it enters the decoctum sarsaparillæ compositum of the London college; but it has also been used in powder combined with some inactive one, as that of liquorice root. It is apt to occasion vomiting and purging; so must be begun in grain doses, and gradually increased. It is often usefully combined with mercury. The bark of the root, which is the most acrimonious part, is recommended in the pharmacopœia chirurgica, to be steeped in vinegar, and applied to promote the discharge of issues. Mezereon has also been of use in tumours and cutaneous eruptions not venereal. The whole plant is very corrosive; and six of the berries, it is said, will kill a wolf. A woman gave 12 grains of the berries to her daughter who had a quartan ague; she vomited blood, and died immediately.

DAPHNE, in the Pagan mythology, a daughter of the river Peneus by the goddess Terra, of whom Apollo became enamoured. This passion had been raised by Cupid; with whom Apollo, proud of his late conquest of the serpent Python, had disputed the power of his darts. Daphne heard with horror his addresses, and endeavoured to avoid his importunities by flight. Apollo pursued her, and Daphne intreated the assistance of the gods, who changed,

changed her into a laurel. Apollo crowned his head with the leaves of the laurel, and for ever ordered that that tree should be sacred to his divinity.

DAPHNE, a daughter of Tiresias, priestess in the temple of Delphi. She was consecrated to the service of Apollo by the Epigoni, or according to others by the goddess Tellus. She was called Sibyl on account of the wildness of her looks and expressions when she delivered oracles.

DAPHNEPHAGI, [*οἱ καὶ αἱ δαφνιφάγοι*, from *δάφνη*, laurel, and *φάγω*, to eat,] in antiquity, enthusiasts, who pretended to be inspired, after eating leaves of laurel.

DAPHNEPHORIA, a festival in honour of Apollo, celebrated every ninth year by the Bœotians. It was then usual to adorn an olive-bough with garlands of laurel and other flowers, and place on the top a brazen globe, on which were suspended smaller ones. In the middle were placed a number of crowns and a globe of inferior size, and the bottom was adorned with a saffron-coloured garment. The globe on the top represented the sun or Apollo. That in the middle was an emblem of the moon, and the other of the stars. The crowns, which were 365 in number, represented the sun's annual revolution. This bough was carried in solemn procession by a beautiful youth of an illustrious family, and whose parents were both living. The youth was dressed in rich garments which reached to the ground, his hair hung loose and dishevelled, his head was covered with a golden crown, and he wore on his feet shoes called Iphicratide, from Iphicrates an Athenian, who first invented them. He was called *Δαφνιφόρος*, Daphnephorus, laurel-bearer; and at the time executed the office of priest of Apollo.

DAPPLE-BAY, in the manege, an epithet applied to bay horses that have marks of a dark bay.

DAPPLE-BLACK is applied to a black horse, that has got spots or marks more black or shining than the rest of his skin.

DAPS, a river of Denmark, which runs into the Little Belt, 14 miles N. E. of Hadersleben.

DARAH, or **DRAS**, a country of Africa, bounded on the N. by Morocco, Gezula, and Tafilet, on the E. and the S. by Zahara, and on the W. by Sus. It takes its name from the river Darah, or Dras, which passes through it. The principal produce is indigo and dates.

DARAMPOORY, a town of Hindostan, in the Mysore country, 88 miles E. of Seringapatam.

DARANTASIA, now **MOUSTEERS**, in ancient geography, a town of the Centrones, in Gallia Narbonensis, between Lemincum and Augusta Prætoria, called Forum Claudii by the Romans. Moustiers.

DARAPORUM, a town of Hindostan, 36 miles E. S. E. of Coimbatore.

DARAPTI, among logicians, one of the modes of syllogisms of the third figure, whose premises are universal affirmatives, and the conclusion is a particular affirmative: thus,

DAR- Every body is divisible;

AP- Every body is a substance;

TI- Therefore, some substance is divisible.

DARDA, a town and fort of Lower Hungary, 30 miles S. of Baes.

DARDANELLES, two ancient and strong castles of Turkey, one of which is in Romania, and the other in Natolia, on each side of the canal, formerly called the Hellespont.

DARDANI, 1. the ancient inhabitants of Troas: 2. the people of Dardania, who are supposed to have been descended from the former.

DARDANIA, in ancient geography, 1. a district of Moesia Superior on the S. now the S. part of Servia, towards the confines of Macedonia and Illyricum: 2. a small district of Troas, along the Hellespont: 3. the ancient name of Samothracia; from Dardanus, who removed thither.

DARDANIS, **DARDANIUM**, or **DARDANIUM PROMONTORIUM**, a promontory of Troas, near Abydos, running out into the Hellespont.

DARDANUS, a son of Jupiter and Electra, who after the death of his brother Jason, left Samothrace his country, and passed into Asia Minor, where he married Batia, the daughter of Teucer, king of Teucra. After the death of his father-in-law, he reigned sixty-two years.

DAREA, in botany, a genus of the cryptogamia filices class and order. Fructification in scattered nearly marginal lines: involucre originating laterally from a vein, opening towards the margin. There are nine species.

DAREL HAMARA, a town of Africa, in the kingdom of Fez. Lon. 6. 35. W. Lat. 34. 20. N.

DARIC, in antiquity, a famous piece of gold, first coined by Darius the Mede, about B. C. 538; probably during his stay at Babylon, out of the vast quantity of gold which had been accumulated in the treasury. From thence the darics were dispersed over the east, and into Greece; where they were also called stateres, and were the gold coins best known in Athens in ancient times. According to Dr. Bernard, the daric weighed two grains more than our guinea; but as it was very fine, and contained little alloy it may be reckoned worth about 25s. sterling.

DARIEN, or **TERRA FIRMA PROPER**, is the northern division of Terra Firma, or Castile del Oro. It is a narrow isthmus, that, properly speaking, joins North and South America together; but is generally reckoned as part of the latter. It is bounded on the N. by the gulf of Mexico; on the S. by the South Sea; on the E. by the river or gulph of Darien; and on the W. by another part of the South Sea, and the province of Veragua. It lies in the form of a bow or crescent, about the great bay of Panama, in the South Sea, and is 300 miles in length. Its breadth has generally been reckoned 60 miles from N. to S. but it is only 37 miles broad from Porto Bello to Panama, the two chief towns of the province.

DARIEN, GULF OF, an arm of the sea running eastward into the Isthmus, on the W. side of St. Sebastian.

DARIEN, a town of the United States, in Liberty county, Georgia, 47 miles S.S.W. of Savannah.

DARIL, in logic, one of the modes of syllogism of the first figure, wherein the major proposition is an universal affirmative, and the minor and conclusion particular affirmatives: thus,

DA- Every thing that is moved, is moved by another;

RI- Some body is moved;

I- Therefore, somebody is moved by another.

DARKENED ROOM, the same as camera obscura; being a room darkened all but in one little hole, having a convex glass in it to transmit the rays of outward objects to a piece of paper, or white cloth in the room.

DARK TENT, a portable camera obscura, resembling a desk, and fitted with optic glasses, to take prospects of landscapes, &c.

DARKING, a town of Surrey, 10 miles E. of Guilford, and 24 S.S.W. of London.

DARKNESS, EGYPTIAN. One of the most terrible sorts of darkness was that which God by Moses brought upon Egypt, as a plague to the inhabitants of it. The Septuagint, our translation of the Bible, and indeed most others, in explaining Moses's account of this darkness, render it "a darkness which may be felt:" and the Vulgate has it, "a palpable darkness;" that is, a darkness consisting of black vapours and exhalations, so condensed that they might be perceived by the organs of seeing or feeling; but some commentators think that this is carrying the sense too far, since in such a medium as this mankind could not live an hour, much less for the space of three days, as the Egyptians are said to have done, during the time this darkness lasted; and therefore they imagine, that instead of a darkness that may be felt, the Hebrew phrase may signify a darkness wherein men went groping and feeling about for every thing they wanted. Le Clerc is of this opinion, and thinks that Philo, in his life of Moses, understood the passage in its right sense. "For in this darkness (says he), whoever were in bed, durst not get up; and such as their natural occasions compelled to get up, went feeling about by the walls, or any thing they could lay hold on, as if they had been blind." What it was that occasioned this darkness, whether it was in the air or in the eyes; whether it was a suspension of light from the sun in that country, or a black thick vapour which totally intercepted it, it would be in vain to conjecture.

DARKNESS, EXTRAORDINARY, AT OUR SAVIOUR'S CRUCIFIXION. During the last three hours that our Saviour hung upon the cross, a darkness covered the face of the earth, to the great terror and amazement of the people present at his execution. This extraordinary alteration in the face of nature (says Dr. Macknight, in his Harmony of the Gospels), was peculiarly proper, whilst the Sun of righteousness was withdrawing his beams from the land of Israel and from the world; not only because it was a miraculous testimony born by God himself to his innocence; but also because it was a fit emblem of his departure and its effects, at least till his light

light shone out anew with additional splendour in the ministry of his apostles. The darkness which now covered Judea and the neighbouring countries, beginning at noon and continuing till Jesus expired, was not the effect of an ordinary eclipse of the sun; for that can never happen but at the new moon, whereas now it was full moon; not to mention, that the total darkness occasioned by eclipses of the sun never continues above four minutes; wherefore it must have been produced by the divine power, in a manner we cannot explain. Accordingly, Luke (Luke xxiii. 44, 45), after relating that there was darkness over all the earth, adds, "and the sun was darkened;" which perhaps may imply, that the darkness of the sun did not occasion, but proceeded from, the darkness that was over all the land. Further, the Christian writers, in their most ancient apologies to the heathens, affirm, that as it was full moon at the passover when Christ was crucified, no such eclipse could happen by the course of nature. They observed also, that it was taken notice of as a prodigy by the heathens themselves.

DARLINGTON, a county of the United States, in Cheraws district, South Carolina, bounded on the S. and S.W. by Lynch's Creek. It is 35 miles long and 21 broad.

DARLINGTON, a town of Durham, situated on a flat on the river Skerne, 19 miles S. of Durham.

DARNEL, in botany. See **LOLIUM**.

DAROCA, a town of Spain, in the province of Arragon, 38 miles S.S.W. of Saragossa.

DARTFORD, a town of Kent, seated on the Darent, 16 miles E. by S. of London.

DARTMOUTH, a sea-port town in Devonshire, 30 miles S.S.W. of Exeter, and 204 W. by S. of London. Lon. 3. 45. W. Lat. 50. 22. N.

DARTMOUTH, a sea-port of the United States, in Bristol county, Massachusetts, 70 miles S. of Boston.

DARTOS, in anatomy, one of the coats which form the scrotum.

DARWAR, a considerable fortress of Hindostan, in the country of Sanore, 90 miles E. N. E. of Goa.

DASSEN, an island in the Atlantic, near the coast of Africa, between the Cape of Good Hope, and the Saldanha bay. Lon. 18° 1' 52" E. from Greenwich. Lat. 34° 25' N.

DASYPUS, the **ARMADILLO**, or **TATOU**, in zoology; a genus of the class mammalia, and order bruta. No tusks; grinders short and cylindrical, and seven or eight in each jaw; body covered with a shelly armour, intersected by circles. All the species of this animal were originally natives of America: they were entirely unknown to the ancients; and modern travellers mention them as peculiar to Mexico, Brazil, and the southern parts of America; though some indeed have confounded them with two species of manis, or shell-lizard, which are found in the East Indies: others report that they are natives of Africa, because some of them have been transported from Brazil to the coast of Guinea, where a few have since been propagated: but they were never heard of in Europe, Asia, or Africa, till after the discovery of America. They are all endowed with the faculty of extending and contracting their bodies, and of rolling themselves up like a ball, but not into so complete a sphere as the hedge-hog. They are very inoffensive animals, excepting when they get into gardens, where they devour the melons, potatoes, and other roots. They walk quickly; but can hardly be said to run or leap, so that they seldom escape the pursuit either of men or dogs. But nature has not left them altogether defenceless. They dig deep holes in the earth; and seldom go very far from their subterraneous habitations: upon any alarm they immediately go into their holes; but, when at too great a distance, they require but a few moments to make one. The hunters can hardly catch them by the tail before they sink their body in the ground; where they stick so close, that the tail frequently comes away and leaves the body in the earth; which obliges the hunters, when they want to take them alive and unimpaired, to dilate the sides of the hole. When they are taken, and find that there is no resource, they instantly roll themselves up, and will not extend their bodies, unless they are held near a fire. When in deep holes, there is no other method of making them come out, but by forcing in smoke or water. They keep in their holes through the day, and seldom go abroad in quest of subsistence, but in the night. The hunters usually chase them with small

dogs, which easily come up with them. When the dogs are near, the creatures instantly roll themselves up, and in this condition the hunters carry them off. However, if they be near a precipice, they often escape both the dogs and hunters: they roll themselves up, and tumble down like a ball, without breaking their shell, or receiving any injury. The dasypus is a very fruitful animal: the female generally brings forth four young ones every month; which is the reason why the species are so numerous, notwithstanding they are so much sought after, on account of the sweetness of their flesh. The Indians likewise make baskets, boxes, &c. of the shells which cover their heads. Linnaeus enumerates six species of dasypus, principally distinguished by the number of their moveable belts. Mr. Kerr, who prefers the arrangement of the Count de Buffon, to that of Linnaeus, enumerates ten species of this genus.

D. NOVEMCINCTUS, the **NINE-BANDED ARMADILLO**, has nine belts, four claws on each fore-foot, and five on the hind feet. The head is five inches long, the body 18, and the tail 12; but some are smaller. Plate XLII.

D. NOVEMDECIMCINCTUS, the **CIRQUINCON**, has no shield on the rump, and has only 18 bands, though from the name we should suppose it to have 19. The body is 10 inches long, the head three, and the tail five. The head resembles that of a weazel, having a large flat forehead, small eyes, and ears about an inch long. The breast, belly, and ears, are naked.

D. SEPTEMCINCTUS, the **SEVEN-BANDED ARMADILLO**, with seven belts; four toes on each of the fore-feet, and five on the hind. Gmelin says it has only six belts, but Mr. Kerr vindicates Linnaeus, who says it has seven.

D. SEXCINCTUS, the **ENCOURBERTO**, or **SIX-BANDED ARMADILLO**, has six moveable girdles, two shields, and five toes on each foot. It lives on roots and fruits; and the flesh is good. The head resembles a pig; there are 18 teeth in each jaw: the tail is thick at the rump; the body is of a reddish yellow colour, and is commonly plump. Plate XLII.

DATA, among mathematicians, a term for such things or quantities, as are given, or known, in order to find other things thereby that are unknown. Euclid uses the word data (of which he has a particular tract) for such spaces, lines, and angles, as are given in magnitude, or to which we can assign others equal. From the use of this word in mathematics, it has been transplanted into other arts; as philosophy, medicine, &c. where it expresses any quantity, which, for the sake of a present calculation, is taken for granted to be such, without requiring an immediate proof for its certainty; called also the given quantity, number, or power. And hence also such things as are known, from whence either in natural philosophy, the animal mechanism, or the operation of medicines, we come to the knowledge of others unknown, are now frequently in physical writers called data.

DATE, in law, is the description of the day, month, year of our Lord, and year of the reign of the king, in which a deed or other writing was made. Anciently deeds had no dates but only of the month and year, and now, if in the date of any deed, the year of our Lord is right, though the year of the king's reign be wrong, it shall not hurt the same. A deed is good, though it has no date of the day, or if that be mistaken, or though it contains an impossible date; but then he that pleads such a deed, must set forth the time when it was delivered: for every deed or writing has a date in law, and that is the day of the delivery; and where there is none, a plaintiff, it is said, may count it of any date. In writings of importance, the date should be written in words at length. In letters, it is usually written in figures. An autodate is a date prior to the real time when the instrument was signed. A post-date is that posterior to the real time when the instrument was passed.

DATISCA, **BASTARD-HEMP**, in botany, a genus of the dodecandria order, and diœcia class of plants; natural order, Miscellanea. Male calyx pentaphyllous; no corolla; anthera sessile, long, and 15 in number; female calyx bidented; no corolla, styles three; capsule triangular, three-horned, unilocular, perivious, polyspermous, inferior. It has two species, natives of North America.

DATISI, in logic, a mode of syllogisms in the third figure, wherein the major is an universal affirmative, and the minor and conclusion particular affirmative propositions. Thus,

DA- All who serve God are kings;

TI- Some who serve God are poor;

SI- Therefore, some who are poor are kings.

DATIVE, [*dativus*, Lat.] 1. [In grammar.] The epithet of the case that signifies the person to whom any thing is given. 2. [In law.] Those are termed dative executors who are appointed such by the judge's decree; as administrators with us here in England.

DATOLA, one of the Lipari islands, in the Mediterranean. It is 10 miles N. E. of Lipari.

DATUM, or **DATUS**, in ancient geography, a town of Thrace, situated between Neapolis, and the river Nessus. It was taken by Philip of Macedon, who changed its name to Philippi, being originally called Cronides on account of its springs.

DATURA, the **THORN-APPLE**, in botany, a genus of the monogynia order, and pentandria class of plants; natural order, Lurida. Corolla funnel-shaped, plaited; calyx tubular, angulated, deciduous; capsule quadrivalved. There are eight species; all, except one, annual herbs.

DATUS. See **DATUM**.

DAVA, or **USPO**, a province of Japan.

DAVAL, **PETER**, Esq. F. R. S. an eminent English mathematician. He was bred a barrister at law; was afterwards master in chancery; and at last accountant-general of that court. He translated the memoirs of Card. de Retz, printed in 12mo. 1723. In the dispute concerning elliptical arches, when Black-friars bridge was built, his opinion was applied for by the committee. His answer may be seen in the London Magazine for March 1760. He died January 8, 1763.

DAVALLIA, in botany, a genus of the cryptogamia, filices. Fructification in roundish distinct dots near the margin; involucre membranous from the surface, half-hooded, distinct, somewhat truncate, opening toward the margin. There are eighteen species.

DAUCUS, the **CARROT**, a genus of the digynia order, and pentandria class of plants; natural order, Umbellata. Corolla a little radiated, all hermaphrodite; fruit bristly, with short hairs. There are eight species; but the one which chiefly merits attention is the

D. CAROTA, or **COMMON CARROT**. There are several varieties, as the white, the orange, and the purple carrot; but of these the orange carrot is the most esteemed. It grows longer, larger, and is generally handsomer than the others, being often 15 or 18 inches long in the eatable part, and from two to four in diameter at top. Carrots are propagated by seeds, sown at different seasons of the year, to afford a supply for the table at all times. The season for sowing for the earliest crop is soon after Christmas. The situation should be open, but near a wall; though if they are sown close under it they will be apt to run up to seed too fast, and give no good roots: the most proper distance is eight inches. They delight in a warm sandy soil, which should be light, and well dug to a good depth, that the roots may meet with no obstruction in running down, so as to make them forked, and shoot out lateral branches. This will happen, especially when the ground has been too much dunged, the same year that the seeds were sown, which will also occasion them to be worm-eaten. The hairiness of these seeds makes the sowing of them difficult, on account of their being apt to stick together. They should, therefore, be put through a fine chaff sieve; and a calm day should be chosen for sowing them. When sown, they should be trod in with the feet, and the ground raked level over them. When they first come up, they should be cut up to four inches distance, and a month after this they are to be cleared again; and if drawn while young, they are now to be left at six inches distance every way; if they are to stand to grow large, they must be separated to 10 inches distance. The second season for sowing carrots is in February. This must be done under a wall or hedge, on warm banks; but those which are to be on open large quarters should not be sown till the beginning of March. In July, carrots may be sown for an autumnal crop; and lastly, in the end of August, for those which are to stand the winter. These last will be fit for use in March, before any of the spring ones; but they are seldom so tender or well tasted. In order to preserve carrots for use all winter, they are to be dug up in the beginning of November, and laid in a dry place in sand; and these roots being again planted in February, will ripen seeds in August for succeeding crops: the longest and straightest roots are to be chosen for this purpose. Carrots have been re-

commended as food for cattle. Dr. Hunter attempted to make ale from carrots; but though it worked kindly, and was in all respects treated as ale, yet, after keeping it four months, it proved of a thick muddy appearance. He attempted to fine it, but in vain. See *Georgical Essays*, 1773. "The taste (he adds) was by no means displeasing, as it much resembled malt liquor. My first intention being frustrated, I threw it into the still, being about 40 gallons in measure, and by two distillations obtained four gallons of a clean proof spirit. It had, however, contracted a flavour from the hop, which should be left out when the intention is to reduce the liquor into spirit. From a gross calculation, I am induced to think that a good acre of carrots manufactured in this manner, will leave a profit of 40l. after deducting the landlord's rent, cultivation, distillation, and other incidental expences. In this calculation, I presume that the spirit is worth 6s. per gallon, and not excised. An acre of barley will by no means produce so much spirit. A rich sandy loam is the best land for carrots; which after the crop is removed, will be in high cultivation for corn." Attempts have also been made to prepare sugar from carrots, but without success; a thick syrupy matter like treacle being the only product. A poultice made of carrots has been found to mitigate the pain, and abate the stench of foul and cancerous ulcers. Crickets are very fond of carrots; and are easily destroyed by making a paste of powdered arsenic, flour, and scraped carrots, which must be placed near their habitations. A marmalade made from carrots, by their strong antiseptic qualities, has also been found useful in preventing and curing the sea-scurvy. The seeds have been reckoned carminative and diuretic; and were formerly much used as a remedy for the stone. Carrots were first introduced into England by the Flemings, in the reign of queen Elizabeth.

DAVENTRY, or **DAINTRY**, a handsome town of Northamptonshire, 10 miles W. of Northampton.

DAUGHTER. See **CHILDREN**. Daughters, among the ancients, were more frequently exposed than sons, as requiring greater charge to educate and settle them in the world. See **EXPOSING OF CHILDREN**. Those who had no legitimate sons were obliged, by the Athenian laws, to leave their estates to their daughters, who were confined to marry their nearest relations, otherwise to forfeit their inheritance; as we find to have been practised likewise among the Jews, many of whose laws seem to have been transcribed by Solon. If an heiress happened to be married before her father's death, this did not hinder the nearest relation to claim the inheritance, and even to take the woman from her husband; which is said to have been a common case.

DAVID, [דָּוִד, Heb. *i. e.* beloved,] king of Israel, and Hebrew poet, was born at Bethlehem in B.C. 1085, and died B.C. 1014; after having reigned seven years and a half in Hebron, and thirty-three in Jerusalem. No hero, whose actions are recorded in sacred or profane history, exhibits a more striking contrast of character than David, or a more surprising mixture of the most eminent virtues and the most fervent piety, with the greatest crimes and vices. It would be foreign from the nature of this work, to expatiate upon either of these. Both are fully and impartially related in the Scriptures. But we cannot help observing, that while the former have led many well-meaning Christian authors almost to idolize the royal psalmist as a saint, the latter have given occasion to infidel writers to degrade him to a level with Nero and the worst of tyrants; and to ridicule revealed religion for stiling such a character "the man after God's own heart." Neither the one party nor the other seem to have adverted, that this expression relates only to David's government of the kingdom, in establishing purity of worship, and preserving the Israelites from those idolatries to which they were so prone. In this sense, and this alone, David was never equalled by any of his successors either in Israel or Judah. The context (Acts xiii. 21, 22), shews plainly, that it was in this sense only that David "fulfilled all his will." We find an expression nearly similar, used by the Almighty, upon a similar occasion, to a monarch much less eminent for piety, and whom nobody ever supposed to deserve the character of a man according to God's own heart, though in this instance he acted properly. "Thou hast done well," said the Lord to Jehu, (2 Kings x. 30,) upon his extirpating the idolatrous worship of Baal, "in executing that which is right in mine eyes, and hast done according to all that was in mine heart," &c. One of the most unjustifiable actions of David's life appears to have been his torturing of the Ammonites, with saws, harrows, and axes, and in brick

brick kilns. (2 Sam. xii. 31.) Even the *jus talionis* could hardly vindicate such wanton barbarity, had the Ammonites treated the Israelites in the same manner, which is no-where recorded. Some commentators, however, vindicate David from this charge of cruelty by saying, that the words he "put them under saws," &c. only mean that he subjected them to hard labour with these instruments; but though the passage in 2 Sam. might perhaps bear such a construction, we doubt the parallel passage in 1 Chron. xx. 3. will not admit of it, for it is expressly said that he "cut them with saws," &c. As an author and poet the merits of David have long been universally acknowledged, both by Jews and Christians. Those who deny, that there has ever been such a thing as any inspiration, or divine revelation, given by the Almighty to his creatures, in any age or country, would do well to study the Psalms of David, and compare them with the writings of the most celebrated authors in the Pagan world, and see if there is any thing equal to them in point of grand and sublime conceptions of the Deity, to be found in the best of the heathen authors. Upon such a comparison, the ideas given by Homer himself, of his deities, will be found quite puerile and contemptible. Let those, then, who deny revelation, account for this phenomenon, how a man born in an early age and a barbarous country, where the arts had made little progress, and the sciences much less, and bred up in one of the lowest stations of life, though afterwards raised to the highest, should have been capable, in the midst of much persecution, vicissitude of fortune, and cares of government, if not inspired, of composing a set of poems, which, in sublimity of sentiment, and just conceptions of the Deity, far excel the most admired productions of Greece and Rome, in their highest periods of refinement?

DAVIDICI, DAVIDISTS, or DAVID GEORGIANS, a sect of heretics, the adherents of David George, a native of Delft, who, in 1525, began to preach a new doctrine; publishing himself to be the true Messiah; and that he was sent thither to fill heaven, which was quite empty for want of people to deserve it. He is likewise said to have denied the existence of angels, good and evil, of heaven and hell, and to have rejected the doctrine of a future judgement. He rejected marriage with the Adamites; held, with Manes, that the soul was not defiled by sin; and laughed at the self-denial so much recommended by Jesus Christ. Such were his principal errors. He made his escape from Delft, and retired first into Friesland, and then to Basil, where he changed his name, assuming the name of John Bruck, and died in 1556. He left some disciples behind him, to whom he promised that he would rise again at the end of three years. Nor was he altogether a false prophet: for the magistrates of that city being informed, at three years end, of what he had taught, ordered him to be dug up and burnt, together with his writings, by the common hangman.

DAVID'S, Str., a town of Asia, in the peninsula on this side the Ganges, and on the coast of Coromandel, which had formerly a fort. The town lies 80 miles S. of Fort St. George. Lon. 79. 45. E. Lat. 11. 30. N.

DAVID'S, Str., an episcopal town of South Wales, in Pembroke-shire, 24 miles N. W. of Pembroke.

DAVID'S TOWN, a town of New Jersey.

DAVIESIA, in botany, a genus of the class and order decandria monogynia. Calyx angular, simple, five-cleft; corolla papilionaceous; stigma simple, acute; legume compressed, one-seeded. One species, *D. australasia*, described by Dr. Smith in the fourth volume of the Linnæan Transactions.

DAVIS, JOHN, a famous navigator in the 16th century, was born at Sandridge, near Dartmouth in Devonshire; and distinguished himself by making three voyages to the most northern parts of America, in order to find out a N. W. passage to the East Indies; in which he discovered the Straits which bear his name. He afterwards performed five voyages to the East Indies; in the last of which he was slain in a desperate fight with some Japanese, near the coast of Malacca, on the 27th of December, 1605. He wrote an account of his second voyage for the discovery of the N. W. passage; a voyage to the East Indies; and other tracts.

DAVIS, Sir JOHN, an eminent lawyer and poet, born about 1570. He first distinguished himself by his poem "Nosce Teipsum" on the Immortality of the Soul. He became attorney-general, and speaker of the house of commons in Ireland; and afterwards was appointed lord chief justice of the court of King's

Bench in England, but died before his installation, in 1626. He published many law tracts; but was esteemed more as a scholar and a wit, than as a lawyer.

DAVIS'S QUADRANT, the common sea quadrant or backstaff. See **QUADRANT**.

DAVIS'S STRAIT, a narrow sea, lying between the N. main of America, and the western coast of Greenland; running N. W. from Cape Farewell.

DAVIT, in a ship, a long beam of timber, represented by *a, a*, (Plate LIV. fig. 2.) It is used as a crane whereby to hoist the flukes of the anchor to the top of the bow, without injuring the sides of the ship as it ascends; an operation which, by mariners, is called fishing the anchor. The anchors being situated on both the bows, the davit may be occasionally shifted, so as to project over either side of the ship, according to the position of that anchor on which it is employed. The inner end of the davit is secured by being thrust into a square ring of iron *b*, which is bolted to the deck, and forelocked under the beams. This ring, which is called the span-shackle, exhibited at large in fig. 3, is fixed exactly in the middle of the deck, and close behind the foremast. Upon the outer end of the davit is hung a large block *c*, through which a strong rope traverses, called the fish-pendent *d*; to the foremost end of which is fitted a large iron hook *e*, and to the after end a tackle or complication of pulleys *f*; the former of which is called the fish-hook and the latter the fish-tackle. The davit, therefore, according to the sea-phrases, is employed to fish the anchor; which being previously catted, the fish-hook is fastened upon its flukes; and the effort of the tackle being transmitted to the hook, by means of the fish-pendent, draws up that part of the anchor sufficiently high upon the bow to fasten it, which is done by the shank-painter. See that article. There is also a davit of a smaller kind occasionally fixed in the long-boat, and employed to weigh the anchor therein.

DAUMA, a kingdom of Africa, in Negroland, with a town of the same name. Lon. 34. 10. E. Lat. 8. 0. N.

DAVOS, a town of the Helvetic republic, and capital of a jurisdiction of the same name, in the country of the Grisons. It is 60 miles S. E. of Zurich.

DAUPHIN, a title given during the monarchy of France, to the presumptive heir of the crown; on account of the province of Dauphiné, which in 1349 was given to Philip VI. on this condition, by Hubert II. dauphin of Viennois.

DAUPHIN was anciently the title of the princes of Viennois in France. Most authors who have sought the origin of the name Dauphin and Dauphiné, seem to have given too much loose to conjecture. Du Chesne is of opinion, that it was the grandson of Guy the Fat who first bore the name of dauphin. Chorier observes, that William, canon of Notre Dame at Grenoble, who has written the life of Margaret, daughter of Stephen earl of Burgundy, married with Guy, the son of Guy the Fat, calls the latter simply Guy the Old, and the former always count Dauphin; and adds, that no record, no monument, ever attributes the title of dauphin to Guy the Fat or any of his predecessors: so that it must necessarily have taken its rise in his son, all whose successors so constantly assumed it, that it became the proper name of the family. He died in 1142, in the flower of his youth: so that it must have been about 1120 that the title commenced; and without doubt, adds he, on some illustrious occasion.

DAUPHIN, an island about 10 miles long, in the mouth of Mobile bay, in the Gulf of Mexico.

DAUPHIN, Fort, a jurisdiction, fort, and sea-port town in the N. part of the island of St. Domingo.

DAUPHINY, or DAUPHINE', a late province of France, which was bounded on the W. by the Rhone, on the N. by the Rhone and Savoy, on the S. by Provence, and on the E. by the Alps.

DAX, DACQS, or ACQS, a town of France, in the department of Landes. See **ACQS**.

DAXABON, DAJABON, DAHABON, or LAXABON, a settlement of the Spaniards on the line between the French and Spanish divisions of the island of St. Domingo. It was settled to prevent smuggling, when the Spaniards had their share of the island.

DAXABON, a town in the above district, 240 miles N. W. of St. Domingo.

DAY, according to the most natural and obvious sense of the word,

word, signifies that space of time during which it continues to be light; in contradistinction to night, being that partition of time wherein it is dark; but the space of time in which it is light, being somewhat vague and indeterminate, the time between the rising and setting of the sun is usually looked on as the day; and the time which lapses from its setting to its rising again, the night. The word **day** is often taken in a larger sense, so as to include the night also; or to denote the time of a whole apparent revolution of the sun round the earth, in which sense it is called by some a natural day, and by others an artificial one: but to avoid confusion, it is usual to call it in the former sense simply the day, and in the latter a *nychthemeron*, by which term that acceptance of it is aptly denoted, as it implies both day and night. The *nychthemeron* is divided into 24 parts called hours; which are of two sorts, equal and unequal, or temporary. See **HOUR**. Different nations begin their day at different hours. See **CHRONOLOGY**. The method of beginning the day at midnight prevails in Great Britain, France, Spain, and most parts of Europe, except Italy, and several parts of Germany; where they begin their day at sun-setting, and reckon on till it sets next day, calling that the 24th hour: these are generally termed Italian hours. The Jews also began their *nychthemeron* at sun-setting: but then they divided it into twice twelve hours, as we do; reckoning twelve for the day, be it long or short, and twelve for the night; so that their hours continually varying with the day and night, the hours of the day were longer than those of the night for one half-year, and the contrary the other; from whence their hours are called temporary: those at the time of the equinoxes became equal, because then those of the day and night are so. The Romans also reckoned their hours after this manner, as do the Turks at this day. This kind of hours is called planetary, because the seven planets were anciently looked upon as presiding over the affairs of the world, and to take it by turns each of these hours, according to the following order: Saturn first, then Jupiter, Mars, the Sun, Venus, Mercury, and last of all the Moon: hence they denominated each day of the week from that planet whose turn it was to preside the first hour of the *nychthemeron*. Thus, assigning the first hour of Saturday to Saturn, the second fell to Jupiter, the third to Mars, and so the 22d of the same *nychthemeron* fell to Saturn again, the 23d to Jupiter, and the 24th to Mars: so that on the first hour of the next day, it fell to the Sun to preside; and by the like reckoning, the first hour of the next fell to the Moon; of the next to Mars; of the next to Mercury; of the next to Jupiter; of the next to Venus: hence the days of the week came to be distinguished by the Latin names, of *Dies Saturni*, *Solis*, *Lunæ*, *Martis*, *Mercurii*, *Jovis*, and *Veneris*; and among us, by the names of Saturday, Sunday, Monday, &c.

DAY, CIVIL, NATURAL, SIDEREAL, AND SOLAR. See **CHRONOLOGY** and **ASTRONOMY**. The sidereal day is shorter than the mean solar day by 3' 56" nearly. We are inclined to think that many persons, especially in the higher walks of life, avail themselves of the change of seasons; inasmuch, that by the law of fashion, in winter they convert the night into day; and in summer exchange the most agreeable mornings and forenoons, for damp, unwholesome evenings and nights. It would be a vain attempt to reprobate this unnatural custom, in those circles where it is fancied to be equally vulgar to repair to bed in good time, and to rise early; a practice instinctively followed even by the lower animals. To the industrious and more domestic members of society, we venture to recommend, while in a good state of health, the following division of the day: namely, in spring and autumn to rise with the first rays of the sun; in summer, one hour after; and in winter, one hour before the luminary appears;—to allot every day (Sundays excepted,) from ten to twelve hours to useful occupations; from six to seven hours to the various purposes of dressing, taking provisions, exercise, or amusements; and also from six to seven, or eight hours, to repose, accordingly as they have been more or less fatigued the preceding day, either by mental or bodily exertions.

DAYS OF GRACE, in commerce, are a customary number of days allowed for the payment of a bill of exchange, &c. after the same becomes due. Three days of grace are allowed in Britain; ten in France and Dantzic; eight at Naples; six at Venice, Amsterdam, Rotterdam, and Antwerp; four at Frankfort; five in Leipzig; twelve at Hamburgh; six in Portugal; fourteen in

Spain; thirty in Genoa, &c. In Britain the days of grace are given and taken as a matter of course, the bill being only paid on the last day: but in other countries, where the time is much longer, it would be reckoned dishonourable for a merchant to take advantage of it; bills are therefore paid on the very day they fall due.

DAYS OF GRACE, in law, are those granted by the court at the prayer of the defendant or plaintiff.

DAY, in a legal sense, relates to the day of appearance of parties, or the continuance of suits, where a day is given, &c. See the article **ESSOIN**. In real actions there are common days and special days given by the judges, in an assise, &c.

DAYS IN BANK, are days set down by statute or order of the court, when writs shall be returned, or when the party shall appear on the writ served. They say also, if a person be dismissed without day, he is finally discharged.

DAY-LIGHT, in our law, some time after sun-setting, and before sun-rising, being accounted part of the day, when the hundred is liable for any robberies committed within that time.

DAY'S MAN, in the north of England, an arbitrator or person chosen to determine an affair in dispute.

DAYS OF GRACE, in trade and commerce, an indulgence granted to the acceptor of a bill, by which it is ordered that the holder shall take no measures, and not even protest an acceptance until the expiration of certain days after the bill becomes due. In London three days of grace are allowed; in Amsterdam, six; in Hamburgh, twelve; in Dantzic, ten; in Copenhagen, eight; in Berlin, three; and a different term in almost every distinct mercantile city.

DAY'S POINT, a district of Virginia, on the banks of James river.

DAY'S WORK, among seamen, the reckoning or account of the ship's course during twenty-four hours, as between noon and noon, according to the rules of trigonometry. See **DEAD RECKONING**.

DEACON, [*Διακον*®, Gr. a servant,] in ecclesiastical polity, one whose business is to baptise, read in the church, and assist at the celebration of the eucharist. Seven deacons were instituted by the apostles, Acts chap. vi. which number was retained a long time in several churches. Their office was to serve in the *Agapæ*, and to distribute the bread and wine to the communicants. Another part of their office was to be a sort of directors to the people in the exercise of their public devotions in the church; for which purpose they used certain forms of words, to give notice when each part of the service began. Whence they are sometimes called *eirokrukes*; or holy criers of the church. Deacons had, by licence from the bishop, a power to preach, to reconcile penitents, and to represent their bishops in general councils. Their office out of the church was to take care of orphans, widows, prisoners, and all the poor and sick who had any title to be maintained out of the revenues of the church; to inquire into the morals of the people, and to make their report to the bishop. Whence, on account of the variety of business, it was usual to have several deacons in the same church. In the Latin church, it is the deacon's office to incense the officiating priest or prelate; to lay the corporal on the altar; to receive the pattern or cup from the subdeacon, and present them to the person officiating; to incense the choir; to receive the pax from the officiating prelate, and carry it to the subdeacon; and at the pontifical mass, when the bishop gives the blessing, to put the mitre on his head, and to take off the archbishop's pall and lay it on the altar. In England, the form of ordaining deacons, declares that it is their office to assist the priest in the distribution of the holy communion: in which, agreeably to the practice of the ancient church, they are confined to the administering wine to the communicants. A deacon in England is not capable of any ecclesiastical promotion; yet he may be a chaplain to a family, curate to a beneficed clergyman, or lecturer to a parish church. He may be ordained at 23 years of age, but it is expressly provided, that the bishop shall not ordain the same person a priest and deacon in the same day. The qualifications of a deacon in the primitive church are mentioned by the apostle Paul, 1 Tim. iii. 8—13.

DEACONESS, an order of women who had their distinct offices and services in the primitive church. This office appears as ancient as the apostolical age; for St. Paul calls *Phæbe*, *Διακον*®, a servant of the church of Cenchrea. Tertullian calls them, *viduæ*, widows,

widows, because they were commonly chosen out of the widows of the church; and Epiphanius, and the council of Laodicea, call them *πρεσβυτιδες*, elderly women, because none but such were ordinarily taken into this office. For, indeed, by some ancient laws, these four qualifications were required in every one that was to be admitted into this order. 1. That she should be a widow. 2. That she should be a widow that had borne children. 3. A widow that was but once married. 4. One of a considerable age, 40, 50, or 60 years old. Though all these rules admitted of exceptions.

DEAD LANGUAGES. See **PHILOLOGY**.

DEAD LIGHTS, certain wooden ports which are made to fasten into the cabin windows, to prevent the waves from gushing into the ship in a high sea. As they are made exactly to fit the windows, and are strong enough to resist the waves, they are always fixed in on the approach of a storm, and the glass lights taken out, which must otherwise be shattered to pieces by the surges, and suffer great quantities of water to enter the vessel.

DEADLY FEUD, in English law-books, a profession of irreconcilable enmity, till a person is revenged by the death of his enemy. The word *feud* is derived from the German *Fehd*; which, as Hottoman observes, signifies *modo bellum, modo capitales inimicitias*. See **FEUD**. Such enmity and revenge was allowed by law in time of the Saxons. If any man was killed, and a pecuniary satisfaction was not made to the kindred, it was lawful for them to take up arms and revenge themselves on the murderer: this was called deadly feud; and probably was the original of an appeal.

DEADLY NIGHTSHADE. See **ATROPA**.

DEADMAN'S ISLAND, one of the Magdalen islands. Lon. 61. 30. W. Lat. 47. 22. N.

DEAD MENS EYES, in the sea language, a kind of blocks with many holes in them, but no sheevers, whereby the shrouds are fastened to the chains; the crow-feet reeve also through these holes: and, in some ships, the main stays are set tight in them; but then they have only one hole, through which the lanyards are passed several times.

DEAD NETTLE. See **LAMIUM**.

DEAD RECKONING, in sea language, that estimation of conjecture which the seamen make of the place where a ship is, by keeping an account of her way by the log, by knowing the course they have steered by the compass, and by rectifying all with the allowance for drift or leeway; so that this reckoning is without any observation of the sun, moon, and stars, and is to be rectified as often as any good observation can be had. This account kept for 24 hours is called a day's work.

DEAD SEA, in geography, a lake of Judea, into which the river Jordan discharges itself; being about 70 miles long and 20 broad.

DEAD TOPS, a disease incident to young trees, and cured by cutting off the dead parts close to the next good twig or shoot, and claying them over as in grafting.

DEAD WATER, at sea, the eddy water just astern of a ship; so called, because it does not pass away so swift as the water running by her sides does. They say that a ship makes much dead-water when she has a great eddy following her stern.

DEAFNESS, the disease of the ear, which prevents its due reception of sounds. See **MEDICINE**. Deafness generally arises either from an obstruction or a compression of the auditory nerve; or from some collection of matter in the cavities of the inner ear; or from the auditory passage being stopped up by some hardened excrement; or lastly, from some excrescence, a swelling of the glands, or some foreign body introduced within it. Those born deaf are also dumb, as not being able to learn any language, at least in the common way. However, as the eyes in some measure serve them for ears, they may understand what is said by the motion of the lips, tongue, &c. of the speaker; and even accustom themselves to move their own; as they see other people do, and thus learn to speak. Thus Dr. Wallis taught two young gentlemen born deaf to know what was said to them, and return pertinent answers. Digby gives us another instance of the same within his own knowledge; and there was a Swiss physician lately living at Amsterdam, one John Conrad Amman, who effected the same in several children born deaf with surprising success. He reduced the art to a systematic method, which he published in his "Surdus Loquens," Amstelod. 1692, and "De Loquela," ibid.

1700. But no person has excelled Mr. Braidwood, in the art of teaching the deaf and dumb to speak. The instances of his success with various pupils, born perfectly deaf, but whom he has nevertheless taught to speak, read, write, cast accounts, and even to become masters of the most abstruse branches of science, are numerous and astonishing. In the Phil. Trans. No. 312, we have an account by Mr. Waller, R. S. Secretary, of a man and his sister, each about 50 years old, born in the same town with Mr. Waller, who had neither of them the least sense of hearing; yet both of them knew, by the motion of the lips only, whatever was said to them, and would answer pertinently to the question proposed. It seems they could both hear and speak when children, but lost their sense afterwards; whence they retained their speech, which, though uncouth, was yet intelligible. Such another instance is that of Mr. Goddy's daughter, minister of St. Gervais in Geneva, related by Bishop Burnet: "At two years old they perceived she had lost her hearing; and ever since, though she hears great noises, yet she hears nothing of what is said to her. But by observing the motions of the mouth and lips of others, she acquired so many words, that out of these she has formed a sort of jargon, in which she can hold conversation whole days with those that can speak her language. She knows nothing that is said to her, unless she sees the motions of their mouths that speak to her, so that in the night they are obliged to light candles to speak to her. One thing will appear the strangest part of the whole narration: she has a sister, with whom she has practised her language more than any body else; and in the night, by laying her hand on her sister's mouth, she can perceive by that what she saith, and so can discourse with her in the dark." (Burn. Let. IV. p. 248. See **DUMBNESS**.) It is observable, that deaf persons, and several other persons dull of hearing, hear better and more easily if a loud noise be raised at the time when one speaks to them: which is owing, no doubt, to the greater tension of the ear-drum on that occasion. Dr. Wallis mentions a deaf woman, who if a drum were beat in the room could hear any thing very clearly; so that her husband hired a drummer for a servant, that by this means he might hold conversation with his wife. The same author mentions another, who, living near a steeple, could always hear very well, if there was a ringing of three or four bells, but never otherwise.

DEAL, in carpentry, a thin kind of fir plank. They are formed by sawing the trunk of a tree into a great many longitudinal divisions, of more or less thickness according to the purposes they are intended to serve. A very good method of seasoning planks for deal, is to throw them into salt water as soon as they are sawed; and keep them there three or four days, frequently turning them. In this case they will be rendered much harder, by drying afterwards in the air and sun: but neither this, nor any other method yet known, will preserve them from shrinking. Rods of deal expand laterally, or cross the grain, in moist weather, and contract again in dry; and thence have been found to make an useful hygrometer. Deals are imported into this country from Christiana, and other parts of Norway; from Dantzic, and various parts of Prussia; from St. Petersburg, Archangel, Narva, Memel, &c. They are sold by the piece, or by the standard hundred, or by the long hundred of 120. A standard, or reduced deal, is one inch and a half thick, eleven inches wide, and twelve feet long.

DEAL, in geography, a town of England, in Kent, between Dover and Sandwich; supposed to be the Dola of Ninnius, and situated on a flat and level coast, 7 miles S. by E. of Sandwich, and 72 E. by S. of London. Lon. 1. 29. E. Lat. 51. 13. N.

DEALBATION, [*dealbatio*, Lat.] the act of bleaching or whitening; rendering things white which were not so before: a word in little use.

DEAMENA, in the mythology, the goddess who was supposed to preside over women during their menses.

DEAN, [*decanus*, Latin; *doyen*, Fr.] from the Greek word *δεκα*; in English, ten; because he was anciently set over ten canons or prebendaries at least in some cathedral church.

DEAN is an ecclesiastical dignitary in cathedral and collegiate churches, and head of the chapter. As there are two foundations of cathedral churches in England, the old and the new, so there are two ways of creating deans. Those of the old foundation, founded before the suppression of monasteries, as the deans of St. Paul's, York, &c. are raised to that dignity much after the manner of bishops, the king first sending his congé d'elire, the chapter electing

electing, and the king granting his royal assent, the bishop confirms him, and gives his mandate to install him. Those of the new foundation, whose deanries were raised upon the ruins of priories and convents, such as the deans of Canterbury, Durham, Ely, Norwich, Winchester, &c. are donative, and installed by virtue of the king's letters patent, without either election or confirmation. Canonists distinguish between deans of cathedral and those of collegiate churches. The first, with their chapter, are regularly subject to the jurisdiction of the bishop. As to the latter, they have usually the contentious jurisdiction in themselves, though sometimes this belongs to them in common with the chapter. There are cathedral churches which never had a dean, and in which the bishop is head of the chapter, and in his absence, the archdeacon: such are the cathedrals of St. David and Landaff. There are also deans without a chapter, as the dean of Battle in Sussex, dean of the arches, &c. and deans without a jurisdiction, as the dean of the chapel royal. In this sense the word is applied to the chief of certain peculiar churches or chapels.

DEAN AND CHAPTER are the council of the bishop, to assist him with their advice in affairs of religion, as well as in the temporal concerns of his see. When the rest of the clergy were settled in the several parishes of each diocese, these were reserved for the celebration of divine service in the bishop's own cathedral; and the chief of them who presided over the rest, obtained the name of decanus or dean, being probably at first appointed to superintend ten canons or prebendaries.

DEAN OF A MONASTERY was a superior established under the abbot, to ease him in taking care of ten monks; whence he was called decanus.

DEAN, RURAL, called also Arch-presbyter, originally exercised jurisdiction over ten churches in the country, and afterwards became only the bishop's substitute, to grant letters of administration, probates of wills, &c.; to convocate the clergy; and to signify to them sometimes by letters the bishop's will, and to give induction to the archdeacon. Their office is now lost in that of the archdeacons and chancellors.

DEAN, in geography, a forest of England in Gloucestershire, between the Severn and the county of Monmouth.

DEAN, GREAT DEAN, or MICHAEL DEAN, a town in the above forest, 12 miles W. of Gloucester.

DEAN, is also a title given to certain civil officers; as

1. **DEAN OF FACULTY**, the president of the Faculty of Advocates, in Scotland.

2. **DEAN OF GUILD**, the chief judge of the Guild Court. See **LAW**.

DEATH is generally considered as the separation of the soul from the body; in which sense it stands opposed to life, which consists in the union thereof. Physicians usually define death by a total stoppage of the circulation of the blood, and a cessation of the animal and vital functions consequent thereon; as respiration, sensation, &c. An animal body, by the actions inseparable from life, undergoes a continual change. Its smallest fibres become rigid; its minute vessels grow into solid fibres no longer pervious to the fluids; its greater vessels grow hard and narrow; and every thing becomes contracted, closed, and bound up; whence the dryness, immobility, and extenuation, observed in old age. By such means the offices of the minuter vessels are destroyed; the humours stagnate, harden, and at length coalesce with the solids. Thus are the subtilist fluids in the body intercepted and lost, the concoction weakened, and the reparation prevented; only the coarser juices continue to run slowly through the greater vessels, to the preservation of life, after the animal functions are destroyed. At length, in the process of these changes, death itself becomes inevitable, as the necessary consequence of life. But it is rare that life is thus long protracted, or that death succeeds merely from the decays and impairment of old age. Diseases, a long and horrid train, cut the work short. The signs of death are in many cases very uncertain. If we consult what Winslow or Bruchier have said on this subject, we shall be convinced, that between life and death the shade is so very undistinguishable, that all the powers of art can scarcely determine, where the one ends and the other begins. The colour of the visage, the warmth of the body, and suppleness of the joints, are but uncertain signs of life still subsisting; while, on the contrary, the paleness of the complexion, the coldness of the body, the stiffness of the extremities, the cessation of all

motion, and the total insensibility of the parts, are but uncertain marks of death begun. In the same manner also, with regard to the pulse and breathing; these motions are often so kept under, that it is impossible to perceive them. By bringing a looking-glass near to the mouth of the person supposed to be dead, people often expect to find whether he breathes or not. But this is a very uncertain experiment: the glass is frequently sullied by the vapour of the dead man's body; and often the person is still alive, though the glass is no way tarnished. In the same manner, neither burning nor scarifying, neither noises in the ears nor pungent spirits applied to the nostrils, give certain signs of the discontinuance of life; and there are many instances of persons who have endured them all, and afterwards recovered without any external assistance, to the astonishment of the spectators. This ought to be a caution against hasty burials, especially in cases of sudden death, drowning, &c. No person who has died, or appeared to die suddenly, should be interred till undoubted signs of putrefaction appear.

DEATH, SYMPTOMS OF: 1. Cessation of the pulse; 2. Total suppression of breathing; 3. Loss of animal heat; 4. Rigidity of the body, and inflexibility of the limbs; 5. Relaxation of the lower jaw; 6. Inability of the eye-balls to return to their sockets, when pressed by the finger; 7. Dimness, faintness, and sinking of the cornea, or uppermost horny coat of the eye; 8. Foam in the cavity of the mouth; 9. Blue spots of various sizes, and on different parts of the body; 10. A cadaverous smell; 11. Insensibility to all external stimulants. All these symptoms, however, if individually considered, are far from being conclusive: they then only afford a certain criterion of death, when most or all those appearances concur at the same time, especially if the sixth, seventh, and tenth of the signs be strongly marked.

DEATH APPARENT, is that state in which life is suspended, either because the body is not susceptible of external stimuli, or the interior organs are in a state similar to that of palsy. Dr. Struve, in his "Practical Essay on the Art of recovering Suspended Animation," lately translated from the German 12mo. London, 1801, exhibits the following view of all the Symptoms of Life: A slight degree of warmth in the region of the heart, accompanied with contractions and dilatations; a vibrating motion of the whole body, especially after being sprinkled with cold water; and a convulsive tension of some muscles. Doubtful Signs: Rigidity of the limbs, gradual smoothness of the skin, warmth and redness in particular parts of the body, hiccough, contraction and hissing of the nostrils, a tremulous motion of the whole body, mucus issuing from the nose during the artificial inflation of the lungs, a slight convulsive motion of the mouth, and a firm compression of the teeth. More certain signs: Gentle throbbing of the heart; pulsation of the temporal arteries; a slight convulsive motion of the inner corner of the eye; vibration of the eye-ball; and almost imperceptible convulsions of the muscles surrounding the neck. Distinct signs of Life: A gentle motion of the jaw; gradual redness of the lips and cheeks; contraction of the different muscles in the face; convulsive motions of the toes; sneezing; tremor of the whole body; vomiting; respiration interrupted by coughing; and groaning.

DEATH, in law: The law makes a distinction between natural and civil death.

DEATH, CIVIL, takes place, where a person is not actually dead, but adjudged so by law. Thus, if any person, for whose life an estate is granted, remains beyond sea, or is otherwise absent, seven years, and no proof of his being alive, he shall be accounted naturally dead.

DEATH, NATURAL, in law, means a person actually dead.

DEATH-WATCH, in natural history, is also called pediculus, fatidicus, mortisaga, pulsatorius, &c. There are two kinds of death-watches. 1. Of the first we have a good account in the Phil. Trans. by Mr. Allen. It is a small beetle, $\frac{1}{8}$ of an inch long, of a dark brown colour, spotted; having pellucid wings under the vagina, a large cap or helmet on the head, and two antennæ proceeding from beneath the eyes, and doing the office of proboscides. The part it beats withal, he observed, was the extreme edge of the face, which he chooses to call the upper lip, the mouth being contracted by this bony part, and lying underneath out of view. This account is confirmed by Dr. Derham; with this difference, that instead of ticking with the upper lip, he observed the insect to draw back its mouth, and beat with its forehead. That

author had two death-watches, a male and a female, which he kept alive in a box several months; and could bring one of them to beat whenever he pleased, by imitating its beating. By this ticking noise he could frequently invite the male to get up upon the other in the way of coition. When the male found he got up in vain, he would get off again, beat very eagerly, and then up again: Whence the Dr. concludes those pulsations to be the way whereby these insects woo one another, and find out and invite each other to copulation. II. The second kind of death-watch is an insect in appearance quite different from the first. The former only beats seven or eight strokes at a time, and quicker; the latter will beat some hours together without intermission; and his strokes are more leisurely, and like the beat of a watch. It is a small greyish insect, much like a louse when viewed with the naked eye. It is very common in all parts of the house in summer: it is very nimble in running to shelter, and shy of beating when disturbed; but will beat very freely, and even answer one's beating, if viewed without giving it disturbance, or shaking the place where it lies, &c. Dr. Derham cannot say whether they beat in any other thing, but he never heard their noise except in or near paper. He is in doubt whether it be made by their heads, or rather snouts, against the paper; or whether it be not made after some such manner as grasshoppers and crickets make their noise. He inclines to the former opinion. The reason of his doubt is, that he observed the animal's body to shake and give a jerk at every beat, but could scarce perceive any part of its body to touch the paper. But its body is so small and near the paper, and its motion in ticking so quick, that he thinks it might be, yet he did not perceive it. The ticking, as in the other, he judges to be a wooing act.

DEBENHAM, a town in Suffolk, 84 miles N. N. E. of London.

DEBENTURE, [*debentur*, Latin, from *debeo*,] a writ or note, by which a debt is claimed.

DEBENTURE is used at the customhouse for a kind of certificate signed by the officers of the customs, which intitles a merchant exporting goods to the receipt of a bounty or draw-back. All merchandises that are designed to be taken on board for that voyage being entered and shipped, and the ship being regularly cleared out, and sailed out of port on her intended voyage, debentures may be made out from the exporter's entries, in order to obtain the draw-backs, allowances, bounties, or premiums; which debentures for foreign goods are to be paid within one month after demand. And in making out these debentures, it must be observed, that every piece of vellum, parchment, or paper, containing any debenture for drawing back customs or duties, must, before writing, be stamped, and pay a duty of eight-pence. The forms of debentures vary according to the merchandise exported. In the execution of debentures for tobacco, it must be particularly observed, 1. That debentures for the same quantity may be made on one or more parchments. 2. That the exporter's oath must be printed, specifying whether he acts for himself or on commission. 3. If exported to any other foreign ports than Ireland, the word Ireland must be added to the oath after Great Britain. 4. That as no tobacco may be consumed on board of ships of war in Europe but what has paid full duties, and been manufactured in Great Britain, no drawback is to be allowed for tobacco exported in any man of war. 5. That the eight pounds per hogshead of 350 pounds, or more, allowed for draught at importation, must not be deducted on exportation. 6. That debentures for tobacco exported to Ireland must not be paid till a certificate be produced, testifying the landing thereof. 7. That no persons may swear to the exportation but such as are permitted to swear to debentures for other goods. In debentures for all other foreign goods, no person may be admitted to swear to the exportation but the true exporter, either as a proprietor, or who, being employed by commission, is concerned in the direction of the voyage. All kinds of debentures, before being delivered or paid to the exporters, are entered into a separate book kept for that purpose by the collector and comptroller of the customs.

DEBILITY, is that feeble state of life in which the vital functions are languidly performed; when the mind loses its cheerfulness and vivacity; when the limbs are tottering with weakness, and the digestive faculty is impaired. This complaint, which at present is so prevalent, even in the bloom of life, and among those who ought to form the most vigorous and robust part of a nation,

may arise from a great variety of causes, of which the following are the principal: 1. Descent from enfeebled parents; 2. Changes in the admixture, and component parts of the surrounding atmosphere. 3. A sedentary and indolent mode of life. 4. Immoderate sleep; or, in a still more hurtful degree, want of the necessary portion of sleep and repose. 5. Too great exertions either of mind or body. 6. The unnecessary and imprudent use of medicines; lastly, the almost total disuse, and exclusion of gymnastic exercise, and the general introduction of sedentary games, the effect of which creates an almost universal apathy to every pursuit that requires exertion. Debility is the source of numerous disorders, such as spasms, palsy, violent evacuations, hemorrhages, putrid and nervous fevers, fainting fits, and apparent death.

DEBIR, in ancient geography, a sacerdotal city of Palestine, in Hebron.

DE-BOIS-BLANC, an island of the United States, belonging to the North-Western Territory, which was a voluntary gift of the Chipeway Indians, at the treaty of peace, concluded by General Wayne, at Greenville, in 1795.

DEBRECEN, DEBRECHIN, DEBRECZIN, or DEBRETZEN, a large and populous town of Hungary, 67 miles W. N. W. of Colosvar, and 165 E. S. E. of Vienna.

DEBRUIZED, in heraldry, a term peculiar to the English, by which is intimated the grievous restraint of any animal, debarred of its natural freedom, by any of the ordinaries being laid over it.

DEBT, debitum, in law, any thing due to another, whether it be money, goods, or services; or the action brought for recovering the same. Where money is due upon any speciality, an action of debt, and no other, lies. On a bond, debt may be brought against the obligor or his heir, who has lands by descent, if the executors have not sufficient to pay it; and an heir mediate may be sued for debt, as if he were an immediate heir. If a person acknowledges, by deed, that he has so much of another's money in his hands, here the action of debt will lie for it; and where one owes a sum of money to another, who hath his note under hand, without a seal, action of debt on a mutuum lies. Debt lies also on a recognizance; so upon a statute merchant, which is in nature of a bond, or obligation: but it is said to be otherwise, in case of a statute staple. Whether an action of debt be brought on a bill, bond, lease, &c. the several writings are to be well considered, by which the plaintiff warrants his action, and the sum due must be rightly set forth: thus, if it be for rent, the time of commencement and ending must be specified; and the judgement, where the demand is in the debt and detinet, is to recover the debt, damages, and costs of suit. But in a debt on a single bill, a defendant may plead payment, before the action brought in bar; and, on bond, he may bring in the principal, interest, and costs pending the action, and thereupon be discharged.

DEBT TO THE KING, comprehends in it all rents, issues, amerciaments, and other things due to the king, whose debts are preferred before those of a subject; and until his debt is satisfied, he may protect the debtor from the arrests of others. Pledges shall not be distrained for these debts, where the principal is sufficient.

DEBT, NATIONAL. See NATIONAL DEBT.

DEBTOR, a person who owes any thing to another, in contradistinction to creditor, which is he to whom the debt is owing. See BOOK-KEEPING. Where debt is a simple contract, it follows the person of the debtor, and, it is said, not of the creditor, as to actions brought, &c. There have been divers statutes discharging debtors out of prison, when they had no effects to pay their creditors.

DECACHORDON, in antiquity, a musical instrument with ten strings, called by the Hebrews hasur, being almost the same as our harp, of a triangular figure, with an hollow belly, and sounding from the lower part.

DECADE, [*deka*, Gr. *decem*, Lat.] the sum of ten; a number containing ten.

DECADE, in literary history, has been appropriated to the number of books, into which the Roman History of Titus Livius is divided.

DECADE, in the new French calendar. See CALENDAR.

DECADI, in the French calendar, the name of the 10th day of each decade, or the 10th, 20th, and 30th day of each month.

DECAGON, in geometry, a plane figure with ten sides and ten angles; it is called a regular decagon, when all the sides and angles are equal. If we suppose the radius of a circle to be

r , then will $\sqrt{\frac{5}{2}r^2 - \frac{1}{2}r}$, or $\sqrt{\frac{5-1}{2}} + r$, be the side of a decagon

inscribed in that circle. Again, supposing the side of a decagon to be 1, the area thereof will be 8.69; whence as 1 to 8.69, so is the square of the side of any given decagon to the area of that decagon.

DECAYGNIA, [from $\delta\epsilon\kappa\alpha$, ten, and $\gamma\upsilon\gamma\eta$, a woman,] an order in the class decandria, consisting of plants whose flowers are furnished with ten stamina and ten styles. See BOTANY.

DECALOGUE, [$\delta\epsilon\kappa\alpha\lambda\omicron\gamma\omicron$,] the ten commandments given by God to Moses. They were engraved by God on two tables of stone. The Jews, by way of eminence, called these commandments the ten words, from whence they had afterwards the name of decalogue: but they joined the 1st and 2d into one, and divided the last into two. They understand that against stealing to relate to the stealing of men, or kidnapping; alleging, that the stealing one another's goods or property is forbidden in the last commandment. The church of Rome has struck the 2d commandment quite out of the decalogue; and to make their number complete, has split the tenth into two. The reason is obvious.

DECANDRIA, [$\delta\epsilon\kappa\alpha$, ten, and $\sigma\iota\ \alpha\upsilon\delta\eta\epsilon\varsigma$, men,] in the Linnean system of botany, a class of plants, the great characteristic of which is, that they have hermaphrodite flowers, with ten stamina in each. See BOTANY.

DECANTATION, among chemists, &c. the gently pouring off a liquor from its fæces, by inclining the lip or canthus of the vessel; whence the name. The design of this operation, is in order to have the liquor free from the sediment, which, upon standing, it lets fall to the bottom of the vessel.

DECANUS, in Roman antiquity, an officer who presided over the ten officers, and was head of the contubernium, or serjeant of a file of soldiers.

DECAPOLIS, [$\delta\epsilon\kappa\alpha$ and $\eta\ \pi\acute{o\lambda\iota\varsigma$,] in ancient geography, a district beyond Jordan, almost wholly belonging to the half-tribe of Manasseh; before the captivity, called Bethsan.

DECAPROTI, DECEPRIMI, in Roman antiquity, officers for gathering the taxes.

DECARCH, [from $\delta\epsilon\kappa\alpha$, ten, and $\alpha\rho\chi\eta\varsigma$, or $\alpha\rho\chi\omega\nu$, chief,] a captain of ten.

DECCAN, an Indian term signifying South, under which the East Indian geographers include all the countries of India S. of the parallels of 21° or 22° of N. Lat. forming an extent of territory nearly equal to the British islands, Spain, and European Turkey; but in its proper and more limited sense, it means only the countries situated between Hindostan Proper, the Carnatic, the Western Indian sea, and the province of Orissa; i. e. the provinces of Candeish, Dowlatabad, or Amednagar, Visiapour, Golconda, and the western part of Berar. Hydrabad is the capital.

DECCAN SHABAZPOUR, an island lying in the mouth of the Ganges. Lon. 98.58 . E. Lat. 22.30 . N.

DECEIT, *dolus*, in law, a subtle trick, or device, to which may be added all manner of craft and collusion, or underhand practice, used to defraud another, by any means whatever. Deceit is an offence both by common law and by statute. All practices of defrauding, or endeavouring to defraud, another of his right, are punishable by fine and imprisonment, and sometimes pillory, &c. and there is a writ called deception, that lies for one who receives injury or damage, &c. A writ of deceit lies against attorneys, for losses sustained by their default; also against bakers, brewers, and other artificers, for not selling good commodities, or refusing to perform a bargain: in all which cases, they are, by statute, liable to penalties in proportion to their offence.

DECEIVED, in the manege; a horse is said to be deceived, upon a demivault of one or two treads, when working, for instance, to the right, and not having yet finished above half the demivault, he is pressed one time or motion forwards, with the inner leg, and then is put to a reprite upon the left, in the same cadence with which he began; and thus he regains the place where the demivault had been begun to the right, and works to the left: thus a horse may be deceived upon any hand.

DECEMBER, the month wherein the sun enters the tropic of Capricorn, and makes the winter-solstice. Among the ancient Romans December was under the protection of Vesta. Romulus assigned it 30 days, Numa reduced it to 29, which Julius Cæsar increased to 31. In the reign of Commodus, this month was called, by way of flattery, Amazonius, in honour of a courtesan whom that prince passionately loved, and had got painted like an Amazon; but this name died with that tyrant. At the end of December they had the juveniles ludi; and the country people kept the feast of the goddess Vacuna in the fields, having then gathered in their fruits and sown their corn; whence seems to be derived our popular festival called Harvest-Home.

DECEMPEDA, [$\delta\epsilon\kappa\alpha\mu\pi\epsilon\delta\alpha$, from *decem*, ten, and *pes*, a foot,] ten feet rod, an instrument used by the ancients in measuring. It was a rule or rod divided into ten feet; the foot was subdivided into 12 inches, and each inch into 10 digits. The decempeda was used both in measuring land, like the chain among us; and by architects to give the proper dimensions and proportions to the parts of their buildings, which use it still retains.

DECEMVIRATE, [*decemviratus*, Lat.] the dignity and office of the ten governors of Rome, who were appointed to rule the commonwealth instead of consuls. Their authority subsisted only two years. Any body of ten men.

DECEMVIRI, ten magistrates of absolute authority among the Romans. I. The privileges of the patricians raised dissatisfaction among the plebeians; who, though freed from the power of the Tarquins, still saw that the administration of justice depended upon the will and caprice of their superiors, without any written statute to direct them, and convince them that they were governed with equity and impartiality. The tribunes complained to the senate, and demanded that a code of laws might be framed for the use and benefit of the Roman people. This petition was complied with; and three ambassadors were sent to Athens and the other Grecian states, to collect the laws of Solon and all the other celebrated legislators of Greece. Upon the return of the commissioners it was universally agreed, that ten new magistrates called Decemviri, should be elected from the senate to put the project into execution. Their power was absolute, all other officers ceased after their election, and they presided over the city with regal authority. They were invested with the badges of the consul, in the enjoyment of which they succeeded by turns; and only one was preceded by the fasces, and had the power of assembling the senate and confirming decrees. The first decemvirs were Appius Claudius, T. Genutius, P. Sextus, Sp. Veturius, C. Julius, A. Manlius, Ser. Sulpitius, Pluricius, T. Romulus, and Sp. Posthumus; A. U. C. 302. Under them the laws which had been exposed to public view, that every citizen might speak his sentiments, were publicly approved of as constitutional, and ratified by the priests and augurs in the most solemn and religious manner. They were ten in number, and were engraved on tables of brass; two were afterwards added, whence they were called the laws of the XII tables, *leges XII tabularum*, and *leges decemvires*. The decemviral power, which was at first beheld by all ranks of people with the greatest satisfaction, was continued; but in the 3d year after their creation the decemvirs became odious on account of their tyranny; and the attempt of Ap. Claudius to ravish Virginia totally abolished the office. The people were so exasperated against them, that they demanded them from the senate to burn them alive. Consuls were again appointed, and tranquillity re-established in the state. II. There were other officers in Rome called decemvirs, who were originally appointed in the absence of the prætor to administer justice. Their appointment became afterwards necessary, and they generally assisted at sales called subhastiones, because a spear, *hasta*, was fixed at the door of the place where the goods were exposed to sale. They were called *decemviri litibus judicandis*. III. The officers whom Tarquin appointed to guard the Sibylline books were also called decemviri. They were originally two in number, called *duumviri*, till A. U. C. 388, when their number was increased to ten, five of whom were chosen from the plebeians and five from the patricians. Sylla increased their number to 15, hence called *quindecimvirs*.

DECEM TALES, in law, a writ that issues directed to the sheriff, whereby he is commanded to make a supply of jurymen, where a full jury does not appear on a trial at bar.

DECENNALIA, ancient Roman festivals, celebrated by the emperors

emperors every 10th year of their reigns, with sacrifices, games, and largesses for the people. Augustus first instituted these solemnities, in which he was imitated by his successors.

DECHALES, **CLAUDIUS FRANCIS MILLIET**, an excellent mathematician, mechanic, and astronomer, descended from a noble family, and born at Chambery in 1611. His principal performances are an edition of Euclid's Elements, in which the unserviceable propositions are rejected, and the uses of those retained, annexed; a discourse on fortification; and another on navigation. These with others have been collected first in 3 vols. folio, and afterwards in 4, under the title of *Mundus Mathematicus*: being indeed a complete course of mathematics. He died in 1678, professor of mathematics in the university of Turin.

DECIATES, or **DECIATH**, an ancient people of Gallia Narbonensis, near the borders of Italy, on the Mediterranean.

DECIATUM OPIRUM, in ancient geography, a town of the Deciates, situated between Antibes and Nice.

DECIDUOUS, an appellation chiefly used in respect to plants; thus, the calyx or cup of a flower is said to be deciduous, when it falls along with the flower leaves; and, on the contrary, it is called permanent, when it remains after they are fallen. Again, deciduous leaves are those which fall in autumn; in contradistinction to those of the evergreens, which remain all the winter.

DECIES TANTUM, a writ which lies against a juror who has taken money for giving his verdict; called so of the effect, because it is to recover ten times as much as he took. Stat. 98 Edw. III. c. 12 and 13. Decies tantum lies against sheriffs taking a reward for arraying a pannel. 11 H. VI. c. 14. See *Vin. Abr.* 378 and 382.

DECIL, in astronomy, an aspect or position of two planets, when they are distant from each other a tenth part of the zodiac.

DECIMÆ, **TITHES**. - See **TITHES**.

DECIMAL ARITHMETIC, the art of computing by decimal fractions.

DECIMAL FRACTION, that whose denominator is always 1, with one or more cyphers: thus, an unit may be imagined to be equally divided into 10 parts, and each of these into 10 more; so that by a continual decimal subdivision the unit may be supposed to be divided into 10, 100, 1000, &c. equal parts, called tenth, hundredth, thousand parts of an unit. See **ARITHMETIC**.

DECIMATION, a punishment inflicted by the ancient Romans, on such soldiers as quitted their posts, or behaved themselves cowardly in the field. The names of the guilty were put into an urn or helmet, and as many were drawn out as made the tenth part of the whole number, and those were put to the sword, and the others saved.

DECIPHERING, the art of reading or explaining ciphers. See **CIPHER**. The rules of deciphering are different, according to the language in which the ciphers are wrote: but in fact it is difficult, if not impossible, to form any general rules, which will apply in all cases to the discovery of the meaning of ciphers; which are arbitrary in their nature, and the rules of which must vary in almost every different instance of importance, as the sole object of those who use them is to prevent a possibility of detection. And where even the language in which the ciphers are wrote is uncertain, the difficulty of deciphering must be greatly increased, and the art rendered entirely conjectural.

DECIZE, a town of France, in the department of Nievre, 16 miles S. E. of Nevers.

DECK OF A SHIP, is a planked floor from stem to stern, upon which the guns lie, and where the men walk to and fro. Great ships have three decks, first, second, and third, beginning to count from the lowermost. Half-deck reaches from the main-mast to the stem of the ship. Quarter-deck is that aloft the steerage, reaching to the round house. Flush-deck is that which lies even in a right line fore and aft, from stem to stern. A rope-deck is made of cordages, interwoven and stretched over a vessel, through which it is easy to annoy an enemy who comes to board her. They are little used but by small vessels, to defend them from privateers. See **SHIPBUILDING**.

DECK, FLUSH, implies a continued floor laid from stem to stern, upon one line, without any stops or intervals.

DECK, HALF, a space under the quarter-deck of a ship of war, contained between the foremost bulk head of the steerage and the

fore-part of the quarter-deck. In the colliers of Northumberland the steerage itself is called the half-deck, and is usually the habitation of the crew.

DECLAMATION, a speech made in public, in the tone and manner of an oration, uniting the expression of action to the propriety of pronunciation, in order to give the sentiment its full impression upon the mind. The word is also used in a derogatory sense, as when it is said, "such a speech was mere declamation," it implies, that it was deficient in point of reasoning, or had more sound than sense. According to the manners and customs of the present age, public harangues are made only, 1. In the pulpit. 2. In the senate, in council, or other public assembly. 3. By public professors. 4. On the theatre. We shall notice the three first:

1. **DECLAMATION IN THE PULPIT**. The dignity and sanctity of the place, and the importance of the subject, require the preacher to exert the utmost powers of his voice to produce a pronunciation that is perfectly distinct and harmonious, and that he observe a deportment and action which is expressive and graceful. No man, therefore, who is destitute of a good voice, should ascend the pulpit. The preacher should not, however, roar like a common crier, and rend the ear with a voice like thunder; for such kind of declamation is not only without meaning and without persuasion, but highly incongruous with the meek and gentle spirit of the gospel. He should likewise take particular care to avoid a monotony; his voice should rise from the beginning, as it were by degrees, and its greatest strength should be exerted in the application. Each inflexion of the voice should be adapted to the phrase, and to the meaning of the words; and each remarkable expression should have its peculiar inflexion. The dogmatic requires a plain, uniform tone of voice only; and the menaces of the gospel demand a greater force than its promises and rewards: but the latter should not be pronounced in the soft tone of a flute, nor the former with the loud sound of a trumpet. The voice should still retain its natural tone in all its various inflexions. Happy is that preacher, to whom nature has given a voice that is at once strong, flexible, and harmonious. An air of complacency and benevolence, as well as devotion, should be constantly visible in the countenance of the preacher. But every appearance of affectation must be carefully avoided: for nothing is so disgusting to an audience, as even the semblance of dissimulation. Eyes constantly rolling, turning towards heaven, and streaming with tears, rather denote a hypocrite, than a man possessed of the real spirit of religion, and who feels the true import of what he preaches. An air of affected devotion infallibly destroys the efficacy of all that the preacher can say, however just and important it may be. On the other hand, he must avoid every appearance of mirth or railery, or of that cold unfeeling manner, which is so apt to freeze the heart of his hearers. The body should be in general erect, and in a natural and easy attitude. The perpetual movement or contortion of the body, has a ridiculous effect in the pulpit, and makes the figure of a preacher and a harlequin too similar. On the other hand, he ought not to remain constantly upright and motionless, like a speaking statue. The motions of the hands give a strong expression to a discourse; but they should be decent, grave, noble, and expressive. The preacher, who is incessantly in action, who is perpetually clapping his hands, or who menaces with a clenched fist, or who counts his arguments on his fingers, will only excite mirth among his auditory. In a word, declamation is an art that the sacred orator should study with assiduity. The design of a sermon is to convince, to affect, and to persuade. The voice, the countenance, and the action, which are to produce this triple effect, are therefore objects to which the preacher should particularly apply himself.

2. **DECLAMATION IN THE SENATE, &c.** The declamation of a minister or statesman, in the senate, in council, or other public assembly, is of a more unconfined nature. To persuade, to move the passions, and gain an ascendancy in a public assembly, the orator should himself feel the force of what he says, and the declamation should only express that internal sensation. But nothing should be carried to excess. A suavity in the tone of voice, a dignity of deportment, a graceful action, and a certain tranquillity of countenance, should constantly accompany the statesman when he speaks in public, even when he is most earnestly engaged in debate, or when he is addressing his sovereign in person. A pleasing tone of voice, and a distinct pronunciation, prejudice

the hearers greatly in the speaker's favour. A young man may improve these to a surprising degree. Demosthenes, who had a natural impediment in his speech, was accustomed to go to the sea-shore, and partly filling his mouth with pebbles he declaimed with a loud voice. The stones by degrees gave a volubility to his tongue, and the roaring of the waves reconciled him insensibly to the noise of the multitude.

3. DECLARATION OF PUBLIC PROFESSORS. The principal object of a public professor is the instruction of the studious youth: for which purpose, he is to convince and persuade. Every tone of voice, every expression of the countenance, or action of the body, which can produce this effect by enforcing the words, should therefore be employed by those who are to teach the sciences. There is one essential reflection which every professor ought to make; viz. that he is surrounded by young students, naturally possessed with vivacity, often ludicrous, and for the most part previously instructed in the preparatory sciences. They are therefore constantly inclined to criticise, to jest, and to ridicule: for which reason, the professor should endeavour to inspire them with respect and attention, by a grave, commanding, and venerable countenance; and carefully avoid any appearance of grimace in his action, and every kind of affectation in his discourse, that he may not afford the least opportunity for pleasantry.

DECLARATION, is a shewing in writing the grief and complaint of the demandant, or plaintiff, against the defendant, or tenant, wherein he is supposed to have done some wrong. And this ought to be plain and certain, both because it impeaches the defendant, and also compels him to answer thereto. It is also an exposition of the writ, with the addition of time, circumstances, &c. and must be true as well as clear, for the court will not take things in it by implication; and it sets forth the names both of the plaintiff and defendant, the nature and cause of the action, &c. and the damage received. Such a declaration in an action real is termed a count, and it is essential, that the count or declaration ought to contain demonstration, declaration, and conclusion; and in the conclusion the plaintiff ought to aver, and offer to prove his suit, and shew the damages he has sustained by the wrong done him. Declaration must be certain: containing, 1. Such sufficient certainty whereby the court may give a peremptory and final judgement upon the matter in controversy. 2. The defendant may make a direct answer to the matter contained therein. 3. That the jury, after issue joined, may give a complete verdict thereupon. 4. No blank, or space, to be left therein.

DECLARATION OF WAR, a public proclamation made by the herald at arms to the members or subjects of a state, declaring them to be at war with some foreign power, and forbidding all and every one to aid or assist the common enemy at their peril.

DECLENSION, in grammar, an inflexion of nouns according to their divers cases, as nominative, genitive, dative, &c. With regard to languages, where the nouns do not admit of changes in the same number, declension is the expression of the different states a noun is in, and the different relations it has. See **GRAMMAR**.

DECLENSION OF A DISEASE is when it is past its height.

DECLINATION, in astronomy, the distance of any celestial object from the equinoctial, either northward or southward. It is either true or apparent, according as the real or apparent place of the object is considered. The declination being an arch of a secondary of the equinoctial intercepted between a given point and the equinoctial, and perpendicular to the same, the declination of a star, &c. is found in the following manner. First observe the altitude of the pole, as PR, Plate L.L. fig. 6, this subtracted from 90°, gives the height of the equator AH; then the meridian-altitude of the star HD being observed, if it be greater than the altitude of the equator AH, the latter subtracted from the former, leaves the declination northward AD: or if the altitude of the star HT be less than that of the equator AH, the former subtracted from the latter, leaves the declination southward TA. If the star be in the quadrant ZR, then the least altitude MR, subtracted from the altitude of the pole PR, leaves the distance from the pole PM; which subtracted again from the quadrant PQ, leaves the declination MQ. See **ASTRONOMY**.

DECLINATION OF THE SEA-COMPASS, OR NEEDLE, is its variation from the true meridian of any place. See **VARIATION**.

DECLINATION OF A WALL OR PLANE FOR DIALS is an arch of the horizon, contained either between the plane and the prime vertical circle, if you reckon it from the east or west; or else between the meridian and the plane, if you account it from north or south. There are many ways given by authors for finding the declination of a plane, of which all those that depend upon the magnetic needle deserve to be suspected on many accounts. The common method, by finding the sun's horizontal distance from the pole of the plane, is subject to many errors and difficulties. The way therefore we would recommend as the best for finding the declination of a plane, is by a declinator. See the next article.

DECLINATOR, or DECLINATORY, an instrument contrived for taking the declinations, inclinations, and reclinations, of planes. It is constructed in the following manner: on a square wooden board, ABCD, Plate L.L. fig. 7, describe a semicircle AED, and divide the two quadrants AE and ED into 90°, each beginning from E, as in the figure: then having fixed a pin in the centre F, fit a ruler HI, upon the same, moveable thereon, with a box and needle K, fig. 8. In order to take the declination of a plane, apply the side AD to the plane proposed, as MN, fig. 9, and move the ruler FG, with the compass G, about the centre F, till the needle rest upon the line of the magnetical meridian of the place: if the ruler cut the quadrant in E, the plane is either directly northern or southern; but if it cut between D and E, the plane declines to the west; and if between A and E, to the east, by the quantity of the angle GFE. Would you take the inclinations and reclinations of planes with this instrument, instead of the ruler and needle, a thread with a plummet is fitted on a pin in the centre F; then the side BC of the declinator ABCD, fig. 10, being applied to the proposed plane, as IL, if the plum-line FG cut the semicircle AED, in the point E, the plane is horizontal; or if it cut the quadrant ED, in any point at G, then will EFG be the angle of inclination: lastly, if applying the side AB to the plane, the plummet cut E, the plane is vertical. Hence if the quantity of the angle of inclination be compared with the elevation of the pole and equator, it is easily known whether the plane be inclined or reclined. See **INCLINATION** and **RECLINATION**.

DECLINING DIALS, those which do not face directly any of the four cardinal points. See **DIALING**.

DECLIVIS, in anatomy, a muscle otherwise called obliquus descendens.

DECOCTION, [*decoctum*, Lat.] the act of boiling any thing, to extract its virtues.

DECOCTION is only applicable to matters containing some principles soluble in water; such particularly are animal and vegetable matters. Decoction ought not to be used with such substances as contain any volatile principles, as they would be dissipated in the air during the process. But it may be safely used, nay, even becomes necessary, when the matters to be treated are solid, and of a close and compact texture; because then the water could not extract its principles without a boiling heat. Most soft animal matters, as flesh, skin, tendons, may be conveniently boiled in water; because they contain no principle volatile with a boiling heat. Water extracts from them nothing but a gelatinous substance, and some oily parts which float on the surface of the water. All vegetable matters which are inodorous, and particularly those which are hard, as roots, barks, &c. are generally boiled, when an extraction of their principles by water is required. To this rule, however, there are some exceptions. Peruvian bark, for instance, gives its strength to cold water better than to such as is boiling hot. Many other vegetables have also the property of yielding less to boiling than cold water. And therefore a general rule may be established, that decoction ought not to be employed but when absolutely necessary, that is, when the same principles, or the same quantities of those principles cannot be obtained by an infusion, and that without heat, if it can be so done, considering that the proximate principles of vegetables are generally so delicate, and so susceptible of change and decomposition, that frequently the most gentle heat changes much their nature and properties.

DECOLLATION is used for a painting, wherein is represented John the Baptist's head struck off from his trunk. It is likewise the name of a festival held in honour of that martyr.

DECOMPOSITION, in chemistry, usually signifies the division or separation of the constituent parts of bodies. It differs from mere mechanical division, in that when a body is chemically decomposed, the parts into which it is resolved are essentially different from the body itself; but though a mechanical force is applied to it ever so long, or if with ever so much violence, the minutest particles into which the body may be reduced, still retain their original nature. Thus, let nitre be reduced to ever so fine a powder, each particle retains the nature of nitre, as much as the compounded mass; but sulphuric acid is applied, a decomposition takes place, and one of the largest component parts of the nitre rises in the form of a smoking acid spirit, which never could have been suspected to lie hid in the mild neutral salt.

DECORATION, in architecture, any thing that adorns and enriches a building, church, triumphal arch, or the like, either without side or within. The orders of architecture contribute greatly to the decoration; but the several parts of those orders must have their just proportions, characters, and ornaments; otherwise the finest order will bring confusion rather than richness. See **ARCHITECTURE**. Decorations in churches, are paintings, vases, festoons, &c. occasionally applied to the walls; and with so much conduct and discretion, as not to take off any thing from the form of the architecture: as is much practised in Italy at the solemn feasts.

DECORUM, in architecture, is the suitableness of a building, and the several parts and ornaments thereof, to the station and occasion.

DECOUPLE, in heraldry, the same as uncoupled; thus a chevron decouple, is a chevron wanting so much of it towards the point, that the two ends stand at a distance from one another, being parted and uncoupled.

DECOY, among fowlers, a place made for catching wild fowl. A decoy is generally made where there is a large pond surrounded with wood, and beyond that a marshy and uncultivated country: if the piece of water is not thus surrounded, it will be attended with the noise and other accidents which may be expected to frighten the wild fowl from a quiet haunt, where they mean to sleep, during the day, in security. If these noises or disturbances are wilful, an action will lie against the disturber. As soon as the evening sets in, the decoy rises (as they term it), and the wild fowl feeds, during the night. If the evening is still, the noise of their wings during their flight, is heard at a very great distance, and is a pleasing, though melancholy sound. This rising of the decoy in the evening, is in Somersetshire called radding. The decoy ducks are fed with hempseed, which is thrown over the screens in small quantities, to bring them forwards into the pipes or canals, and to allure the wild fowl to follow, as this seed floats. There are several pipes, as they are called, which lead up a narrow ditch that closes at last with a funnel net. Over these pipes (which grow narrower from their first entrance) is a continued arch of netting suspended on hoops. It is necessary to have a pipe, or ditch, for almost every wind that can blow, as upon this circumstance it depends which pipe the fowl will take to; and the decoy man always keeps on the leeward side of the ducks, to prevent his effluvia reaching their sagacious nostrils. All along each pipe, at certain intervals are placed screens made of reeds, so situated, that it is impossible the wild fowl should see the decoy man, before they have passed on towards the end of the pipe, where the purse net is placed. The inducement of the wild fowl to go up one of these pipes is, because the decoy ducks trained to this lead the way, either after hearing the whistle of the decoy man, or enticed by the hempseed: the latter will dive under water, whilst the wild fowl fly on, and are taken in the purse net. It often happens, however, that the wild fowl are in such a state of sleepiness and dozing, that they will not follow the decoy duck. Use is then generally made of a dog, who is taught his lesson; he passes backwards and forwards between the reed screens (in which are little holes, both for the decoy man to see, and the little dog to pass through); this attracts the eye of the wild fowl, who, not choosing to be interrupted, advance towards the small and contemptible animal, that they may drive him away. The dog all the time, by the direction of the decoy man, plays among the screens of reeds, nearer and nearer the purse-net; till at last, perhaps, the decoy man appears behind a screen, and the wild fowl not daring to pass by him in return, nor being able to escape upwards on account of the net covering, rush on into the purse-net. Sometimes the dog

will not attract their attention, if a red handkerchief, or something very singular, is not put about him. The general season for catching fowls in decoy, is from the end of October till February; the taking of them earlier is prohibited by an act 10 Geo. II. c. 32, which forbids it from June 1 to October 1, under the penalty of 5s. for each bird destroyed within that space. The Lincolnshire decoys are commonly set at a certain annual rent, from 5l. to 20l. a year; and there is one in Somersetshire that pays 30l. The former contribute principally to supply the markets in London. Amazing numbers of ducks, wigons, and teal, are taken a few winters past, in one season, and in only ten decoys, in the neighbourhood of Wainfleet, the number amounted to 31,200, in which were included several other species of ducks. These quantities make them so cheap on the spot, that the decoy men would be content to contract for years to deliver their ducks at Boston, for 10d. per couple. It was customary formerly to have in the fens an annual driving of the young ducks before they took wing. Numbers of people assembled, who beat a vast tract, and forced the birds into a net placed at the spot where the sport was to terminate; 150 dozens have been taken at once; but this practice being supposed to be detrimental, has been abolished by act of parliament.

DECOY, in naval affairs, a stratagem employed by a ship of war, to betray a vessel of inferior force into an uncautious pursuit, till she has drawn her within the range of her cannon, or what is called within gunshot. It is usually performed by painting the stern and sides in such a manner as to disguise the ship, and represent her either much smaller and of inferior force, or as a friend to the hostile vessel, which she endeavours to ensnare, by assuming the emblems and ornaments of the nation to which the stranger is supposed to belong. When she has thus provoked the adversary to chase, in hopes of acquiring a prize, she continues the decoy, by spreading a great sail, as endeavouring to escape; at the same time that her course is considerably retarded by an artful alteration of her trim till the enemy approaches. Decoying is also performed to elude the chase of a ship of a superior force in a dark night, by throwing out a lighted cask of pitch into the sea, which will burn for a considerable time, and misguide the enemy. Immediately after the cask is thrown out, the ship changes her course, and may easily escape, if at any tolerable distance from the foe.

DECREE, in the civil law, is a determination which the emperor pronounces upon hearing a particular cause between the plaintiff and defendant.

DECREE IN CHANCERY, the determination of the lord chancellor, upon a full hearing of the merits of a cause.

DECREE OF COUNCILS, laws made by them, to regulate the doctrine and policy of the church.

DECREET, in the law of Scotland, a final decree or judgment of the lords of session, from which an appeal only lies to parliament.

DECREMENT, in heraldry, signifies the wane of the moon from the full to the new. The moon in this state is called moon decrecent, or in decours; and when borne in coat armour, faces to the left side, when in the increment.

DECREPITATION, in chemistry, signifies the quick separation of the parts of a body, occasioned by a strong heat, and accompanied with noise and crackling. This effect is most frequently produced by water contained betwixt the parts of the decrepitating body, when these parts have a certain degree of adhesion together. This water being quickly reduced into vapour by the heat suddenly applied to it, rarefies, and bursts with noise the parts which compress it. The bodies most subject to decrepitation are certain salts, such as common salt, vitriolated tartar, nitre of lead, &c. the decrepitation of all which proceeds from the water of their crystallization. Clays which are not perfectly dry, and flints, are also subject to decrepitation.

DECRESCENT, [from *decrescens*, Lat.] growing less; being in a state of decrease.

DECRETAL, [*decretal*, Lat.] the collection of the pope's decrees. The decretals compose the second part of the canon law. The first genuine one, acknowledged by all the learned as such, is a letter of Pope Siricius, written A. D. 385, to Himerus, bishop of Tarragona, in Spain, concerning some disorders which had crept into the churches of Spain. Gratian published a collection of decretals, containing all the ordinances made by the popes till A. D. 1150. Gregory IX. in 1227, following the example of Theodo-

sus and Justinian, formed a constitution of his own, collecting into one body all the decisions and all the causes which served to advance the papal power; which collection of decretals was called the pentateuch, because it contains five books.

DECTURAPOUR, one of the Laccadive islands, in the Indian sea. Lon. 72. 0. E. Lat. 12. 8. N.

DECUMARIA, in botany, a genus of the monogynia order, and didecandria class of plants. Calyx eight to twelve-leaved, superior; petals eight to twelve; capsule eight-celled, with many seeds. There is but one species, viz. *D. barbara*, climbing decumaria, a native of Carolina.

DECUPLE PROPORTION, that of ten to one.

DECURIA, a **DECURY**, among the ancient Romans, ten men under one leader, called the Decurio. The decurio was the third part of a turma, or the 30th of a legion of horse, which consisted of 300 men. The Roman cavalry was divided into decuria, which were subdivisions of a century, each century containing ten decuries.

DECURIO, a subaltern officer in the Roman armies, who commanded a decuria.

DECURIONES, **MUNICIPALES**, magistrates in the Roman provinces, who formed a body to represent the Roman senate in free and corporate towns.

DECUSSATION, in geometry, optics, and anatomy, signifies the crossing of two lines, rays, or nerves, when they meet in a point, and then go on separately from one another.

DECUSSORIUM, an instrument used by surgeons, which, by pressing gently on the dura mater, causes an evacuation of the pus collected between it and the cranium, through the perforation made by the trepan.

DEDDINGTON, a town of Oxfordshire, 16 miles N. of Oxford.

DEDHAM, a town in Essex, seated on the Stour, 7 miles N. N. E. of Colchester.

DEDICATION, [*dedicatio*, Lat.] the act of consecrating a temple, altar, statue, palace, &c. to the honour of some deity. The use of dedications is very ancient both among the worshippers of the true God and among the heathens: the Hebrews call it *hhanuchah*, "imitation;" which the Greek translators render *ἱεραία*, and *ἱεραγωγία*, "renewing." In the scripture we meet with dedications of the tabernacle, of altars, of the first and second temple, and even of the houses of private persons. One of the most solemn on record is that of the first temple by Solomon. (1 Kings viii. 2 Chron. vi.) There were also dedications of vessels, and garments of the priests and Levites, and even of the men themselves. The heathens had also dedications of temples, altars, and images, of their gods, &c. Nebuchadnezzar held a solemn dedication of his statue, Dan. iii. 2. Pilate dedicated gilt bucklers at Jerusalem to Tiberias, Philo de legat. Petronius would have dedicated a statue to the emperor in the same city, *ibid*. p. 791. Tacitus, *Hist. lib. iv. c. 53*. mentions the dedication of the capital, upon rebuilding it by Vespasian, &c. The Jews celebrated the anniversary of the dedication of their temple every year for eight days. This was first enjoined by Judas Maccabeus, and the whole synagogue, in the year of the Syro-Macedonian era 148, i. e. 164 years before Christ. The heathens had similar anniversaries, as that of the dedication of the temple of Parthenope, mentioned by Lycophron. Under Christianity, dedication is only applied to a church; and is properly the consecration thereof performed by a bishop, with a number of ceremonies prescribed by the church. The Christians finding themselves at liberty under Constantine, in lieu of their ruinous churches, built new ones in every place; and dedicated them with a deal of solemnity. The dedication was usually performed in a synod; at least they assembled a number of bishops to assist at the service. We have the description of those of the churches at Jerusalem and Tyre in Eusebius, and many others in later writers.

DEDICATION, [*dedicatio*, Lat.] in literature, is an address prefixed to a book, soliciting patronage, or testifying respect for the person to whom it is made.

DEE, a river of England and Wales, which rises in the N. W. angle of Merionethshire, and falls into the Irish sea 15 miles below Chester.

DEE, a river of Ireland, which crosses the county of Louth.

DEE, a river of Scotland, in Aberdeenshire.

DEE, JOHN, a famous mathematician and astrologer, was born

at London in July 1527, where his father was a wealthy vintner. In 1542, he was sent to St. John's college, Cambridge. After five years close application to mathematical studies, particularly astronomy, he went to Holland, to visit several eminent mathematicians on the continent. Having continued abroad near a year, he returned to Cambridge; and was there elected one of the fellows of Trinity college, then first erected by king Henry VIII. In 1548, he took the degree of M.A. and left England a second time; his stay at home being rendered uneasy to him, by the suspicions that were entertained of his being a conjuror; arising partly from his application to astronomy, but especially on account of a piece of machinery in the *Enigma* of Aristophanes, which he exhibited to the university, and in which he represented the Scarabeus flying up to Jupiter, with a man, and a basket of victuals on its back. These suspicions he could never afterwards shake off; nor did his subsequent conduct, tend to clear him of the imputation; for if he was not actually a conjuror, it was not for want of endeavours. Upon leaving England, he went to the university of Louvain; where he was much esteemed, and visited by several persons of high rank. Here he resided about two years, and then set out for France; where, in the college of Rheims, he read lectures of Euclid's elements with vast applause. In 1551, he returned to England, and king Edward VI. assigned him a pension of 100 crowns, which he afterwards relinquished for the rectory of Upton upon Severn: but soon after the accession of queen Mary, having some correspondence with the lady Elizabeth's servants, he was accused of practising against the queen's life by enchantment. On this account he suffered a tedious confinement, and was several times examined; till, in 1555, he obtained his liberty by an order of council. Upon queen Elizabeth's accession, our astrologer was consulted by lord Dudley, concerning a propitious day for her coronation. He was, on this occasion, introduced to the queen, who made him great promises, which were never performed, though she condescended to receive his instructions relative to his unintelligible writings, which he published about this time. In 1564, he made another voyage to the continent; to present a book he had dedicated to the emperor Maximilian. He returned to England, but in 1571, we find him in Lorrain; where, being dangerously ill, the queen sent over two physicians to his relief. Having once more returned to his native country, he settled at Mortlake in Surrey, where he continued his studies with unremitting ardour, and collected a considerable library of curious books and MSS. with a variety of instruments; most of which were afterwards destroyed by the mob, as belonging to one who dealt with the devil. In 1578, the queen being much indisposed, Mr. Dee was sent abroad to consult with German physicians and philosophers (astrologers no doubt) on the occasion. We now behold him again in England, where he was soon after employed in a more rational service. The queen desirous to be informed concerning her title to those countries which had been discovered by her subjects, commanded Mr. Dee to consult the ancient records, and furnish her with proper geographical descriptions. Accordingly he presented her, in three weeks after, with two large rolls, in which the discovered countries were geographically described, and historically illustrated. These rolls are preserved in the Cottonian library. His next employment was the reformation of the calendar, on which subject he wrote a rational and learned treatise, preserved in the Ashmolean library at Oxford. Though Dee was undoubtedly a man of parts and learning, he became at last a credulous alchemist, and gave his mind to necromancy. In 1581, he fell acquainted with one Edward Kelley, by whose assistance he performed diverse incantations, and maintained a very frequent intercourse with spirits. He was, it is said, intimate with the angels Raphael and Gabriel. One of them made him a present of a black speculum, in which his angels and demons appeared as often as he had occasion for them; they answered his questions, and Kelley's business was to record their dictates. In 1583, they were both introduced to a Polish nobleman, then in England, named Albert Laski, palatine of Siradia, a person addicted to the same antichristian pursuits. He was so charmed with Dee and his companion, that he persuaded them to accompany him to his native country. They embarked for Holland in September 1593; and travelling overland, arrived at the town of Laski in February following. Their patron, however, finding himself abused by their abominations, persuaded them to pay a visit to the emperor Rodolph II.; who, in a very short time, was soon disgusted with

them. They were afterwards introduced to Stephen, king of Poland, but with no better success. Soon after this they were invited by a rich Bohemian nobleman, to his castle of Trebona, where they continued for some time in great affluence; owing, as they asserted, to their art of transmutation by means of a certain powder in the possession of Kelley. Dee now quarrelling with his companion in iniquity, quitted Bohemia, and returned to England, where he was once more graciously received by the queen; who, in 1595, made him warden of Manchester college, in which town he resided several years. In 1604, he returned to his house at Mortlake, where he died in 1608, aged 81, leaving a large family, and many works, behind him. The black stone into which Dee used to call his spirits, was in the collection of the earls of Peterborough, whence it came to Lady Elizabeth Germaine. It was next the property of the late duke of Argyle, and is now Mr. Walpole's. It has been found upon examination to be nothing but a polished piece of cannel coal. The celebrated Dr. Hook, many years after Dee's death, has endeavoured to prove that his journal, published by Casaubon, was entirely cryptographical, concealing his political transactions, and that under the mask of pursuing the occult sciences, he was employed by queen Elizabeth as a spy. He is said to have been created LL. D. at Louvain.

DEED, an instrument written on paper or parchment, which relates principally to the conveyance, or transferring of property, and the validity of which consists in the following essential particulars: 1. Proper parties to contract with one another, and a proper subject matter to be contracted for; 2. A good and sufficient consideration; 3. Writing on parchment, or paper, duly stamped; 4. Sufficient and legal words, properly disposed; 5. Reading (if it be desired) before execution; 6. By stat. 29 Car. 2. c. 3, in many cases signing also; and, lastly, delivery which must be done either by the party himself, or by his attorney, lawfully authorized, and expressed in the attestation. If any of these requisites be wanting, the deed is absolutely void, from the beginning. The preservation of deeds is an object that has ever engaged the attention of the lawyer and the antiquary: it is of still greater importance to those who hold estates or other tenements, in order to enable them to peruse such papers as have been kept for a series of years, and which from moisture, or other causes, are almost illegible. To facilitate this desirable object, we select the following, as being the most simple of the many recipes which have been recommended: immerse the parchment obliterated by time, into a vessel of cold water, fresh drawn from a well: in the space of a minute, it should be taken out, and pressed between two blotting papers, to prevent it from shrivelling, while it is drying. As soon as it is moderately dry (if the characters be not legible,) the operation should be repeated two or three times. Thus, the skin will resume its pristine colour, and appear throughout alike. In construction of law, the first deed and the last will stand in force; and where a deed is by indenture between parties, none can have an action upon such deed, but the person who is a party to it. In a deed-poll, however, one person may covenant with another, who is not a party, to do certain acts; for the non-performance of which he may bring his action. Where a man justifies title under any deed, he ought to produce that deed; if it be alleged in pleading, it must be produced to the court, that it may determine whether the deed contain sufficient words to make a valid contract.

DEEMSTERS, or **DEMSTERS**, [from *dema*, Sax. a judge or umpire,] all controversies in the Isle of Man are decided without process, writings, or any charges, by certain judges, chosen yearly from among themselves, called deemsters; there being two for each division of the island: they sit judges in all courts, either for life or property; and with the advice of 24 keys, declare what is law in uncommon emergencies.

DEEP SEA-LINE, or **DIP SEA-LINE**, in the sea-language a small line to sound with: some a hundred and fifty fathoms long, with a hollow plummet at the head, and tallow put into it, to bring up stones, gravel, sand, shells, and the like, from the bottom, in order to know the differences of the ground; which being entered from time to time in their books, by comparing of observations, they guess by their soundings, &c. what coasts they are on, though they cannot see land.

DEER, an island of the United States, in Penobscot Bay, on the coast of Hancock county, in the district of Maine, 19 miles in circumference.

DEER, [*deor*, Sax. *thier*, Teutonic; *θῆρ*, Gr.] that class of

animals which is hunted for venison, containing many subordinate species; as the stag, or red deer, the buck, or fallow deer, the roebuck, and others. See **CERVUS**.

DEERFIELD, a town of New Hampshire 35 miles N. W. of Portsmouth.

DEERFIELD, or **POCOMTIC**, a river of Vermont, which receiving many streams, enters Massachusetts, thence falls into the Connecticut.

DE FACTO, [Lat.] something actually in fact, or existing; in contradistinction to *de jure*, where a thing is only so in justice, but not in fact: as a king *de facto* is a person who is actually in possession of a crown, but has no legal right to the same; and a king *de jure* is the person who has a just right to the crown, though he is not possessed of it.

DEFAMATION, the offence of speaking slanderous words of another; and where any person circulates any report injurious to the credit or character of another, the party injured may bring an action to recover damages proportioned to the injury he has sustained; but it is incumbent upon the party to prove that he has sustained an injury, to entitle him to damages. In some cases, however, as for words spoken which, by law, are in themselves actionable, as calling a tradesman a bankrupt, a cheat, or swindler, &c. there is no occasion to prove any particular damage, but the plaintiff must be particularly attentive to state words precisely as they were spoken, otherwise he will be nonsuited.

DEFAULT, is commonly taken for non-appearance in court at a day assigned. If a plaintiff make default in appearance in a trial at law, he will be nonsuited; and where a defendant makes a default, judgement shall be had against him by default.

DEFAULT IN CRIMINAL CASES. If an offender, being indicted, appears at the *capias*, and pleads to issue, and is let to bail to attend his trial, and then makes default; here the inquest, in case of felony, shall never be taken by default: but a *capias ad audiendum juratum* shall issue, and if the party is not taken, an exigent; and if he appear on that writ, and then makes default, an *exigi facias de novo* may be granted: but where, upon the *capias* on exigent, the sheriff returns *cepi corpus*, and at the day has not his body, the sheriff shall be punished; but no new exigent awarded because in custody of record. 2 H. H. 202.

DEFAULT OF JURORS. If jurors make default in their appearance for trying of causes, they shall forfeit their issues, unless they have any reasonable excuse proved by witnesses, in which case the justices may discharge the issues for default. Stat. 35 H. VIII. c. 6.

DEFEASANCE, or **DEFEISANCE**, the difference between a common condition and a defeasance is, that the condition is annexed to, or inserted in, the deed; and a defeasance is a deed by itself, concluded and agreed on between the parties, and having relation to another deed.

DEFECATE, or **DEFECATE**, in chemistry, a term applied to a body freed and purged from feces and impurities. See the article **CLARIFICATION**, &c.

DEFECTION, the deserting, abandoning, or falling off from, a party, or interest, a person had been engaged in.

DEFECTIVE, in general, an appellation given to things which want some of the properties that naturally they ought to have. Thus,

DEFECTIVE NOUNS are those which want one of the numbers, or one or more cases. See **NOUN**.

DEFENCE, in fortification, all sorts of works that cover and defend the opposite posts, as flanks, casemates, parapets, and *faussebrays*. See **FORTIFICATION**.

DEFENCE, TO BE IN A POSTURE OF, is to be in a condition to resist or oppose an enemy.

DEFENCE, LINE OF, a supposed line drawn from the angle of the curtain, or from any other part in the curtain, to the flanked angle of the opposite bastion. See **FORTIFICATION**.

DEFENCE, in law, signifies a plea, or what the defendant ought to make after the plaintiff's count, or declaration, viz. that he defends all the wrong, force, and damages, where and when he ought, &c. If the defendant would plead to the jurisdiction, he must omit the words, where and when he ought; and if he would shew any disability in the plaintiff, and demand judgement, if the plaintiff shall be answered unto, then he ought to omit the defence of the damage. There is a full defence usually in personal actions.

DEFENCES,

DEFENCES, in heraldry, are the weapons of any beast, as the horns of a stag, the tusks of a wild boar, &c.

DEFEND, a term used in our old statutes, for, to prohibit or forbid.

DEFENDANT, in law, the person sued in an action personal; as tenant is he who is sued in an action real. See ACTION.

DEFENDEMUS, in law, a word formerly used in gifts and grants, having this force, that it binds the donor and his heirs to defend the donee, if any persons claimed right to, or laid any incumbrance on, the thing given, otherwise than is contained in the deed of gift.

DEFENDER OF THE FAITH, [*fidei defensor*, Lat.] a peculiar title belonging to the king of England; as Catholicus to the king of Spain, and Christianissimus to the king of France, &c. These titles were given by the popes of Rome. That of *fidei defensor* was first conferred by Leo X. on king Henry VIII. for writing against Martin Luther; and the bull for it bears date quinto idus Octob. 1521. It was afterwards confirmed by Clement VII. But the pope, on Henry's suppressing the houses of religion at the time of the reformation, not only deprived him of his title, but deposed him from his crown also; though in the 35th year of his reign, his title, &c. was confirmed by parliament; and has continued to be used by all his successors. Chamberlayne says, the title belonged to the kings of England before that time; and for proof hereof appeals to several charters granted to the university of Oxford; so that pope Leo's bull was only a renovation of the ancient right.

DEFICIENT NUMBERS, in arithmetic, are those numbers whose parts, added together, make less than the integer, whose parts they are, such is 8, its parts 1, 2, 4, making only 7.

DEFILE, in fortification, a straight narrow passage, through which a company of horse or foot can pass only in file, by making a small front; so that the enemy may take an opportunity to stop their march and charge them with so much the more advantage, in regard that those in the front and rear, cannot reciprocally come to the relief of one another.

DEFILE is to reduce an army to a small front, in order to march through a defile.

DEFINITE, in grammar, is applied to an article that has a precise determinate signification; such as the article *the* in English, *le* and *la* in French, &c. which fix and ascertain the noun they belong to, to some particular; the king, *le roi*, the queen, *la reine*, *i. e.* the king or queen of the country we are in, or speaking of; whereas the articles, *a*, *an*, *un* or *une*, mark nothing particular, and are therefore called indefinite: thus a king, an artist, un roi, une reine, mean a king, artist, or queen, of any country or any age.

DEFINITION, the shewing the meaning of one word by several other not synonymous terms. The meaning of words being only the ideas they are made to stand for, by him that uses them, the meaning of any term is then shewed, or the word is defined, when, by other words, the idea it is made the sign of, and is annexed to it in the mind of the speaker, is, as it were, represented and set before the view of another; and thus its signification is ascertained. This is the only end and use of definitions, and therefore the only measure of what is, or is not, a good definition. The names then of simple ideas are incapable of being defined, because the several terms of a definition signifying several ideas, they can altogether by no means, represent an idea which has no composition at all; and therefore a definition, which is properly but shewing the meaning of any one word by several others, not signifying the same each, can in the names of the simple ideas have no place. Definitions, which then take place in compound ideas only are of two sorts: the definition of the name, which is the explanation of what any word means; and the definition of the thing, which explains in what the nature of that thing consists. In order to form a definition of any thing, we must employ these three acts of the mind, first compare the thing to be defined with other things that are most like to itself, and see wherein its essence and nature agrees with them; and that is called the general nature or genus in a definition: so, if you would define what wine is, first compare it with other things like itself, as cyder, perry, &c. and you will find that it agrees essentially with them in this, that it is a sort of juice. Secondly, consider the most remarkable and primary attribute, property, or idea, wherein the thing differs from

those other things that are most like it, and that is its essential or specific difference: so that wine differs from cyder and perry, and all other juices, in its being pressed from a grape. This may be called its special nature, which distinguishes it from other juices. Thirdly, join the general and special nature together, or the genus and the difference, and these make up a definition; so the juice of a grape, or juice pressed from grapes, is the definition of wine. Here it must be observed, that in speaking of the genus and difference, as composing a definition, it must always be understood, that the nearest genus and specific difference are required. The next general nature, or the nearest genus, must be used in a definition, because it includes all the rest: as if I were to define wine, I must say, wine is a juice, which is the nearest genus; and not say, wine is a liquid, which is a remote general nature; or, wine is a substance which is yet more remote, for juice includes both liquid and substance. Besides neither of these two remote general natures would make any distinction between wine and a thousand other substances, or other liquids: a remote genus leaves the thing too much undistinguished. The specific difference is that primary attribute which distinguishes each species from one another, while they stand ranked under the same general nature or genus; so that the specific difference of wine is its pressure from the grape, as cyder is pressed from apples, and perry from pears. In definitions we must also use the primary attribute that distinguishes the species, or special nature; and not attempt to define wine by its particular tastes, or effects, or rather properties, which are but secondary, or consequential, when its pressure from the grape is the most obvious and primary distinction of it from all other juices. In some cases, indeed, it is not so easily known, which is the primary idea that distinguishes one thing from another; so some would as soon define winter by the coldness of the season, as by the shortness of the days, though the shortness of the days is doubtless the most just, primary, and philosophical difference; since winter-days are always the shortest, but not always the coldest; besides, the shortness is one cause of the coldness, but the coldness is no cause of their shortness. The special rules for a good definition are these: 1. A definition must be universal or adequate, that is, it must agree to all the particular species or individuals that are included under the same idea. 2. It must be proper, and peculiar to the thing defined, and agree to that alone. These two rules, being observed, will always render a definition reciprocal with the thing defined, that is, the definition may be used in the place of the thing defined; or they may be mutually affirmed concerning each other. 3. A definition should be clear and plain; and indeed it is a general rule concerning the definition both of names and things, that no word should be used in either of them, which has any difficulty in it, unless it has been before defined. 4. A definition should be short, so that it must have no tautology in it, nor any words superfluous. 5. Neither the thing defined, nor a mere synonymous name should make any part of the definition. Though the defining by the genus and difference be the shortest way, yet it may be doubted whether it be the best; certainly it is not the only, and so not absolutely necessary. Thus, man may be defined to be a solid extended substance, having life, sense, spontaneous motion, and the faculty of reasoning; and certainly the meaning of the word man would be as well understood as when it is defined a rational animal.

DEFINITION, in rhetoric, is defined by Cicero, a short comprehensive explanation of a thing. The definitions of the orator, it must be observed, differ much from those of the logician and philosopher: the orators take a large compass, and define things more ornamentally: thus, "man is a curious work of an almighty Creator, framed after his own image, endued with reason, and born with immortality:" but this rhetorical definition, in strictness, comes nearer to the nature of a description, than any accurate definition.

DEFLAGRATION, [*deflagratio*, Lat.] in chemistry, the act of burning two or more substances together, as charcoal and nitre. When nitre, (nitrate of potash,) is mixed with an equal weight of sulphur, charcoal, or other inflammable substance, and the mixture is thrown into a crucible heated to redness, a very vivid combustion is instantly excited: this is called deflagration, which is occasioned by the disengagement of a large portion of oxygen, from the nitre thus suddenly presented to the inflammable body, and hence the vivid combustion that is excited; and for the production of this, it is not even requisite to raise the temperature so high as that which would be necessary, if applied alone, to decom-

pose the nitre, the affinity of the inflammable body to the oxygen of the nitre, causing it to take place at a temperature somewhat lower. The nitrogen, or azote of the nitric acid, passes off in the state of gas, and the potash with which the acid was united, remains mixed, or united with the body formed by the combination of the oxygen, and the inflammable substance.

DEFLECTION OF THE RAYS OF LIGHT, a property which Dr. Hook observed in 1675, and read an account of before the Royal Society, March 18, the same year. He says he found it different both from reflection and refraction, and that it was made towards the surface of the opaque body, perpendicularly. This property Sir Isaac Newton calls inflection.

DEFLECTION, in navigation, the tendency of a ship from her true course, by reason of currents, &c. which turn her out of her right way.

DE FOE, DANIEL, a writer famous for politics and poetry. He was bred a hosier, which profession he soon forsook, and became one of the most enterprising authors that any age has produced. When discontents ran high at the Revolution, and king William was obliged to dismiss his Dutch guards, De Foe, who had true notions of civil liberty, ridiculed the enemies of government in his well known poem, called "The true-born Englishman;" which had a prodigious sale. The next satire he wrote was intitled, "Reformation of Manners;" aimed at some persons of high rank, who rendered themselves a disgrace to their country. When the ecclesiastics breathed too much of a spirit of persecution, De Foe wrote a tract called "The Shortest Way with the Dissenters;" for which he was called to account, and explained himself with great firmness. He was afterwards sentenced to the pillory for attacking some public measures; which so little intimidated him, that, in defiance of their usage, he wrote a "Hymn to the Pillory." It would be endless to enumerate all his publications; but the following are the principal: "The History of the Plague in 1665;" a novel intitled "The History of Colonel Jack;" "A new Voyage round the World by a Company of Merchants," printed for Bettesworth, 1725; "The History of Roxana;" "Memoirs of a Cavalier;" "The History of Moll Flanders;" a religious romance, intitled "Religious Courtship," which has undergone upwards of 20 editions; and the "Life and Adventures of Robinson Crusoe, an admirable performance, of which there have been editions without number, but concerning which there is an anecdote, that does the author of it no credit, as to the better part of a writer's character, honesty. When Captain Woods Rogers touched at the island of Juan Fernandez, in the South Sea, he brought away Alexander Selkirk, a Scots sailor, who had been left ashore there, and had lived on that desolate place above four years. When Selkirk came back to England, he wrote a narrative of his adventures, and put the papers into the hands of De Foe, to digest for publication; who ungenerously converted the materials into the History of Robinson Crusoe, and returned Selkirk his papers again! A fraud for which, the distinguished merit of that romance can never atone. Daniel de Foe died at Islington, in 1731. All his productions of the romantic species, but especially the two last mentioned, are much in vogue amongst country readers; and, on account of their moral and religious tendency, may very probably in some measure counteract the pernicious effects, produced by the too general circulation of modern novels, those occasional vehicles of impiety and infidelity.

DEFOLIATION, [from *de*, and *folium*, a leaf,] the fall of the leaves; a term opposed to frondescentia, the annual renovation of the leaves. Most plants in cold and temperate climates shed their leaves every year: this happens in autumn, and is generally announced by the flowering of the common meadow-saffron. The term is only applied to trees and shrubs; for herbs perish down to the root every year, losing stem, leaves, and all. All plants do not drop their leaves at the same time. The ash and walnut trees, though latest in unfolding, are soonest divested of them: the latter seldom carries its leaves above five months. On the oak and hornbeam, the leaves die and wither as soon as the cold commences; but remain attached to the branches till they are pushed off by the new ones, which unfold themselves the following spring. These trees are doubtless a kind of ever-greens: the leaves are probably destroyed only by cold; and perhaps would continue longer on the plant, but for the force of the spring sap, joined to the moisture. In mild and dry seasons,

the lilac, privet, yellow jessamine of the woods, and maple of Crete, preserve their leaves green until spring, and do not drop them till the new leaves are beginning to appear. The fig-tree, and many other trees that grow between the tropics, are of this particular class of ever-greens. The trees in Egypt, says Dr. Hasselquist, cast their leaves in the end of December and beginning of January having young leaves before all the old ones are fallen off; and, to forward this operation, few of the trees have buds: the sycamore, and willow, indeed, have some, but with few and quite loose stipules or scales. Buds seem not so necessary in the southern as in the northern countries. Some trees and shrubs preserve their leaves constantly through the whole year: and are not in the least influenced by the clemency or inclemency of seasons. Such are the fir, juniper, yew, cedar, cypress, and many other trees, hence denominated ever-greens. The falling off of the leaves of deciduous trees seems principally to depend on the temperature of the atmosphere, which likewise serves to hasten or retard the appearance in question. An ardent sun contributes to hasten the dropping of the leaves. Hence in hot and dry summers, the leaves of the lime-tree and horse-chesnut turn yellow about the first of September; whilst in other years, the yellowness does not appear till the beginning of October. Nothing, however, contributes more to hasten the fall of the leaves, than immoderate cold or moist weather in autumn; moderate droughts, on the other hand, serve to retard it. As a proof of this position, Mr. Adanson relates, that in 1759, the leaves of the elm-tree, which generally fall off about the 25th of November, continued in verdure and vigour at Paris, where the autumn was remarkably dry, till the 10th of the following month. The following table, respecting the mean times in which different trees shed their leaves, is founded upon observations:

Gooseberry-tree and bladder-sena,	} Generally quit their leaves about	Oct. 1st.
Walnut and ash,		—15th.
Almond-tree; horse-chesnut, and lime-tree,		—20th.
Maple, hazle nut, black poplar, and aspen tree,		—25th.
Birch, plane-tree, mountain osier, false acacia, pear, and apple tree,		Nov. 1st.
Vine, mulberry, fig, sumac, and angelica tree,	}	—10th.
Elm-tree and willow,		—15th.
Apricot and eldertrees,		—20th.

It is remarkable that an ever-green tree grafted upon a deciduous, determines the latter to retain its leaves. This observation is confirmed by repeated experiments; particularly by grafting the laurel, or cherry-bay, an ever-green, on the common cherry; and the ilex, or ever-green oak, on the oak.

DEFORCEMENT, a with-holding of lands and tenements by force from the right owner.

DEFORCEMENT, in Scots law, the opposing or resisting of the officers of the law in the execution of their office.

DEFORMITY, [*deformitas*, Lat.] generally signifies the want of that symmetry and uniformity, which are necessary to constitute the beauty of an object; it is more particularly applied to the human frame. The chief cause of the personal deformity so frequent at present, is the neglect of paying proper attention to the clothing of infants, by which they are deprived of the free use of their limbs; and thus, in a great measure, rendered unserviceable to society. But, though deformity may apparently be prejudicial to health, it is ultimately a real advantage. Deformed persons, it is true, possess a less share of strength than others; they should therefore be naturally more careful to preserve it, as well as their health; which can be effected only by a strict adherence to temperance. This object will likewise be considerably facilitated by moderate exercise, which few, in such a situation, can want strength to perform; and, as they are not calculated for violent exercise, they are consequently exempt from all the disorders arising from that source; and may thus attain a mature old age. For a further investigation of this subject, we refer the reader to an ingenious essay, intitled "Deformity," by Mr. Hay, in 8vo. published in the year 1753, and of which a new edition appeared a few years since, collectively with his other works, in two vols. 4to. where it is amply discussed.

DEFOSSIO, or **DEFOSSION**, the punishment of burying alive, inflicted among the Romans on vestal virgins guilty of incontinency. It is also a custom among the Hungarians to inflict this punishment on women convicted of adultery. Heretics were also punished in this manner.

DEGENERATION OF PLANTS. Some naturalists have been of opinion, that plants are capable of degenerating into quite indistinct species; but this is a mere chimera. All that happens in the degeneration of a plant, is the losing its usual beauty, colour, smell, &c. a circumstance entirely owing to its being planted in an improper soil, climate, &c.

DEGLUTITION, in medicine, the act of swallowing the food, performed by means of the tongue driving the aliment into the œsophagus, which, by the contraction of the sphincter, protrudes the contents downwards.

DEGNIZLU, or **DENIZSLEY,** a town of Asiatic Turkey, in the province of Natolia, 108 miles E. S. E. of Smyrna.

DEGRADATION, the act of depriving a person for ever of a dignity or degree of honour, and taking away the title, badge, and privileges, of it.

DEGRADATION, in our law-books, is called Disgradation and Deposition. The degradation of a peer, a priest, a knight, a gentleman, an officer, &c. are performed with divers ceremonies, in which the person degraded is stripped of those ornaments and rights which were the ensigns of his order and degree.

DEGRADATION, in painting, expresses the lessening the appearance of distant objects in a landscape, in the same manner as they would appear to an eye placed at that distance from them.

DEGRADED CROSS, in heraldry, a cross divided into steps at each end, diminishing as they ascend towards the centre, called by the French *perronnée*.

DEGREE, [*dégré* Fr.] in geometry, a division of a circle, including a three hundred and sixtieth part of its circumference. Every circle is supposed to be divided into three hundred and sixty parts, called degrees, and each degree divided into sixty other parts, called minutes; each of these minutes being again divided into sixty seconds, each second into sixty thirds, and each third into sixty fourths, and so on. By this means no more degrees or parts are reckoned in the greatest circle than in the least that is; and therefore if the same angle at the centre be subtended by two concentric arches, as many degrees are counted in the one as in the other; for these two arches have the same proportion to their whole peripheries. See **TRIGONOMETRY**.

DEGREE OF LATITUDE, and **DEGREE OF LONGITUDE.** See **LATITUDE**, **LONGITUDE**, **GEOGRAPHY**, and **ASTRONOMY**.

DEGREE, in the civil and canon laws, denotes an interval in kinship, by which proximity, and remoteness of blood are computed. See **CONSANGUINITY**, and **DESCENT**.

DEGREE, in universities, denotes a quality conferred on the students or members thereof, as a testimony of their proficiency in the arts or sciences, and intitling them to certain privileges. The degrees are much the same in all universities, but the laws thereof, and the previous discipline or exercise differ. The degrees are bachelor, master, and doctor, instead of which last, in some foreign universities, they have licentiate. In each faculty, there are two degrees, bachelor and doctor, which were antiently called bachelor and master. In the arts likewise there are two degrees which still retain the antient denomination, viz. bachelor and master. With regard to obtaining degrees at Oxford and Cambridge, matters are nearly on the same footing, only at Cambridge the discipline is somewhat more severe, and the exercises more difficult. For the degree of bachelor of arts, besides residence in the university near four years, it is required that the person in the last year have defended three questions in natural philosophy, mathematics, or ethics, and answered the objections of three several opponents at two several times; as also that he have opposed three times. After which, being examined by the master and fellows of the college, he is referred to seek his degree in the schools, where he is to sit three days, and be examined by two masters of arts appointed for the purpose. For the degree of master of arts, the candidate is obliged three several times to maintain two philosophical questions in the public schools, and to answer the objections brought against him by a master of arts. He must also keep two acts in the bachelors school, and declaim once. To pass bachelor of divinity, the candidate must have been seven years master of arts: he must have opposed a bachelor of divinity twice, kept one divinity act, and preached before the university once in Latin and once in English. For the degree of doctor, see **DOCTOR**.

DEGREES OF COMPARISON, in grammar, are three; viz. the positive, comparative, and superlative. See **GRAMMAR**.

DEGREES, in music, are the little intervals whereof the concords, or harmonical intervals, are composed. Musical degrees are three, 1st. The greater tone, whose ratio is 8:9. 2. The less tone, whose ratio is 9:10. and 3. The semitone, whose ratio is 15:16.

DEJANIRA, in fabulous history, daughter of Oeneus king of Etolia, and wife of Hercules. The centaur Nessus, endeavouring to ravish her, was slain by Hercules with a poisoned arrow.

DEINSE or **DEYNSE,** a town of France in the department of Escaut, 9 miles S. W. of Ghent.

DEIPHON, in fabulous history, a brother of Triptolemus, and son of Celeus and Metanira. When Ceres travelled over the world, she stopped at his father's court, and undertook to nurse him and bring him up. To reward the hospitality of Celeus, the goddess, to make his son immortal, every evening placed him on burning coals, to purify him from his mortal particles.

DEISCAL or **DEISHEAL,** in the ancient British customs, the name of a ceremony originally used in the druidical worship, and retained in many places down to a very late period as a civil ceremony towards persons of particular distinction. The temples of the ancient Britons were all circular; and the druids in performing the public offices of their religion, never neglected to make three turns round the altar, accompanied by all the worshippers. This practice was so habitual to the ancient Britons, that it continued in some places many ages after the druids and their religion were both destroyed. In the Scottish isles, the vulgar never came to the ancient sacrificing and fire-hallowing cairns, but they walk three times round them, from east to west, according to the course of the sun.

DEISM [*déisme*, Fr. from *Deus*, God, Lat.] may properly be used to denote natural religion, as comprehending those truths which have a real foundation in reason and nature; and in this sense it is so far from being opposite to Christianity, that it is one great design of the gospel to illustrate and enforce it. Thus some of the deistical writers have affected to use it. But deism more precisely signifies that system of religion relating both to doctrine and practice, which, it is supposed, every man may discover for himself, by the mere force of natural reason, independent of all revelation, and exclusive of it; and this religion, Dr. Tindal and others pretend, is so perfect, as to be incapable of receiving any addition or improvement even from divine revelation. It is indeed surprising, that men of learning and philosophy, who reject Christianity, on account of its miracles and mysteries, See **DEISTS**, notwithstanding its many evidences external and internal, should nevertheless adopt opinions, without the smallest evidence, which, if they were true, would be not only more miraculous, but even more mysterious, because paradoxical and contradictory. For miraculous it certainly would be, if a finite, limited, foolish, imperfect, material, being, whose days are of yesterday, and whose whole mass of knowledge is acquired from external and visible objects, through the medium of his five senses, could, by his own powers alone, discover the existence, nature, powers, and character, of an infinitely and eternally wise, good, perfect, unlimited, immaterial, and invisible, Being, without the smallest information or revelation from him. And it is a self-evident contradiction, to say, that such a weak and imperfect being could discover, or (what, in matters of this kind, amounts to the same thing,) form a system of religion and morality, so perfectly pure and excellent, that the omnipotent Author of all wisdom, goodness, and perfection, could not improve it, or give a better in its stead. Yet such contradictory systems are adopted as sterling truths, by many modern deists: which affords the Christian a strong proof of the truth of our Saviour's prophecy, that at his second coming he will hardly find faith on the earth.

DEIST, a sect or class of people also denominated **FREE-THINKERS**; they profess to think freely for themselves; and to follow the light and law of nature, rejecting revelation, and opposing Christianity. The name of Deists seems to have been first assumed as the denomination of a party, about the middle of the 16th century, by some gentlemen in France and Italy, who were desirous of thus disguising their opposition to Christianity, by a more honourable appellation than that of Atheists. Viret, an eminent reformer, mentions certain persons, in his epistle dedicatory, prefixed to the second volume of his "Instruction Chrétienne," published in 1563, who called themselves by a new name, that

that of Deists. These, he tells us, professed to believe in God, but shewed no regard to Jesus Christ, and considered the doctrine of the apostles and evangelists as fables and dreams. He adds, that they laughed at all religion, though they outwardly conformed to the religion of those with whom they lived, or whom they wished to please, or feared to offend. Some, he observed, professed to believe the immortality of the soul; others denied both this doctrine and that of providence. Many of them were considered as persons of acute and subtil genius, and took pains in disseminating their notions. The deists hold, that, considering the multiplicity of religions, the numerous pretences to revelation, and the precarious arguments generally advanced in proof thereof, the best and surest way is to return to the simplicity of nature and the belief of one God; which is the only truth agreed to by all nations. They complain, that the freedom of thinking and reasoning is oppressed under the yoke of religion; and that the minds of men are tyrannized over, by the necessity imposed on them of believing inconceivable mysteries; and contend that nothing should be required to be assented to or believed, but what their reason clearly conceives. The distinguishing character of modern deists is, that they discard all pretences to revelation, as the effects of imposture or enthusiasm. They profess a regard for natural religion, though they are far from being agreed in their notions concerning it. They are classed by some of their own writers into mortal and immortal deists; the latter acknowledging a future state; and the former denying it, or representing it as very uncertain. Dr. Clarke distinguishes four sorts of deists. 1. Those who pretend to believe the existence of an eternal, infinite, independent, intelligent Being, who made the world, without concerning himself in the government of it. 2. Those who believe the being and natural providence of God, but deny the difference of actions as morally good or evil, resolving it into the arbitrary constitution of human laws; and therefore they suppose that God takes no notice of them. With respect to both these classes, he observes, that their opinions can consistently terminate in nothing but downright atheism. 3. Those who having right apprehensions concerning the nature, attributes, and all-governing providence of God, seem also to have some notion of his moral perfections; though they consider them as transcendent, and such in nature and degree, that we can form no true judgement, nor argue with any certainty concerning them: but they deny the immortality of human souls; alleging that men perish at death, and that the present life is the whole of human existence. 4. Those who believe the existence, perfections, and providence, of God, the obligations of natural religion, and a state of future retribution, on the evidence of the light of nature, without a divine revelation; such as these, he says, are the only true deists; but their principles, he apprehends, should lead them to embrace Christianity; and therefore he concludes that there is now no consistent scheme of deism in the world. The first deistical writer of any note that appeared in this country was Herbert baron of Cherbury. He lived and wrote in the seventeenth century. His book "De Veritate" was first published at Paris in 1624. This, together with his book "De Causis Errorum," and his treatise "De Religione Laici," were afterwards published in London. His celebrated work "De Religione Gentilium" was published at Amsterdam in 1663 in 4to, and in 1700 in 8vo.; and an English translation of it was published at London in 1705. As he was one of the first that formed deism into a system, and asserted the sufficiency, universality, and absolute perfection, of natural religion, with a view to discard all extraordinary revelation as useless and needless, we shall subjoin the five fundamental articles of this universal religion. They are these: 1. That there is one supreme God. 2. That he is chiefly to be worshipped. 3. That piety and virtue are the principal part of his worship. 4. That we must repent of our sins; and if we do so, God will pardon them. 5. That there are rewards for good men and punishments for bad men, both here and hereafter. Our own age has produced a number of advocates in the same cause; and however they may have differed among themselves, they have been agreed in their attempts of invalidating the evidence and authority of divine revelation. We might mention Hobbes, Blount, Toland, Collins, Woolston, Tindal, Morgan, Chubb, Lord Bolingbroke, Hume, Gibbon, Paine, &c. Some have added Lord Shaftesbury, and the late Lord Kaimes, to the number. Among foreigners, Voltaire, Rousseau, Condorcet, and many other celebrated French

authors, have rendered themselves conspicuous by their deistical writings. But the friends of Christianity have no reason to regret the free and unreserved discussion which their religion has undergone. Objections have been stated and urged in their full force, and as fully answered; arguments and railery have been repelled; and the controversy between Christians and Deists has called forth a great number of excellent writers, who have illustrated both the doctrines and evidences of Christianity, in a manner that will ever reflect honour on their names, and be of lasting service to the cause of genuine religion, and the best interests of mankind. With all their boast of reason, the deists, have not been able to produce one solid argument to invalidate revelation, or the Christian doctrine of salvation as delivered in the gospel. On the other hand, the truth of revelation has been evinced by the clearest, and most solid arguments, which were ever urged in favour of any truth. We shall here add this advice, viz. let him who wishes to be fully assured of the truth of revelation, attend, in simplicity and sincerity of heart to its doctrines and precepts, and he will experience its efficacy so as fully to be satisfied, that it is of God and not of man.

DE-LA-WAR, a town of Virginia, in King William's county, 20 miles N. by W. of Williamsbury.

DELAWARE, a river of the United States, which was called Chihohocki by the aboriginals, and in an old Nuremburg map is named Zuydt river. It rises by two principal head waters in New York state.

DELAWARE, one of the United States of N. America, situated between 38° 29' 30" and 39° 54' N. lat. and between 75° and 75° 48' W. lon. being in length 92 miles, and in breadth 24, containing 2000 square miles, or 1,200,000 acres. This state derived its name from Lord De-La-War, who was instrumental in establishing the first settlement of Virginia. It is divided into three counties, Newcastle, Kent, and Sussex; whose chief towns are Wilmington, Newcastle, Dover, Milford, and Lewes. Dover is the seat of government. The state of Delaware, the upper parts of the county of Newcastle excepted, are in general low and level. It is chiefly an agricultural state, including a very fertile tract of country; and scarcely any part of the United States is better adapted to the different purposes of agriculture, or in which a greater variety of the most useful productions can be conveniently and plentifully reared. This state produces plentiful crops of Indian corn, barley, rye, oats, flax, buck wheat, and potatoes. It abounds in natural and artificial meadows, containing a very large variety of grasses. Hemp, cotton, and silk, if properly attended to, would thrive well.

DELAWARE BAY is 60 miles long, from the cape to the entrance of the river, Delaware, at Bombay Hook; and occupies a space of about 630,000 acres. It is so wide in some parts, that a ship, in the middle of it, cannot be seen from the land. It opens into the Atlantic on the N. W. and S. E. between Cape Henlopen on the right, and Cape May on the left; which are 18 or 20 miles apart.

DELAWARE COUNTY, in Pennsylvania, is S. W. of Philadelphia county, on Delaware river.

DELAWARE COUNTY, a new county in the state of New York, on the head waters of Delaware river, taken from Otsego county.

DELAWARES, a nation of North American Indians, formerly numerous and powerful, and who possessed part of Pennsylvania, New Jersey, and New York. This name was given them by the Europeans; for they call themselves Lennilenape, that is, Indian men; or Woapanachky, which signifies a people living towards the rising sun. They now reside about half-way between lake Erie and Ohio river.

DELEGATES, COURT OF, a court wherein all causes of appeal, by way of devolution from either of the archbishops, are decided. This is the great court of appeal in all ecclesiastical causes. These delegates are appointed by the king's commission under his great seal, and issuing out of chancery, to represent his royal person, and hear all appeals to him made by virtue of the statute 25 Henry VIII. cap. 19. This commission is usually filled with lords spiritual and temporal, judges of the courts at Westminster, and doctors of the civil law. Appeals to Rome were always looked upon by the English nation, even in the times of Popery, with an evil eye, as being contrary to the liberty of the subject, the honour of the crown, and the independence of the whole

whole realm; and were first introduced in very turbulent times, in the 16th year of King Stephen, (A. D. 1151,) at the same period (Sir Henry Spelman observes,) that the civil and canon laws were first imported into England. However, the custom of appealing to Rome in causes ecclesiastical were so prevalent, that it never could be thoroughly broken off, till the grand rupture happened in the reign of Henry VIII. when all the jurisdiction usurped by the Pope in matters ecclesiastical was restored to the crown, to which it originally belonged: so that the statute 25 Henry VIII. was but declaratory of the ancient law of the realm. But in case the king himself be party in any of these suits, the appeal does not then lie to him in chancery, which would be absurd; but, by the 24 Henry VIII. cap. 12, to all the bishops of the realm, assembled in the upper house of convocation.

DELEGATION, in law, a commission extraordinary given by a judge to take cognisance of, and determine some cause, which ordinarily does not come before him.

DELEGATION, in Scots law, the extinguishing an obligation on a former debtor, by another becoming bound in his place.

DELFINO, a town of European Turkey, in Albania, 356 miles west of Constantinople, and 60 S. S. W. of Edessa.

DELFT, one of the eight departments into which the Batavian republic, was divided in March 1798. Delft is the capital. It is pleasantly situated among the meadows on the river Schie, 3 miles N. W. of Rotterdam.

DELFT WARE, a kind of pottery of baked earth, covered with an enamel or white glazing, which gives it the appearance and neatness of porcelain. Some kinds of it differ much from others, either in sustaining sudden heat without breaking, or in the beauty and regularity of their forms, of their enamel, and of the painting with which they are ornamented. In general, the fine and beautiful enamelled potteries, which approach the nearest to porcelain in external appearance, are least able to resist a brisk fire. Those which best sustain a sudden heat, are coarse, and resemble common pottery. The basis of this pottery is clay, which is to be mixed, when too fat, with such a quantity of sand, that the earth shall preserve enough of its ductility to be worked, moulded, and turned easily: and yet that its fatness shall be sufficiently taken from it, that it may not crack or shrink too much in drying or in baking. Vessels formed of this earth must be dried very gently to avoid cracking. They are then to be placed in a furnace to receive a slight baking, which is only meant to give them a certain consistence or hardness. And, lastly they are to be covered with an enamel or glazing; which is done, by putting upon the vessels thus prepared, the enamel, which has been ground very fine, and diluted with water. As vessels on which the enamel is applied are but slightly baked, they readily imbibe the water in which the enamel is suspended, and a layer of this enamel adheres to their surface: these vessels may then be painted with colours composed of metallic calces, mixed and ground with a fusible glass. When they are become perfectly dry, they are to be placed in the furnace, included in cases of baked earth called seggars, and exposed to a heat capable of fusing uniformly the enamel which covers them. This heat given to fuse the enamel being much stronger than that which was applied at first to give some consistence to the ware, is also the heat necessary to complete the baking of it. The furnace and the colours used for painting this ware, are the same as those employed for Porcelain. The glazing which is nothing but white enamel, ought to be so opaque as not to shew the ware under it. There are many receipts for making these enamels; but all of them are composed of sand or flints, vitrifying salts, oxide of lead, and oxide of tin; and the sand must be perfectly vitrified, so as to form a glass considerably fusible. Somewhat less than an equal part of alkaline salt, or twice its weight of oxide of lead, is requisite to effect such vitrifications of sand. The oxide of tin is not intended to be vitrified, but to give a white opaque colour to the mass; and one part of it is to be added to three or four parts of all the other ingredients taken together. From these general principles various enamels may be made to suit the different kinds of earthenware. To make the enamel, lead and tin are oxydized together with a strong fire; and the sand is also to be made into a frit with the salt or ashes. The whole is then to be well mixed and ground together. The matter is then to be placed under the furnace, where it is melted and vitrified during the baking of the ware. It is next to be ground in a mill, and

applied as above directed. Concerning the earth of which the ware is made, M. Bosc d'Antic observes, that pure clay is not a proper material when used alone. Different kinds of earth mixed together are found to succeed better. Pieces of ware made of clay alone, are found to require too much time to dry; and they crack, and lose their form, unless they are made exceedingly thick. An addition of marle diminishes the contraction of the clay; renders it less compact; and allows the water to escape, without altering the form of the ware in drying. It affords also a better ground for the enamel; which appears more glossy and white than when laid on clay alone. The kinds of clay which are chiefly used in the composition of delft ware, are the blue and green. A mixture of blue clay and marle would not be sufficiently solid, and would be apt to scale, unless it were exposed to a fire more intense than what is commonly used for the burning of delft ware. To give a greater solidity, some red clay is added; which on account of its ferruginous matter, possesses the requisite binding quality. The proportion of these ingredients vary in different works, according to the different qualities of the earths employed. Three parts of blue clay, two parts of red clay, and five parts of marle, form the composition used in several manufactories. M. d'Antic thinks, that the best delft ware might be made of equal parts of pure clay and pure calcareous earth; but this composition would require that the fire should be continued twice as long as it generally is.

DELFTHAVEN, a sea-port town of the late Batavian republic, in the department of Delft, 2 miles S. W. of Rotterdam.

DELHI, or **DELLI**, a province of Hindostan Proper, bounded on the N. W. by Lahore, on the N. E. by Serinagur, on the E. by the Rohila country on the S. by Agra, and on the W. by Moultan.

DELHI, the capital of the above province, is seated on the W. bank of the river Jumna, and is surrounded with brick walls 4 or 5 feet thick; it is the nominal capital, at present, of all Hindostan, and was the actual capital during the greatest part of the time since the Mohammedan conquest. It is 880 miles N. E. by N. of Bombay. Lon. 77. 40. E. Lat. 28. 37. N.

DELIA, in antiquity, a festival celebrated every 5th year in the island of Delos, in honour of Apollo. It was first instituted by Theseus, who at his return from Crete placed a statue there, which he had received from Ariadne.

DELIBAMENTA, in antiquity, a libation to the infernal gods, always offered by pouring downwards.

DELIBERANDI ANNUS, in the Scots law, a year allowed to an heir, to deliberate whether he will enter heir or not.

DELIBERATIVE, [*deliberativus*, Lat.] an appellation given to a branch of rhetoric, employed in proving a thing, or convincing an assembly thereof, in order to persuade them to put it in execution.

DELIBERATIVE VOICE, a right to give advice, and to vote in an assembly. In councils, the bishops have deliberative voices; those beneath them have only consultative voices.

DELICT, in Scots law, a small offence, or breach of the peace, punishable only by fine or short imprisonment.

DELIMA, in botany, a genus of the monogynia order, and polyandria class of plants. No corolla; calyx five-leaved, with a two-seeded berry. One species a native of Ceylon.

DELINQUENT, [from *delinquo*, Lat.] a guilty person, or one who has committed some fault, or offence, for which he is punishable.

DELIQUESCENT, in chemistry, the property which certain bodies have of attracting moisture from the air, and thereby becoming liquid. This property is never found but in saline substances, or matters containing them. It is caused by the great affinity which these substances have for water. The more simple they are, according to Mr. Macquer, the more they incline to deliquescence. Hence, acids, and certain alkalis, which are the most simple, are also the most deliquescent salts. Many neutral salts are deliquescent, chiefly those whose bases are not saline substances. See **CHEMISTRY**.

DELIQUUM, [from *deliquesco*, to be dissolved,] in chemistry, Salt of tartar, or any fixed alkali, set in a cellar or other moist place, and in an open vessel, resolves or runs into a kind of liquor called by the chemists oil of tartar per deliquium.

DELIQUUM, or **DELIQUUM ANIMI**, in medicine, [from *delinquo*,

quo, to swoon,] a swooning or fainting away; called also asphyxia, eclysis, lipopsychia, lipothymia, and syncope.

DELIRIUM, [Lat.] in medicine, the production of ideas not answerable to external causes, from an internal indisposition of the brain, attended with a wrong judgement following from those ideas, and an affection of the mind, and motion of the body, accordingly; and from these increased through various degrees, either alone or joined together, various kinds of deliria are produced.

DELIVERY. See **MIDWIFERY**.

DELMENHORST, a town of Germany, in the circle of Westphalia, and county of Oldenburgh, eight miles S. W. of Bremer.

DELOS, an island of the Archipelago, very famous in ancient history. Originally it is reported to have been a floating island, but afterwards it became fixed. It was fabled to have been the birth-place of Apollo and Diana. Anciently it was governed by its own kings. It is now called *Dii*.

DELOS, an extensive city in the above island, which occupied a spacious plain, reaching from the one coast to the other. It was well peopled, and the richest city in the Archipelago, especially after the destruction of Corinth; merchants flocking thither from all parts, both on account of the immunity they enjoyed, and of its convenient situation between Europe and Asia.

DELPHI, in ancient geography, a town of Phocis situated on the S. W. extremity of mount Parnassus. It was famous for a temple and oracle of Apollo, of which the following was said to be the origin: a number of goats that were feeding on mount Parnassus came near a place which had a deep and long perforation. The steam which issued from the hole seemed to inspire the goats, and they played and frisked about in such an uncommon manner, that the herd was tempted to lean on the hole, and see what mysteries the place contained. He was immediately seized with a fit of enthusiasm, his expressions were wild and extravagant, and passed for prophecies. This circumstance was soon known about the country, and many experienced the same enthusiastic inspiration. The place was revered; a temple was erected to Apollo; and a city built, which became the most illustrious in Phocis. The influence of its oracle controlled the councils of states, directed the course of armies, and decided the fate of kingdoms. The ancient history of Greece is full of its energy, and early register of its authority. The circumjacent cities were the stewards and guardians of the god. Their deputies composed the famous Amphictyonic assembly, which once guided Greece.

DELPHINIUM, **DOLPHIN FLOWER**, or **LARKSPUR**: a genus of the trigynia order, and polyandria class of plants; natural order, Multisiliquæ. No calyx; petals five; nectarium bifid, horned behind; siliquæ three or one. There are eleven species; hardy annuals or perennials. They are herbaceous plants of upright growth, rising from 18 inches to four feet in height, garnished with finely divided leaves, and terminated by long spikes of pentapetalous flowers of blue, red, white, or violet colours.

DELPHINIUS, an epithet of Apollo, so called, as it is pretended, because he assumed the form of a dolphin, to conduct Castalius and his colony from the isle of Crete to the Sinus Crisæus Delphinium, one of the courts of judicature of the Athenians.

DELPHINUS, the **DOLPHIN**, in astronomy. See **ASTRONOMY**.

DELPHINUS, the **DOLPHIN**, in zoology, a genus of the class mammalia, order cetæ. Teeth in each jaw; spiracle on the head. Shaw enumerates six species, and Gmelin four.

D. DELPHIS, the **TRUE DOLPHIN**. Historians and philosophers seem to have contended who should invent most fables concerning this fish. It was consecrated to the gods, was celebrated in the earliest time for its fondness of the human race, was honoured with the title of the sacred fish, and distinguished by those of boy-loving and philanthropist. It gave rise to a long train of inventions, proofs of the credulity and ignorance of the times. Aristotle steers the clearest of all the ancients from these fables, and gives in general a faithful history of this animal; but the elder Pliny, Ælian, and others, seem to preserve no bounds in their belief of the tales related of this fish's attachment to mankind. Scarce an accident could happen at sea, but the dolphin offered himself to convey to shore the unfortunate. Arion the musician, when flung into the ocean by the pirates, was received and saved by this benevolent fish. (Ovidii Fasti. Lib. ii. 113.) We are at a loss to account for the origin of those fables, since it does not ap-

pear that the dolphin shews a greater attachment to mankind, than the rest of the cetaceous tribe. We know, that at present the appearance of this fish and the porpessæ are far from being esteemed favourable omens by the seamen: for their boundings, springs, and frolics, in the water, are held to be sure signs of an approaching gale. It is during their leaps out of that element, that they assume a temporary form that is not natural to them; but which the ancient painters and sculptors have almost always given them. A dolphin is scarce exhibited by the ancients in a straight shape, but almost always incurvated: such are those on the coin of Alexander the Great, preserved by Belon, as well as on several other pieces of antiquity. The poets describe them much in the same manner, and it is not improbable but that the one had borrowed from the other. (See Senec. Trag. Agam. 430.) The natural shape of the dolphin is almost straight, the back being very slightly incurvated, and the body slender: the nose is long, narrow, and pointed, not much unlike the beak of some birds, for which reason the French call it *Poye de mer*. See Plate LV. It has in all forty teeth; twenty-one in the upper jaw and nineteen in the lower; a little above an inch long, conic at their upper end, sharp-pointed, bending a little in. They are placed at small distances from each other; so that when the mouth is shut, the teeth of both jaws lock into one another. It was formerly reckoned a great delicacy: Dr. Caius says, that one, which was taken in his time, was thought a present worthy the duke of Norfolk, who distributed part of it among his friends.

D. PHOCENA, or the **PORPESSE**, is the most abundant of cetaceous animals, and is found particularly in the European seas, whence it often advances very nearly to the mouths of considerable rivers. Its general length is from five to eight feet. Porpesses are gregarious, and are frequently seen frolicking on the water, and playing their uncouth gambols, more especially in boisterous and tempestuous weather. They feed principally on smaller fishes, and pursue the shoals of herrings and mackerel with apparently unwearied vigour and insatiable appetite. They are covered immediately under the skin with a fatty substance of considerable thickness, and which produces a large quantity of oil. The porpessæ were formerly considered, not merely as eatable, but as a species of luxury, being served up at noble and royal tables. Such, however, are the revolutions of taste, that by the least fastidious appetite this food is at present decidedly rejected.

D. ORCA, the **GRAMPUS**, is found from the length of fifteen feet to that of twenty-five. It is remarkably thick in proportion to its length, one of eighteen feet being in the thickest place ten feet diameter. With reason then did Pliny call this "an immense heap of flesh armed with dreadful teeth." It is extremely voracious; and will not even spare the porpessæ, a congenerous fish. It is said to be a great enemy to the whale, and that it will fasten on it like a dog on a bull, till the animal roars with pain. The nose is flat and turns up at the end. There are 30 teeth in each jaw: those before are blunt, round, and slender: the farthest sharp and thick; between each is a space adapted to receive the teeth of the opposite jaw when the mouth is closed. The spout hole is in the top of the neck. The colour of the back is black, but on each shoulder is a large white spot; the sides marbled with black and white; the belly of a snowy whiteness. These fishes sometimes appear on our coasts; but are found in much greater numbers off the N. Cape in Norway, whence they are called the North-Capers.

DELPHOS, a town, or rather village, of Turkey in Asia, in the province of Libadia: occupying part of the site of the ancient Delphi.

DELSPERG, a town of Switzerland, in the bishopric of Basle, 10 miles N. W. of Soleure.

DELTA, a part of Lower Egypt, which takes up a considerable space of ground between the branches of the Nile and the Mediterranean Sea: the ancients called it the Delta, because it is in the form of a triangle, like the Greek Δ. The principal towns on the coast are Damietta, Rosetta, and Alexandria; but, within land, Menousia, and Maaku or Elmalâ.

DELTOIDE, [from *delta*, *delta*, the fourth letter of the Greek alphabet, and Δ, likeness; so called by reason of its resembling this letter,] an epithet applied to a triangular muscle arising from the clavicula, and from the process of the same, whose action is to raise the arm upward. See **ANATOMY**.

DELUGE, [*diluvium*, Lat.] an inundation, or overflowing of the earth, either wholly, or in part, by water. We have several deluges recorded in history, as that of Ogyges, which overflowed almost all Attica, and that of Deucalion, which drowned all Thessaly, in Greece: but the most memorable was that called the universal deluge, or Noah's flood, which overflowed and destroyed the whole earth, and out of which only Noah, and those with him in the ark, escaped. This flood makes one of the most considerable epochs in chronology. Its history is given by Moses, Gen. chap. vi. and vii. Its time is fixed by the best chronologers, to the year from the creation, 1656, answering to the year before Christ, 2348. From this flood, the state of the world is divided into diluvian and antediluvian. Among the many testimonies of the truth of this part of the Mosaic history, we may account the general voice of mankind at all times, and in all parts of the world. The objections of the free-thinkers have indeed principally turned upon three points, viz. 1. The want of any direct history of that event by the profane writers of antiquity: 2. the apparent impossibility of accounting for the quantity of water necessary to overflow the whole earth to such a depth as it is said to have been: and 3. there appearing no necessity for an universal deluge, as the same end might have been accomplished by a partial one. The first of these objections has given rise to several very elaborate treatises. Mr. Bryant, in his *System of Mythology*, has with great learning and considerable success endeavoured to shew, that the deluge was one of the principal, if not the only foundation, of the Gentile worship; that the first of all their deities was Noah; that all nations of the world look up to him as their founder: and that he, his sons, and the first patriarchs, are alluded to, in most if not all of the religious ceremonies, not only of the ancient but of the modern heathens. In short, he observes that the deluge, so far from being forgot, or obscurely mentioned by the heathen world, is in reality conspicuous throughout every one of their acts of religious worship. The Egyptian Osiris (he says) was the same with Ham the son of Noah; though the name was sometimes bestowed on Noah himself. Osiris, according to Diodorus Siculus, was wonderfully preserved in an ark, and taught the use of the vine; to build, plant, &c. He proceeds to shew from the hieroglyphics, fables, and ceremonies, which are found in the heathen mythology, and history, as well as from the names which were applied to the objects and places of their worship, as gods, heroes, temples &c. that an indubitable account of an universal deluge and the principal circumstances of it, as mentioned in the sacred scriptures, is preserved in every part of the pagan world. 2. The fact being thus established by the universal consent of mankind, that there was a general deluge which overflowed the whole world; it is worthy of inquiry, by what means it may be supposed to have been accomplished. The chief hypotheses are the following:—1. It has been asserted, that a quantity of water was created on purpose, and at a proper time annihilated, by divine power. This, however, besides its being absolutely without evidence, is directly contrary to the words of the sacred writer, whom the asserters of this hypothesis mean to defend. He expressly derives the waters of the flood from two sources; first, the fountains of the great deep, which he tells us were all broken up; and secondly, the windows of heaven, which he says were opened: and speaking of the decrease of the waters, he says, the fountains of the deep and the windows of heaven were stopped, and the waters returned continually from off the earth. It is obvious, that Moses was so far from having any difficulty about the quantity of water, that he thought the sources from whence it came were not exhausted; since both of them required to be stopped by the same almighty hand who opened them. 2. Dr. Burnet, in his "*Telluris Theoria Sacra*," endeavours to shew, that all the waters in the ocean are not sufficient to cover the earth to the depth assigned by Moses. Supposing the sea drained quite dry, and all the clouds of the atmosphere dissolved into rain, we should still want the greatest part of the water of a deluge. According to the Dr. no less than eight oceans would have been requisite. To get clear of this difficulty, he and others have adopted Descartes's theory. That philosopher will have the antediluvian world to have been perfectly round and equal, without mountains or valleys. He accounts for its formation on mechanical principles, by supposing it at first in the condition of a thick turbid fluid replete with divers heterogeneous matters; which, subsiding by slow degrees, formed themselves into different concentric strata, or beds, by the laws of gravity. Dr. Burnet improves

on this theory, by supposing the primitive earth to have been no more than a crust investing the water contained in the ocean, and in the central abyss, which he and others suppose to exist in the bowels of the earth. At the time of the flood, this outward crust broke in a thousand places; and sunk down among the water, which thus spouted up in vast cataracts, and overflowed the whole surface. He supposes also, that before the flood there was a perfect coincidence of the equator with the ecliptic, and consequently that the antediluvian world enjoyed a perpetual spring; but that the violence of the shock, by which the outer crust was broken, shifted also the position of the earth, and produced the present obliquity of the ecliptic. This theory is not only equally arbitrary with the former, but directly contrary to the words of Moses, who assures us, that all the high hills were covered; while Dr. Burnet affirms that there were no hills then in being. 3. Other authors, supposing a sufficient fund of water in the sea or abyss, are only concerned for an expedient to bring it forth. Accordingly Mr. Ray has recourse to a shifting of the earth's centre of gravity, which, drawing after it the water out of its channel, overwhelmed the several parts of the earth successively. But this could only occasion a partial deluge in that part of the globe, towards which the centre of gravity was translated: nor can the possibility of such a translation be allowed, since the centre of gravity is the necessary result of the materials composing our globe, and not alterable whilst the parts remained in the same position. 4. Dr. Hook's opinion of the compression of a shell of earth into a prolate spheroid, thereby pressing out the water of the abyss under the earth, may very well account for the waters overflowing two opposite zones of the globe; but the middle zone being by much the greater part of the earth's surface, must thus have been raised higher from the centre, and consequently more out of the water than before. 5. Dr. Halley ascribes the deluge to the shock of a comet, whereby the polar and diurnal rotation of the globe would be instantly changed. The great agitation that must have been occasioned by it in the sea, he observes, would be sufficient to account for all those strange appearances of heaping vast quantities of earth and high cliffs upon beds of shells, which were once the bottom of the sea, and raising up mountains where none were before. Such a shock as this, impelling the solid parts, would occasion the waters, and all fluid substances that were unconfined, as the sea is, to run violently towards that part of the globe where the blow was received, and that with force sufficient to take with it the very bottom of the ocean, and remove it to the land. It is objected to this system, that such a shock must have brought on the deluge instantaneously, and not gradually, as it is expressly said to have happened. Phil. Trans. No. 383, p. 120. 6. The inquisitive Mr. Whiston, in his "*New Theory of the Earth*," has a very ingenious hypothesis, similar to that of Dr. Halley, but more fully explained. He shews from several remarkable coincidences, that a comet descending in the plane of the ecliptic, towards its perihelion, passed just before the earth on the first day of the deluge; the consequences whereof would be, first, that this comet, when it came below the moon, would raise a vast and strong tide, both in the small seas, which, according to his hypothesis, were in the antediluvian earth, (for he allows no great ocean there as in ours,) and also in the abyss which was under the upper crust of the earth; and this tide would rise and increase all the time of the approach of the comet towards the earth; and would be at its greatest height when the comet was at its least distance from it. By the force of this tide, as well as by the attraction of the comet, he judges, that the abyss must put on an elliptical figure, whose surface being considerably larger than the former spherical one, the outward crust of the earth, incumbent on the abyss, must accommodate itself to that figure, which it could not do while it held solid, and conjoined together. He concludes, therefore, that it must of necessity be extended, and at last broke by the violence of the said tides and attraction; out of which the included water issuing, was a great means of the deluge: this answering to what Moses speaks of the "fountains of the great deep being broke open."—Again, the same comet, he shews, in its descent towards the sun, passed so close by the body of the earth, as to involve it in its atmosphere and tail for a considerable time; and of consequence left a vast quantity of its vapours, both expanded and condensed, on its surface; a great part of which being rarefied by the solar heat, would be drawn up into the atmosphere, and afterwards return in violent rains; and this he takes to be what Moses intimates by "the windows of heaven being

being opened," and particularly by the "forty days rain." For as to the following rain, which with this made the whole time of raining 150 days, Mr. Whiston attributes it to the earth coming a second time within the atmosphere of the comet as the comet was on its return from the sun. 7. Dr. Woodward, taking the several strata found in the earth for the relicts of a deluge, and considering the circumstances of those fishes, shells, and other exuviae, found in them, draws several inferences, which seem to illustrate the effects of the deluge. These marine bodies, and other spoils of salt-water fish, were carried out of the sea by the universal deluge; and on the return of the water, were left behind upon the land, &c. See Nat. Hist. of the Earth, p. 1 and 2. 8. According to M. De La Pryme, the antediluvian world had an external sea as well as land, with mountains, rivers, &c. and the deluge was effected by breaking the subterraneous caverns, and pillars thereof, with dreadful earthquakes, and causing the same to be for the most part, if not wholly, absorbed, swallowed up, and covered by the seas that we now have. This earth of ours arose (he says) out of the bottom of the antediluvian sea; and in its room, just as many islands are swallowed down, and others thrust up in their stead. 9. Mr. King has lately adopted an hypothesis resembling this last. He ascribes the deluge to subterraneous fires within the bowels of the earth, which burst forth with great violence under the sea, and raised up the bottom of the ocean, so as to pour out the waters over the face of what was before dry land, which thus became the sea, and has since continued, and that which was before the bottom of the sea became dry land. An earthquake thus occasioned will account, he supposes, for the access of the deluge and the confused disposition of marine productions in the post-diluvian earth. Phil. Trans. vol. lvii. p. 44, &c. These three last hypotheses appear to be pretty plausible, because they seem to account for the well-known phenomena of shell-fish, shells, and various other marine productions, as well as trees and the bones and horns of numberless quadrupeds, &c. being found deeply buried in the earth among various strata, and in the heart or mountains far distant from the sea, or the places where the plants and animals are originally and usually produced. But on these, as on all the other hypotheses, it may be remarked, that they are quite arbitrary, and without the least foundation from the words of Moses. The sacred historian speaks not one word of earthquakes, comets, or subterraneous fires; nay, from the nature of the thing, we know it is impossible that the flood could have been occasioned by an earthquake, and the ark preserved, without a miracle, which is not to be supposed, when we endeavour to account for events upon natural principles. It is certain, that if a ship sinks at sea, the commotion excited in the water by the descent of such a large body, will swallow up a small boat that happens to come too near. If the pillars of the earth itself then were broken, what must the commotion have been, when the continents of Europe, Asia, and Africa, descended into the abyss at once? not to mention America, which lying at so great a distance from Noah, he might be supposed out of danger from that quarter. By what miracle was the ark preserved amidst the tumult of those impetuous waves which must have rushed in from all quarters? Besides, as the ark was built not at sea, but on dry ground; when the earth on which it rested sunk down, the ark must have sunk along with it; and the waters falling in as it were overhead, must have dashed in pieces the strongest vessel that can be imagined. Earthquakes, also, operate suddenly and violently; whereas, according to the Mosaic account, the flood came on gradually, and did not arrive at its height till six weeks, or perhaps five months, after it began. 10. Mr. Hutchinson and his followers present us with a theory of the deluge, which they pretend to derive from the word of God itself. This theory has been illustrated by Mr. Catcot, who, in 1768, published a volume on the subject. He asserts, that when the world was first created, at the time when it is said to have been "without form and void," the terrestrial matter was then entirely dissolved in the aqueous; so that the whole formed, as it were, a thick muddy water. The figure of this mass was spherical; and on the outside of this sphere lay the gross dark air. Within the sphere of the earth and water was an immense cavity, called by Moses the deep; and this internal cavity was filled with air of a kind similar to that on the outside. On the creation of light, the internal air received elasticity sufficient to burst out through the external covering of earth and water. Upon this the water descended, filled up the void, and left the earth in a form

similar to what it hath at present. Thus, according to him, the antediluvian world, as well as the present, consisted of a vast collection of water, called the great deep, or the abyss; and over this the shell of earth perforated in many places; by which means the waters of the ocean communicated with the abyss. The breaking up of these fountains was occasioned by a miraculous pressure of the atmosphere, from the immediate action of the Deity himself. So violent was this pressure, that the air descended to where it had been originally; occupied the space of the abyss; and drove out the waters over the whole face of the dry land. But this account, so far from being infallibly certain, seems inconsistent with the most common observations. No pressure, however violent, will cause water to rise above its level, unless that pressure is unequal. If, therefore, the atmosphere entered into the supposed abyss, by a vehement pressure on the surface of the ocean, that pressure must only have been on one place, or on a few places: and even though we suppose the atmosphere to have been the agent made use of, it is impossible that it could have remained for any time in the abyss without a continued miracle; as the pressure of the water would immediately have forced it up again through those holes which had afforded it a passage downwards. The explanation given from Hutchinson by Mr. Catcot, of the "windows of heaven," is somewhat extraordinary. According to him, these windows are not in heaven, but in the bowels of the earth; and mean no more than the cracks and fissures by which the airs found a passage through the shell or covering of earth, which they utterly dissolved and reduced to its original state of fluidity. It is, however, difficult to conceive how the opening of such windows as these could cause a violent rain for 40 days and nights. These several theories are all of them very far from being satisfactory, and some of them are quite contradictory: however, they serve to shew the weakness of our reason and the limited state of our knowledge, for though we cannot find out one way naturally to account for the deluge, yet we are well satisfied that God could find a thousand ways to effect this purpose. The following theory, inserted under the article DELUGE, in the Encyclopædia Britannica, is more agreeable both to Scripture, and to the latest discoveries in natural philosophy, than any of those above-mentioned. 1. "If we consider the quantity of water requisite for the purpose of the deluge, it will not appear so very extraordinary as has been commonly represented. The height of the highest hills is thought not to be quite four miles. It will therefore be deemed a sufficient allowance, when we suppose the waters of the deluge to have been four miles deep on the surface of the ground. Now it is certain, that water, or any other matter, when spread out at large upon the ground, seems to occupy an immense space in comparison of what it does when contained in a cubical vessel, or when packed together in a cubical form. Suppose we wanted to overflow a room 16 feet every way, or containing 256 square feet, with water, to the height of one foot, it may be nearly done by a cubical vessel of six feet filled with water. A cube of eight feet will cover it two feet deep, and a cube of ten feet will very nearly cover it four feet deep. It makes not the least difference whether we suppose feet or miles to be covered. A cube of ten miles of water would very nearly overflow 256 square miles of plain ground to the height of four miles. But if we take into our account the vast number of eminences with which the surface of the earth abounds, the above-mentioned quantity of water would do a great deal more. If, therefore, we attempt to calculate the quantity of water sufficient to deluge the earth, we must make a very considerable allowance for the bulk of all the hills on its surface. To consider this matter, however, in its utmost latitude: the surface of the earth is supposed, by the latest computations, to contain 199,512,595 square miles. To overflow this surface to the height of four miles, is required a parallelopiped of water 16 miles deep, and containing 49,878,148 square miles of surface. Now, considering the immense thickness of the globe of the earth, it can by no means be improbable, that this whole quantity of water may be contained in its bowels, without the necessity of any remarkable abyss or huge collection of water, such as most of our theorists suppose to exist in the centre. It is certain, that as far as the earth has been dug, it hath been found not dry, but moist; nor have we the least reason to imagine, that it is not at least equally moist all the way down to the centre. How moist it really is cannot be known, nor the quantity of water requisite to impart to it the degree of moisture it has; but we are sure it must be immense.

mense. The earth is computed to be near 8000 miles in diameter. The ocean is of an unfathomable depth; but there is no reason for supposing it more than a few miles. To make all reasonable allowances, however, we shall suppose the whole solid matter in the globe to be only equal to a cube of 5000 miles; and even on this supposition we shall find, that all the waters of the deluge would not be half sufficient to moisten it. The above-mentioned parallelopiped of water would indeed contain 798,050,368 cubic miles of that fluid; but the cube of earth containing no less than 125,000 millions of cubic miles, it is evident that the quantity assigned for the deluge would scarce be known to moisten it. It could have indeed no more effect this way, than a single pound of water could have upon 150 times its bulk of dry earth. We are persuaded therefore, that any person who will try by experiment how much water a given quantity of earth contains, and from that experiment will make calculations with regard to the whole quantity of water contained in the bowels of the earth, must be abundantly satisfied, that though all the water of the deluge had been thence derived, the diminution of the general store would, comparatively speaking, have been next to nothing.

2. It was not from the bowels of the earth only that the waters were discharged, but also from the air; for we are assured by Moses, that it rained 40 days and 40 nights. This source of the diluvian waters hath been considered as of small consequence by almost every one who hath treated on the subject. The general opinion concerning this matter we shall transcribe from the "Universal History," Vol. I. where it is very fully expressed. "According to the observations made of the quantity of water that falls in rain, the rains could not afford one ocean, nor half an ocean, and would be a very inconsiderable part of what was necessary for a deluge. If it rained 40 days and 40 nights throughout the whole earth at once, it might be sufficient to lay all the lower grounds under water, but it would signify very little as to the overflowing of the mountains; so that it has been said, that if the deluge had been made by rains only, there would have needed not 40 days, but 40 years, to have brought it to pass. And if we suppose the whole atmosphere condensed into water, it would not all have been sufficient for this effect; for it is certain, that it could not have risen above 32 feet, the height to which water can be raised by the pressure of the atmosphere: for the weight of the whole air, when condensed into water, can be no more than equal to its weight in its natural state, and must become no less than 800 times denser; for that is the difference between the weight of the heaviest air and that of water." On this subject we must observe, that there is a very general mistake with regard to the air, similar to the above-mentioned one regarding the earth. Because the earth below our feet appears to our senses firm and compact, therefore the vast quantity of water, contained even in the most solid parts of it, and which will readily appear on proper experiment, is overlooked, and treated as a non-entity. In like manner, because the air does not always deluge with excessive rains, it is also imagined that it contains but very little water. Because the pressure of the air is able to raise only 32 feet of water on the surface of the earth, it is therefore supposed we may know to what depth the atmosphere could deluge the earth, if it was to let fall the whole water contained in it. But daily observations shew, that the pressure of the atmosphere has not the least connection with the quantity of water it contains. Nay, if there is any connection, the air seems to be lightest when it contains most water. In the course of a long summer's drought, for instance, the mercury in the barometer will stand at 30 inches, or little more. If it does so at the beginning of the drought, it ought to ascend continually during the time the dry weather continues; because the air is all the while absorbing water in great quantity from the surface of the earth and sea. This, however, is known to be contrary to fact. At such times the mercury does not ascend, but remains stationary; and what is still more extraordinary, when the drought is about to have an end, the air, while it yet contains the whole quantity of water it absorbed, and has not discharged one single drop, becomes suddenly lighter, and the mercury will perhaps sink an inch before any rain falls. The most surprising phenomenon, however, is yet to come. After the atmosphere has been discharging for a number of days successively a quantity of matter 800 times heavier than itself, instead of being lightened by the discharge, it becomes heavier, nay specifically heavier than it was before. It is also certain, that very dry air, provided it is not at the same time very hot, is always

heaviest; and the driest air which we are acquainted with, namely Dr. Priestley's dephlogisticated air, is considerably heavier than the air we commonly breathe. For these reasons we think the quantity of water contained in the whole atmosphere ought to be considered as indefinite, especially as we know that by whatever agent it is suspended, that agent must counteract the force of gravity, otherwise the water would immediately descend; and while the force of gravity in any substance is counteracted, that substance cannot appear to us to gravitate at all. 3. The above considerations render it probable at least, that there is in nature a quantity of water sufficient to deluge the world, provided it was applied to the purpose. We must next consider whether there is any natural agent powerful enough to effect this purpose. We shall take the phrases used by Moses in their most obvious sense. The breaking up of the fountains of the deep we may reasonably suppose to have been the opening of all the passages, whether small or great, through which the subterraneous waters possibly could discharge themselves on the surface of the earth. The opening of the windows of heaven we may also suppose to be the pouring out of the water contained in the atmosphere through those invisible passages by which it enters in such a manner as totally to elude every one of our senses, as when water is absorbed by the air in evaporation. As both these are said to have been opened at the same time, it seems from thence probable, that one natural agent was employed to do both. Now it is certain, that the industry of modern inquirers has discovered an agent unknown to the former ages, and whose influence is so great, that with regard to this world it may be said to have a kind of omnipotence. The agent we mean is electricity. It is certain, that, by means of it, immense quantities of water can be raised to a great height in the air. This is proved by the phenomena of water-spouts. Mr. Forster relates, that he happened to see one break very near him, and observed a flash of lightning proceed from it at the moment of its breaking. The conclusion from this is obvious. When the electric matter was discharged from the water, it could no longer be supported by the atmosphere, but immediately fell down. Though water-spouts do not often appear in this country, yet every one must have made an observation somewhat similar to Mr. Forster's. In a violent storm of thunder and rain, after every flash of lightning, or discharge of electricity from the clouds, the rain pours down with increased violence; thus shewing that the cloud, having parted with so much of its electricity, cannot longer be supported in the form of vapour, but must descend in rain. It is not indeed yet discovered that electricity is the cause of the suspension of water in the atmosphere; but it is certain that evaporation is promoted by electrifying the fluid to be evaporated. (See ELECTRICITY and EVAPORATION.) It may therefore be admitted as a possibility, that the electric fluid contained in the air is the agent by which it is enabled to suspend the water which rises in vapour. If, therefore, the air is deprived of the due proportion of this fluid, it is evident that rain must fall in prodigious quantities. Again we are assured, from the most undeniable observations, that electricity is able to swell up water on the surface of the earth. This we can make it do even in our trifling experiments; and much more must the whole force of the fluid be supposed capable of doing it, if applied to the waters of the ocean, or any others. The agitation of the sea in earthquakes is a sufficient proof of this. (See EARTHQUAKE.) It is certain, that at these times there is a discharge of a vast quantity of electric matter from the earth into the air; and as soon as this happens, all becomes quiet on the surface of the earth. From a multitude of observations it also appears, that there is at all times a passage of electric matter from the atmosphere into the earth, and vice versa from the earth into the atmosphere. There is therefore no absurdity in supposing the Deity to have influenced the action of the natural powers, in such a manner, that for 40 days and nights the electric matter contained in the atmosphere, should descend into the bowels of the earth; if indeed there is occasion for supposing any such immediate influence at all, since it is not impossible that there might have been, from some natural cause, a descent of this matter from the atmosphere for that time. But by whatever cause the descent was occasioned, the consequence would be, the breaking up of the fountains of the deep, and the opening the windows of heaven. The water contained in the atmosphere being left without support, would descend in impetuous rains; while the waters of the ocean, those from which fountains originate, and those contained in the solid earth itself, would rise from

from the very centre, and meet the waters which descended from above. Thus the breaking up of the fountains of the deep, and the opening of the windows of heaven, would accompany each other, as Moses tells us they actually did; for, according to him, both happened on the same day. In this manner the flood would come on quietly and gradually, without that violence to the globe which Burnet, Whiston, and other theorists, are obliged to suppose. The abatement of the waters would ensue on the ascent of the electric fluid to where it was before. The atmosphere would then absorb the water as formerly; that which had ascended through the earth would again subside; and thus every thing would return to its pristine state." 3. The proof of the universal deluge is so strong from the traditions prevalent among almost all nations on the face of the earth, that no farther objection could be made to the Mosaic account, were it not that the necessity of an universal deluge is denied by some, who contend that all the deluges mentioned in history, or recorded by tradition, were only partial, and may be accounted for from the swelling of rivers, or other accidental causes. Many indeed, even of those who profess to believe the Mosaic account, have thought that the deluge was not universal; or, that though it might be universal with respect to mankind, it was not so with regard to the earth itself. The learned Isaac Vossius was of this opinion, though his reasons seem principally to have been, that he could not conceive how an universal deluge could happen. Bishop Stillingfleet adopted the same opinion, from a persuasion that the earth was by no means fully peopled, and therefore there was no necessity for the deluge being universal. And Mr. Coetlogon, in his *Universal History of Arts and Sciences*, has adopted the same idea, to accommodate the belief of a deluge to the opinions of freethinkers. All the arguments that have been advanced by these ingenious authors, in support of a partial deluge, may be summed up in the three following articles: 1. The impossibility, in a natural way, of accounting for the quantity of water necessary to overflow the whole world; 2. The small number of mankind supposed at that time to have existed on the earth; and, 3. The inutility of an universal deluge; when the divine purposes could have been equally well answered by a partial one. But to all this we may make one general answer, that a partial deluge, sufficiently great to have overwhelmed the whole human race, though the globe had not been half-peopled, is in the nature of things impossible. We cannot imagine that the waters could accumulate upon any country without going off to the sea, while the latter retained its usual level; neither can we suppose any part of the sea to remain above the level of the rest. On the supposition of Bishop Stillingfleet, therefore, that the deluge extended over the whole continent of Asia, we know that it must have covered the high mountains of Ararat, on which the ark rested; Caucasus, Taurus, &c. The height of Ararat is indetermined, as no traveller of any credit pretends to have ascended to its top; but from the distance at which it is seen, we can scarce look upon it to be inferior to the most celebrated mountains of the old continent. Sir John Chardin thinks that some part of Caucasus is higher; and supposing each of these to be only a mile and an half in height, the sea all round the globe must have been raised to the same height; and therefore all that could remain of dry ground, as a shelter to animals of any kind, must have been the uninhabitable tops of some high mountains scattered at immense distances from one another. We may, therefore, with equal reason suppose, that these were in like manner covered, and that no living creature whatever could find shelter for a moment; and it is certainly more agreeable for the character of the Deity to believe, that he would at once destroy animal life by suffocation in water, rather than allow numbers of them to collect themselves on the tops of mountains, to perish with hunger and cold. It is besides very improbable, that any creature, whether bird or beast, could sustain a continued rain of 40 days and 40 nights, even without supposing them to have been absolutely immersed in water. This consideration alone is sufficient to shew, that the deluge must have been universal with regard to the world as well as the human race. At the time of the deluge, according to the most moderate computations, the world must have been vastly more full of people than at present. The lowest calculation indeed seems incredible; since, according to it, the world must have contained upwards of 68,719 times as many inhabitants as are at present to be met with in the empire of China, the most populous country in the world: but China bears a much larger proportion to the habit-

able part of the world than this. The violences exercised by mankind upon one another, have always been the chief means of thinning their numbers, and preventing the earth from being overstocked with inhabitants; and the strong expression in Scripture, that the "earth was filled with violence," shews that it must have gone to an extraordinary height. But though this violence must have undoubtedly thinned the old world of its inhabitants, it must likewise have dispersed some of them into distant regions. There is therefore no reason for supposing, that before the flood the human race were not driven into the remotest regions of the habitable world, or that America was destitute of inhabitants then, more than it is at present. At any rate, the schemes of Vossius and Coetlogon, who would confine the whole race of mankind to a small part of Asia, must appear highly erroneous. Objections have been made to the doctrine of an universal deluge from the state of the continent of America, and the number of animals peculiar to that and other countries, which could not be supposed to travel to such a distance either to, or from the ark. On this subject bishop Stillingfleet observes, that the supposition of animals being propagated much farther in the world than mankind before the flood, seems very probable, "because the production of animals is parallel in Genesis with that of fishes, and both of them different from man. (See Gen. i. 20-25.) From hence I observe this difference between the formation of animals and of man, that in one, God gave a prolific power to the earth and waters for the production of the several living creatures which came from them, so that the seminal principles of them were contained in the matter out of which they were produced, which was otherwise in man, who was made by a peculiar hand of the great Creator himself, who thence is said to have formed man out of the dust of the ground. If now this supposition be embraced, by it we presently clear ourselves of many difficulties concerning the propagation of animals in the world, and their conservation in the ark. Besides, some kind of animals cannot live out of the climate wherein they are; and there are many sorts of animals discovered in America and the adjoining islands, which have left no remainders of themselves in these parts of the world. And it seems very strange, that these should emigrate into those parts of the world from the place of the flood, and leave none at all of their number behind them in these parts whence they were propagated." To this Mr. Cockburn, in his treatise on the deluge, replies, 1. That as it pleased God to create only one man and one woman at the beginning, and their posterity were sufficient to overspread the earth, it might well be supposed to be furnished with animals from an original pair of each. 2. On the supposition of many pairs of brute animals having been created originally, they must, when the human race were few in number, have multiplied to such a degree as to render the world uninhabitable. We have good reason therefore to conclude, that there was but one pair of animals created at first, that they might not increase too fast for mankind; and though they would multiply much more, and increase faster than men could do, they had room to spread themselves for a long time without much annoyance to man; and as men increased in number and extended their habitations, they would be able to drive them further off, or defend themselves from their depredations." 3. Though at the restoration of the world it was to be re-peopled by six persons instead of two, and though at the same time animal food was given to man, yet Noah was commanded only to take a single pair of each of the animals, clean beasts, which are but few in number, only excepted. It is further observable, that notwithstanding this scanty supply of animals, they had increased so much by the time of Nimrod, that it then became necessary to hunt and destroy them; and Nimrod was celebrated for his courage and skill in that necessary employment. 4. Mr. Cockburn is of opinion, that America must have been peopled before the flood, as the old continent could not be supposed able to hold the number of inhabitants. 5. With regard to the main difficulty, viz. how the animals peculiar to different countries could travel to such distances to and from the ark, he replies, that America has nothing peculiar to it, but what may equally well be urged both with respect to Asia and Africa; each of them having animals peculiar to themselves. It is also possible, that there might formerly be a more easy communication between the Asiatic and American continents than there is now. He likewise observes, that though the ark rested on mount Ararat, yet we are not told where it was built, which might be far enough from the place commonly supposed.

posed. But in whatever part of the earth the ark was built, it was at God's command that the several kinds of animals came thither in order to their preservation; and his power could bring them from the farthest parts of the earth, during the 120 years that the world lay under condemnation. Though after all, none of the animals might have very far to travel to the ark; for if only one pair of each kind was created at first, and all of these in or near one place, since they were all brought before Adam, and received names from him, there is no absurdity in supposing, that some of every kind might remain in the country where they were first produced, from whence Noah's habitation might not be very distant. Neither can any objection be brought from the extinction of some species of animals in certain countries of the world, since they might have been hunted and destroyed either by the human race, or by other creatures. Among other questions which have been started on this subject, one is, by what means were the ravenous animals, which feed only upon flesh, supported in the ark? For this some authors have supposed, that Noah, besides those animals whom he took into the ark for preservation, took likewise a great number for slaughter. Bishop Wilkins has allowed no fewer than 1825 sheep, though he was of opinion, that there were no carnivorous animals before the flood; and this latter opinion is adopted by Mr. Cockburn. The idea indeed of slaughtering a number of harmless animals to satisfy a few vile rapacious ones, and that too in a place designed for the common asylum of the animal creation, seems inconsistent with that scheme of mercy displayed in the whole transaction. It is by much the more probable supposition, then, that though some animals had been accustomed to live on flesh in their natural state, they could nevertheless subsist upon vegetable food. This seems the more probable, as some animals naturally carnivorous, particularly dogs and cats, may be supported in their domestic state by vegetable food alone. If we extend this to the whole canine and feline genera, we shall take in the most of the beasts of prey; as lions, tigers, leopards, panthers, wolves, foxes, hyænas, &c. Bears are well known sometimes to feed on berries; snakes will eat bread and milk; and there is no reason to suppose, that even the most carnivorous birds could not be kept alive by gram or other vegetable food. By thus excluding such a number of useless animals, a very considerable space will be allowed for the circulation of air in the ark, the want of which seems to be the most inexplicable difficulty, if we may judge from the present constitution of things. See **ARK**.

DEMAIN, DEMEAN, DEMESNE, [*domaine*, Fr.] 1. That land which a man holds originally of himself, called *dominium* by the civilians, and opposed to *feodum*, or fee, which signifies those that are held of a superior lord. It is sometimes used also for a distinction, between those lands that the lord of the manor has in his own hands, or in the hands of his lessee, demised or let upon a rent for a term of years or life, and such other lands appertaining to the said manor as belong to free or copyholders. 2. Estate in land.

DEMAND, calling upon a man for any sum or sums of money, or any other thing due. By the several statutes of limitation, debts, claims, &c. are to be demanded and made in time, or they will be lost by law. There are two manner of demands, the one in deed, the other in law; in deed, as in every precept there is an express demand; in law, as in every entry in land, distress for rent, taking or seizing of goods, and such like acts, which may be done without any words, are demands in law. Where there is a duty which the law makes payable on demand, no demand need be made; but if there be no duty but demand, in such case there must be a demand to make the duty.

DEMERARA, a district of South America, in Dutch Guiana, which forms one government with Issequibo.

DEMERARA, DEMERARY, or DEMERARI, a river in the above district, about 2 miles wide at its mouth, opposite the fort, on the E. bank of the river.

DEMESNE. See **DEMAIN**.

DEMESNE LANDS. See **REVENUE**.

DEMETÆ, an ancient people of Britain, supposed to be a branch of the Silures, who occupied that inner corner formed by the Bristol Channel and the Frish Sea.

DEMETER, or DEMETRA, [*Δημήτηρ*, Gr.] the name given by the Greeks to Ceres.

DEMETRIA, a festival in honour of Ceres. It was then cus-

tomary for the votaries of the goddess to lash themselves with whips made of the bark of trees.

DEMETRIOWITZ, a city of Russia, in the duchy of Smolensko. Lon. 37. 0. E. Lat. 53. 20. N.

DEMETRIUS I. surnamed **POLIORCETES**, *i. e.* a taker of towns, was the son of Antigonus, king of Asia, by Stratonice. At the age of twenty-two, he was sent by his father against Ptolemy, who invaded Syria. He was defeated near Gaza; but he soon repaired his loss by a victory over one of the generals of the enemy. He afterwards sailed with a fleet of 250 ships to Athens, and restored the Athenians to liberty, by freeing them from the power of Cassander and Ptolemy, and expelling the garrison, which was stationed there under Demetrius Phalereus. After this successful expedition, he besieged and took Munychia, and defeated Cassander at Thermopylae. His reception at Athens after these victories was attended with the most servile flattery; and the Athenians were not ashamed to raise altars to him as to a god, and consult his oracles. This uncommon success raised the jealousy of the successors of Alexander; and Seleucus, Cassander, and Lysimachus, united to destroy Antigonus and his son. Their hostile armies met at Ipsus, B. C. 301: Antigonus was killed in the battle; and Demetrius, after a severe loss, retired to Ephesus. The Athenians, who had lately adored him as a god, refused to admit him into their city. But he soon after ravaged the territory of Lysimachus, and reconciled himself to Seleucus, to whom he gave his daughter Stratonice in marriage. Athens now laboured under tyranny, and Demetrius relieved it a second time, and pardoned the inhabitants. The loss of his possessions in Asia recalled him from Greece, and he established himself on the throne of Macedonia by killing Alexander, in self-defence. Here he was continually at war with the neighbouring states, and the superior power of his adversaries obliged him to leave Macedonia, after he had sat on the throne for seven years. He passed into Asia, and attacked some of the provinces of Lysimachus with various success; but famine and pestilence, having destroyed the greatest part of his army, he applied to Seleucus for assistance. He met with a kind reception: but hostilities were again soon begun; and though he gained some advantages over his son-in-law, he was at last forsaken by his troops, and taken prisoner. Though he was kept in confinement by Seleucus, yet he maintained himself like a prince, and passed his time in hunting and in every laborious exercise. His son Antigonus offered Seleucus all his possessions, and even his person, to procure his father's liberty; but all proved unavailing, and Demetrius died in the 54th year of his age, after a confinement of three years, B. C. 286. His remains were given to Antigonus, and honoured with a splendid funeral at Corinth, and thence conveyed by his friends with royal pomp to Demetrius.

DEMETRIUS, the disciple of Apollonius Tyaneus, a cynic philosopher in the age of Caligula. The emperor wished to gain the philosopher to his interest by a large present; but Demetrius refused it with indignation, and said, "If Caligula wishes to bribe me, let him send me his crown. Vespasian was displeased with his insolence, and banished him to an island. The cynic derided the punishment, and satirized the emperor. He died in an extreme old age; and Seneca observes, that "nature had brought him forth to shew mankind, that an exalted genius can live securely without being corrupted by the vices of the surrounding world."

DEMIANSKOI, a town of Russia, in the government of Tobolsk, 100 miles N.N.E. of Tobolsk.

DEMI-CANNON LOWEST, a great gun that carries a ball of thirty pounds weight, and six inches diameter. The diameter of the bore is six inches two-eighths parts.

DEMI-CANNON OF THE GREATEST SIZE, a gun six inches and six-eighths parts diameter in the bore, twelve feet long. It carries a ball of six inches five-eighths diameter, and thirty-six pounds weight.

DEMI-CANNON ORDINARY, a great gun six inches four-eighths diameter in the bore, twelve feet long. It carries a shot six inches one-sixth diameter, and thirty-two pounds weight.

DEMI-CULVERIN, ELDER SORT, a gun four inches six-eighths diameter in the bore, ten feet, one-third in length. It carries a ball four inches four-eighths parts diameter, and twelve pounds eleven ounces weight. It weighs 3000 pounds, and carries a ball point blank 178 paces.

DEMI-CULVERIN

DEMI-CULVERIN OF THE LOWEST SIZE, a gun four inches two-eighths diameter in the bore, and ten feet long. It carries a ball four inches diameter, and nine pounds weight. It is 2000 pound weight, and carries a ball 174 paces.

DEMI-CULVERIN ORDINARY, a gun four inches four-eighths diameter in the bore, ten feet long. It carries a ball four inches two-eighths diameter, and ten pounds eleven ounces weight. It is 2700 lb. weight, and carries a ball point blank 175 paces.

DEMI-GORGE, in fortification, is that part of the polygon which remains after the flank is raised, and goes from the curtain to the angle of the polygon. It is half of the vacant space or entrance into a bastion. See **FORTIFICATION**.

DEMI-LUNE, HALF-MOON, in fortification, an outwork consisting of two faces and two little flanks, frequently built before the angle of a bastion, and sometimes also before the curtain, though now much disused. See **FORTIFICATION**.

DEMIQUAVER, a note in music, two of which are equal to a quaver.

DEMISE, in law, is applied to an estate either in fee simple, fee tail, or for term of life or years; and so it is commonly taken in many writs.

DEMISE, and **RE-DEMISE**, denote a conveyance where there are mutual leases made from one to another of the same land, or something out of it.

DEMI-SEMI-QUAVER, in music, the shortest note, two of them being equal to a semi-quaver.

DEMIURGE, [from *δημιος*, a public servant, and *εργον*, work,] in the mythology of the eastern philosophers, was one of the *Æons* employed by the supreme Deity in the creation of the world. The character they give him is a compound of shining qualities and insupportable arrogance; and his excessive lust of empire effaces his talents and virtues. He is represented as claiming dominion over the new world he has formed, as his sovereign right; and excluding totally the supreme Deity from all concern in it, he demands from mankind, for himself and his associates, divine honours.

DEMMIN, a town of Germany, in the circle of Upper Saxony, and duchy of Pomerania, 26 miles S. of Stralsund.

DEMOCIDES, a celebrated physician of Croton, who was famous for his attachment to his native soil. Though caressed and enriched by the king of Persia, whose queen he had snatched from the jaws of death, he abandoned wealth and honours, and by stratagem escaped to the humble comforts of a private life at Croton.

DEMOCRACY, [*δημοκρατία*, from *δemos*, the people, and *κρατία*, to govern,] literally signifies that form of government wherein the people govern, or are equally entitled to govern, themselves. In this sense of the word, the world has not yet seen a pure democracy. Among the ancient republics, the two that approached nearest to it were Athens and Rome. But in both these commonwealths there were distinctions of ranks, between certain privileged orders and the great body of the people, which were inconsistent with that perfect equality, which seems requisite to constitute the essence of a democracy. And personal slavery, which is not only inconsistent with liberty, but imperceptibly undermines it, wherever it is permitted, disgraced the constitutions of both. All the modern states of Europe, that have assumed the name of republics within these few centuries, have been more or less aristocratic. Venice was the most tyrannical aristocracy that ever existed. Genoa was not much better; and of the Swiss cantons, all but one were mere oligarchies. Basil was the only one that had any thing like a democratic form of government, though even it was inferior to that of ancient Athens.

Holland was only a limited monarchy, with the substitution of the title stadtholder for that of King. Of the various republics which the present age has produced, not one can be strictly said to be a pure democracy. Among the sixteen United States of America, not above three have established that *sine qua non* of democracy, universal suffrage; and slavery is not only permitted, but interwoven with the very constitution of the whole United States, although the citizens of three of them have not taken advantage of this permission. And even in the French, Batavian, Cisalpine, Ligurian, Roman, and Helvetic republics, a pure democracy was far from being established, notwithstanding their boasted systems of liberty and equality. For although hereditary honours, distinctions of rank by titles, and ecclesiastical hierarchies, as well as personal slavery, were abolished in all of them, yet a very considerable part of the people had no vote in electing their governors;

even after the privileged electors had exercised their constitutional powers in choosing their representatives, we have seen by recent instances, that the directory (of France at least, and from them we may judge of the rest), could exercise a power beyond the constitution, of turning out and even banishing, a number of those representatives, upon mere alleged disaffection to the constitution, without so much as trial by jury, to establish the fact. In short we may safely say, the experiment of a pure democracy, wherein all do, or may, govern all, by frequent and free election and representation, has not yet been made. The French constitution of 1793, indeed, exhibited a plausible theory of such a perfect democracy; but while the fascinating plan was held out to the people in theory, it was never attempted to be reduced to practice; but, instead of it, the most absolute despotism took place, and a few individuals, assuming the whole power of the state, in their own hands, marked with indelible characters of blood the awful lesson to posterity, of the dreadful consequences of a conjunction of the legislative and executive powers, in the hands of any, but especially in those of a small oligarchy. On the whole, from all the experiments that have as yet been made, the philanthropic philosopher will be apt to doubt, whether a perfect democracy is not inconsistent with the present imperfect state of human nature; and whether, wherever it is attempted to be established, the ungovernable passions of mankind will not soon make it degenerate either into a tyrannical oligarchy, or absolute anarchy.

DEMOCRITUS, a famous philosopher of antiquity, was born at Abdera, in Thrace, about the 80th Olympiad, or B. C. 460. His father, says Valerius Maximus, was able to entertain the army of Xerxes. At his father's death it is said that his portion amounted to about 100 talents, which is near 20,000*l.* sterling. His extraordinary love of knowledge, induced him to travel into all countries famed for learned men. He went to visit the priests of Egypt, from whom he learned geometry; he consulted the Chaldean and the Persian philosophers, and it is said that he penetrated even into India and Ethiopia, to confer with the Gymnosophists. In these travels he wasted his substance, so that on his return, he was obliged to be maintained by his brother; notwithstanding which, he gave such proofs of superior understanding, that he procured the highest honours of his country; which he governed with unlimited sway, as well as consummate wisdom. The magistrates of Abdera made him a present of 500 talents, and erected statues to him even in his lifetime: but being naturally more inclined to contemplation than delighted with public honours and employments, he withdrew into solitude and retirement. He incessantly laughed at human life, as a continued farce, which made the inhabitants of Abdera think he was mad; on which he sent for Hippocrates to cure him; but that celebrated physician having discoursed with the philosopher, expresses the utmost veneration for him, and told the Abderians, that those who esteemed themselves the most healthy were the most distempered. Democritus died, according to Diogenes Laertius, aged 109. He was the author of many books, which are lost; and from these Epicurus borrowed his philosophy.

DEMOIVRE, ABRAHAM, an eminent French mathematician, born at Vitry, in Champagne, in May 1667. Being a protestant, he fled to London upon the revocation of the edict of Nantes, in 1685. He had studied mathematics in France, but the *Principia Mathematica* of Sir Isaac Newton soon convinced him how little he had advanced in the science he professed to teach. He fell hard to work; made himself master of Newton's principles, and soon became connected with, and celebrated among the first rate mathematicians. His abilities soon procured him an admission into the Royal Society of London, and afterwards into the Academy of Sciences at Paris. His merit was so acknowledged by the former, that they judged him a fit person to decide the famous contest between Newton and Leibnitz. The collection of the academy at Paris contains no memoir of this author, who died at London, Nov. 1754, soon after his admission into it; but the Philosophical Transactions of London have several, and all of them interesting. He published also some capital works, such as, "*Miscellanea Analytica, de Seriebus & Quadraturis*," 1730, 4to. But perhaps he has been more generally known by his "*Doctrine of Chances*; or Method of calculating the Probabilities of Events at Play." This work was first printed 1718, in 4to, and dedicated to Sir Isaac Newton: it was reprinted 1738, with great alterations and improvements; and a third edition was afterwards published

with additions, and "A Treatise on Annuities," dedicated to Lord Carpenter.

DEMON. See **DÆMON**.

DEMONA, or VAL DI DEMONA, [*i. e.* the valley of demons,] a province of Sicily, so called from mount *Ætna* being situated in it, whose continual flames led the superstitious inhabitants anciently to believe that it was a chimney of hell.

DEMONOLOGY, [*δαίμων* and *λογία*,] discourse of the nature of devils. Thus king James entitled his book concerning witches.

DEMONSTRABLE, a term used in the schools, to signify that a thing may be clearly proved. Thus it is demonstrable, that the three angles of a triangle, are equal to two right ones.

DEMONSTRATION, [*demonstratio*, Lat.] in logic, a series of syllogisms, all whose premises are either definitions, self-evident truths, or propositions already established. See **LOGIC**.

DEMONSTRATIVE, in grammar, a term given to such pronouns as serve to demonstrate or point out a thing or person. Of this number are *hic, hac, hoc*, among the Latins; and *this, that, these, those*, in English.

DEMOSTHENES, the famous Athenian orator, was born at Athens, B. C. 381. He lost his father at seven years of age; and was placed under the conduct of guardians, who robbed him of his substance, and neglected his education. Demosthenes soon repaired this loss by his extraordinary abilities. He became the disciple of Isæus and Plato, and studied the orations of Isocrates. At the age of 17 he gave a proof of his eloquence and abilities against his guardians, from whom he recovered the greatest part of his estate. His rising talents were, however, impeded by various natural defects, but which he overcame by dint of resolution and unwearied attention. He declaimed by the sea-shore, that he might be used to the noise of a tumultuous assembly; and with pebbles in his mouth, that he might correct a defect in his speech. He practised at home with a naked sword hanging over his shoulder, that he might check an ungraceful motion to which he was subject. He confined himself in a subterraneous cave, to devote himself more closely to study; and to check all inclination to appear in public, he shaved one-half of his head. In this solitary retirement, by the help of a glimmering lamp, he composed the greatest part of his orations, which have since been the admiration of all ages, though his contemporaries and rivals inveighed against them, and observed that they smelt of oil. His abilities as an orator raised him to consequence at Athens, and he was soon placed at the head of government. In this public capacity he roused his countrymen from their indolence, and animated them against the encroachments of Philip of Macedonia. In the battle of Cheronæa, however, his eloquence could not supply the want of courage, and he saved his life by flight. After the death of Philip, he declared himself warmly against his son Alexander; when the Macedonians demanded of the Athenians their orators, Demosthenes reminded his countrymen of the fable of the sheep which delivered up their dogs to the wolves. By the prevalence of party, however, he was forced to retire to Trœzen in *Ægina*, where, it is said, he lived with more effeminacy than heroism. When Antipater made war against Greece after the death of Alexander, Demosthenes was publicly recalled from his exile, and a galley was sent to fetch him from *Ægina*. His return was attended with much splendor, and all the citizens crowded at the Piræus to see him land. But his triumph and popularity were short. Antipater and Craterus were near Athens, and demanded all the orators to be delivered up into their hands. Demosthenes fled to the temple of Neptune in Calauria; when he saw no hopes of safety, he took a dose of poison, which he always carried in a quill, and expired on the day that the Thesmophoria were celebrated, B. C. 322. The Athenians raised a brazen statue to his honour, with a suitable inscription. Demosthenes has been deservedly called the prince of orators. Indeed no orator had ever a finer field than Demosthenes in his *Olynthiacs* and *Philippics*, which are his capital orations; and undoubtedly to the greatness of the subject, and to that integrity, and public spirit, which breathe in them, they owe a large portion of their merit. The subject is, to excite the indignation of his countrymen against Philip of Macedon, the public enemy of the liberties of Greece; and to guard them against the treacherous measures by which that crafty tyrant endeavoured to lull them into a neglect of their danger. To attain this end, he uses every proper means to animate a people, distinguished by justice, humanity, and valour, but in many instances become cor-

rupt and degenerate. He boldly accuses them of venality, indolence, and indifference, to the public good; while at the same time, he reminds them of their former glory, and of their present resources. His contemporary orators, who were bribed by Philip, and who persuaded the people to peace, he openly reproaches as traitors to their country. He not only prompts to vigorous measures, but teaches how they are to be carried into execution. His orations are strongly animated, and full of the impetuosity and ardour of public spirit. His composition is not distinguished by ornament and splendor. It is an energy of thought, peculiarly his own, which forms his character, and raises him above his species. He seems not to attend to words, but to things. We forget the orator, and think of the subject. He has no parade and ostentation, no studied introductions; but is like a man full of his subject, who, after preparing his audience by a sentence or two for the reception of plain truths, enters directly on business. The style of Demosthenes is strong and concise; though sometimes it must be confessed, harsh and abrupt. His words are highly expressive, and his arrangement firm and manly. Negligent of less graces, he seems to have aimed at that true sublime which lies in sentiment. His action and pronunciation are said to have been uncommonly vehement and ardent; which, from the manner of his writings, we should readily believe. His character appears to have been of the austere rather than of the gentle kind. He is always grave, serious, and passionate; never degrading himself, nor attempting any thing like pleasantry. If his admirable eloquence be in any respect faulty, it is that he sometimes borders on the hard and dry. He may be thought to want smoothness and grace; which is attributed to his imitating too closely the manner of Thucydides, who was his great model for style, and whose history he is said to have transcribed eight times with his own hand. But these defects are more than atoned for by that masterly force of masculine eloquence, which, as it overpowered all who heard it, cannot, even in the present day, be read without emotion. Cicero calls him a perfect model, and such as he himself wished to be. These two great princes of eloquence have been often compared together; but the judgement hesitates to which to give the preference. The archbishop of Cambray, however, seems to have stated their merits with great justice and perspicuity, in his "Reflections on Rhetoric, and Poetry." "I do not hesitate (says he) to declare, that I think Demosthenes superior to Cicero. I am persuaded no one can admire Cicero more than I do. He adorns whatever he attempts. He does honour to language. He disposes of words in a manner peculiar to himself. His style has great variety of character. Whenever he pleases, he is even concise and vehement; for instance, against Catiline, against Verres, against Antony. But ornament is too visible in his writings. His art is wonderful, but it is perceived. When the orator is providing for the safety of the republic, he forgets not himself, nor permits others to forget him. Demosthenes seems to escape from himself, and to see nothing but his country. He seeks not elegance of expression; unsought for, he possesses it. He is superior to admiration. He makes use of language, as a modest man does of dress, only to cover him. He thunders, he lightens. He is a torrent which carries every thing before it. We cannot criticise because we are not ourselves. His subject enchains our attention, and makes us forget his language. We lose him from our sight: Philip alone occupies our minds. I am delighted with both these orators; but I confess that I am less affected by the infinite art and magnificent eloquence of Cicero, than by the rapid simplicity of Demosthenes."

DEMPSTER OF COURT, the name formerly given in Scotland to the common executioner, or hangman.

DEMSTER, or DEEMSTER. See **DEEMSTER**.

DEMULCENTS, among physicians, medicines good against acrimonious humours. Such are the roots of marsh-mallows, white lilies, liquorice, and viper-grass, the five emollient herbs, &c.

DEMURRAGE, [from *demur*,] an allowance made by merchants to masters of ships, for their stay in a port beyond the time appointed.

DEMURRER, [*demeurer*, Fr. *i. e.* *manere in aliquo loco, vel morari*,] a kind of pause upon a point of difficulty in an action; for, in every action, the controversy consists either in the fact, or in the law: if in the fact, that is tried by the jury; if in law, then is the case plain to the judge, or so hard and rare, as it breedeth just

just doubt. I call that plain to the judge, wherein he is assured of the law; and in such case the judge, with his associates, proceeds to judgement without farther work. But when it is doubtful to him and his associates, then is their stay made, and a time taken, either for the court to think farther upon it, and to agree, if they can; or else for all the justices to meet together in the Chequer-chamber, and, upon hearing that which the serjeants can say of both parts, to advise, and set down as law, whatsoever they conclude firm, without farther remedy.

DEN, [*den*, Sax.] 1. A cavern or hollow running horizontally, or with a small obliquity under ground; distinct from a hole which runs down perpendicularly. 2. The cave of a wild beast. 3. Den, the termination of a local name, may signify either a valley or a woody place; for the Saxon *den* imports both. It is only near the sea, on a high coast, that dens exist. They are very distinct from glens, which are valleys between hills. These you can easily survey in all their grandeur, from the summit of the hill on either side. But you cannot judge from the appearance of the adjacent grounds, which are highly cultivated, and rise not above the level of the surrounding fields, that there are any such objects as dens, till you come close upon them; and the illusion greatly heightens the pleasure of the spectator. Dens sink suddenly from the common level of the country, and seem to owe their origin to some rivulet or stream: which issuing from springs on the higher lands, and meeting with soft materials on its way, has washed away all these in the course of ages, till it found the hard bottom.

DENARIUS, [*Lat.*] in antiquity, the chief silver coin among the Romans, worth in our money about $7\frac{1}{2}d.$ at $5s. 2d.$ per ounce, or $8d.$ when bullion is high priced. It was about the size of a sixpence but much thicker, and had the emperor's head on the one side: the figures on the reverse were various. In our translation of the New Testament, the denarius is called a penny. See Matth. xxii. 19. A considerable quantity of Denarii, with the heads of Nero, Vespasian, Titus, Domitian, Nerva, Trajan, and Adrian were found near Stirling, in 1766.

DENARIUS was also the name of a Roman weight; the 7th part of an ounce.

DENARIUS is likewise used in our law-books for an English penny.

DENBIGH, or **DENBIGHSHIRE**, a county of N. Wales, bounded on the S. by Merioneth and Montgomery shires, on the N. by part of Flintshire and the Irish sea, on the W. by Caernarvon and part of Merionethshire; and on the E. by Shropshire and Flintshire. It is 48 miles long and 21 broad. The air is wholesome, but sharp; the county being pretty hilly, and the snow lying long on the tops of the mountains.

DENBIGH, the capital of Denbighshire, in N. Wales, 27 miles W. of Chester.

DENDER, a river of France, which runs into the Scheldt at Dendermond.

DENDERA, a town of Egypt, on the W. side of the Nile, at the edge of a small but fertile plain, about half a mile from the river.

DENDERMOND, a handsome town of France, in the department of Dyle, 14 miles E. of Ghent.

DENDRACHATES, in natural history, [from *δένδρον*, a tree, and *αχάτης*, an agate,] the name used by the ancients for an extremely elegant and beautiful species of agate, the ground of which is whitish, variegated with veins of a brighter white, and often very beautiful delineations of trees, mosses, sea-plants, and the like. See **DENDRITES**.

DENDRANATOMY, a term used by some for a description of the various parts of trees; as the root, trunk, branch, bark, wood, pith, flower, fruit, &c. See **PLANTS**, **VEGETATION**, &c.

DENDRITES, or **ARBORIZATIONS**. This appellation is given to figures of vegetables which are frequently observed in fossil substances. These are of two kinds; the one superficial, the other internal. The first are chiefly found on the surface of stones, and between the strata and in the fissures of those of a calcareous nature. Stones of a similar kind, when very compact, sometimes also exhibit internal arborizations; such are the marbles of Hesse, of Angersburg in Prussia, and of Baden-Doullach on the left bank of the Rhine. Several of these dendrites bear a striking resemblance to the poplar; while others exhibit the straight stem, py-

ramidal form, and pendant branches, of the fir. Some specimens of dendrites found in Switzerland, represent, in a very surprising manner, plantations of willows; and many of them are so beautiful, as really to appear the work of art. The superficial dendrites are mostly of a brown, changing gradually to a reddish yellow. The internal dendrites are of a deep black. The most esteemed dendrites are those found in agates; and more particularly in the sardonyx, cornelian, and other precious stones, brought from the East, and which are commonly denominated Moka stones. The Oriental agates display the most varied and beautiful forms. Sometimes they exhibit the appearance of terraces covered with different species of moss, interspersed with plants of the fern-tribe, having large leaves, and the outlines exquisitely finished; the colours are likewise extremely brilliant. A species of metallic dendrites is sometimes formed by means of fire. For example, some kinds of copper ore, on being subjected to the action of heat, and afterwards withdrawn from the furnace, appear covered with brilliant yellow spots, some inches in diameter, exactly resembling in form lichens growing on rocks. These arborizations, which are of pure copper, are very singular; being composed of vertical threads, of about a line in height, united in fasciculi, like so many small sheaves standing upright by the side of each other. The finest specimens of this kind of metallic dendrites are produced at a foundry on the Oural mountains. The ore with which this foundry is supplied, is brought from the mines of Touria, where the most beautiful native copper in a state of vegetation yet known, is to be found. In whatever manner we may be inclined to account for this wonderful phenomenon, it should seem, from the above fact, that the same cause which produces these arborizations in the mine, must likewise produce the same effect after the ore has been subjected to the action of fire. See Plate LIV. fig. 7, and 8.

DENDROMETER, [from *δένδρον*, a tree, and *μετρώω*, to measure,] an instrument lately invented by Messrs. Duncombe and Whittle, for which they obtained a patent, so called from its use in measuring trees. See Plate LIV. fig. 5, and 6. This instrument consists of a semicircle A, divided into two quadrants, and graduated from the middle; upon the diameter B there hangs a plummet L for fixing the instrument in a vertical position; there is also a chord D parallel to the diameter, and a radius E, passing at right angles through the diameter and chord. From a point on the radius hangs an altimeter C, between the chord and diameter, to which is fixed a small semi-circle G, and a screw, to confine it in any position. The altimeter, which is contrived to form the same angle with the radius of the instrument as the tree forms with the horizon, is divided from its centre both ways into forty equal parts; and these parts are again subdivided into halves and quarters. Upon the small semicircle G, on which is accounted the quantity of the angle made by the altimeter and radius, are expressed degrees from 60 to 120, being 30 on each quadrant. The radius is numbered with the same scale of divisions as the altimeter. There is also a nonius to the small semicircle, which shews the quantity of an angle to every five minutes. On the back of the instrument, fig 6, the stock, M, of the sliding piece is confined to the axis N, which moves concentrically parallel to the elevation index F on the opposite side, to which it is fixed. This index is numbered by a scale of equal divisions with the altimeter and radius: at the end of the index is a nonius, by which the angles of elevation above, or of depression below, the horizon, measured upon the semicircle of the instrument, are determined to every five minutes. There is also a groove in the radius, that slides across the axis by means of a screw I, working between the chord and semicircle of the instrument; and this screw is turned by the key. Upon the stock M is a sliding piece P, that always acts at right angles with the altimeter, by means of a groove in the latter. To the shank of the sliding piece is affixed a moveable limb Q, which forms the same angle with the altimeter as the bough forms with the body or trunk of the tree. This limb may be of any convenient length, divided into equal parts of the same scale with all the foregoing divisions. At the extremity of the fixed axis, on a centre, an index R, with telescopic sights, works horizontally upon the moveable limb of the sliding piece. Upon this horizontal index R may be fixed a small quadrant T, described with any convenient radius from the centre on which the index moves, and divided into 90 degrees, beginning at a right

line drawn from the centre at right angles with the fiducial edge of the said index; and upon the extremity of the axis is a nonius, whereby to determine the quantity of an angle upon the quadrant to every five minutes. There are also two small circular arches S, S, serving to keep the sights in a parallel position, each containing an equal number of degrees. Upon these arches is measured the angle, subtending a side equal to the difference of the altitudes of the observed objects above the plane of the horizon, and whose base is the nearest distance between the perpendiculars in which these objects are situated. The dendrometer is fitted to a theodolite, and may be used either with or without it as occasion requires. The principal use of this instrument is for measuring the length and diameter of any tree, perpendicular or oblique, to an horizontal plane, or in any situation of the plane on which it rests, or of any figure, whether regular or irregular, and also the length and diameter of the boughs, by mere inspection; and the inventors of it have calculated tables, annexed to their account of the instrument itself, by the help of which the quantity of timber in a tree is obtained without calculation, or the use of the sliding rule. The instrument is rectified by setting it in a perpendicular position, by means of the plummet, and screwing it to the staff; then the altimeter is placed in the exact position of the tree, whether perpendicular, reclining, or inclining, and screwed fast. If the tree stands on level ground, the horizontal distance from the tree to the axis of the instrument is measured with a tape line, and the radius is moved with a key till that distance be cut upon it by the inside of the diameter; but if the ground be slanting, the distance from the tree to the instrument is measured, and the elevation index is moved till the point of the tree from which the distance was measured is seen through the sights, and there screwed fast; and the radius is moved backwards or forwards with the key till this distance is cut upon the elevation index by the perpendicular line of the altimeter; and the horizontal line will be marked upon the radius by the inside of the diameter. To obtain the length of the tree, the elevation index is first moved downwards, till the bottom of the tree cut by the horizontal wires is observed through the sights, and the feet and inches marked by the index upon the altimeter below the point of sight or horizontal line are noted down: then the index is moved upwards till the part to which you would measure, cut by the horizontal wires, is seen, and the feet and inches marked on the altimeter above the point of sight are noted: these two quantities added together give the exact length of the tree, which is inserted in a field book. For the girth of the tree, the circumference in that part where the horizontal distance was taken, is measured with the tape line; and a sixth part of this circumference is added to the distance on the radius, which was before cut by the inside of the diameter, because the tape line, in taking the distance cannot be applied to the centre of the body of the tree; then the elevation index is lowered to that part of the tree, of which the diameter is to be taken and screwed fast. Set the moveable limb of the sliding piece quite straight, and the edge of the horizontal index upon the first division of it. Turn the whole instrument about to the left hand till the left side of the tree is seen, through the sights, cut exactly by the perpendicular wires; then the instrument being fixed, move the sights only upon the sliding piece, till the right side of the tree is also seen cut by the perpendicular wires: and the true diameter will be found marked by the horizontal index upon the sliding piece, which is to be entered in a distinct column of the field book. For the boughs; let the distance on the radius be now deducted to its former quantity, and the elevation index moved upwards till the bough is seen through the sights and screwed fast. Set the moveable part of the sliding piece in a position parallel to the bough, and the edge of the horizontal index on the first division of it. Turn the whole instrument about till you see through the sights the shoot of the bough close to the trunk cut by the perpendicular wires; then move the sights till you see the other end of the bough cut by the said wires, and note the feet and inches marked by the horizontal index on the moveable limb of the sliding piece, which will give the true length of the bough to be inserted in the field book. And the girth of the bough may be obtained by directing the sights to that part of it whose girth is desired; then by moving the elevation index downwards till you see the under side of the bough cut by the horizontal wires, and there noting the feet and inches marked by the said index on the altimeter; after which

let the elevation index be moved upwards till the upper side of the bough cut by the horizontal wires is seen; the feet and inches marked upon the altimeter are to be noted as before. The former quantity subtracted from the latter will give the true diameter of the bough, which is entered in the field book. The true solidity both of the body of the tree and of the boughs may be found from the diameter and lengths in tables calculated for this purpose. The dendrometer, fitted to a theodolite, may be applied to measuring the heights and distances of objects, accessible or inaccessible, whether situated in planes parallel or oblique to the plane in which the instrument is placed. It may be also used for taking all angles, whether vertical, horizontal, or oblique, in any position of the planes in which they are formed; and thus for facilitating the practical operations of engineering, land surveying, levelling, mining, &c. and for performing the various cases of plane trigonometry without calculation; of which the inventors have subjoined to their account of this instrument many examples.

DENDROPHORI, [from *δένδρον*, a tree, and *φέρω*, to bear,] tree-bearers, in antiquity, priests who marched in procession, carrying branches of trees in their hands in honour of some god, as Bacchus, Cybele, Solvanus, &c.

DENDROPHORIA, in antiquity, the religious ceremony of carrying branches of trees. See last article.

DENEB, an Arabic term, signifying tail, used by astronomers to denote several fixed stars. Thus,

1. **DENEB ADIGEGE** signifies the bright star in the swan's tail.

2. **DENEB ELEET**, that in the lion's tail.

DENIA, a sea-port of Spain, in the province of Valencia.

DENIER, [from *denarius*, Lat. It is pronounced as *deneer*, in two syllables,] a small French copper coin, of which 12 make a sol. There are two kinds of deniers, the one tournois, the other parisien, whereof the latter is worth a fourth part more than the former.

DENIER is also the name of a small weight used in assaying silver. Like the carat used in trying and expressing the fineness of gold, it is rather imaginary, than real, as the whole mass of silver, whatever be its weight, is supposed to be divided into twelve deniers; and as many 12th parts as it contains of pure silver, it is called silver of so many deniers fine. Thus Sterling silver of eleven deniers fine, the standard degree of fineness, of which the British coin consists, and of which all silver manufactured into plate and sold by weight, ought to consist, is a mixture, of which eleven parts are pure silver and one part copper. Each denier is supposed to be divided into 24 grains: and thus estimating pure silver at six shillings per ounce an ounce of Sterling silver is worth five shillings and six-pence, and the fineness of any quantity of silver can be calculated with the utmost exactness to half a grain in purity, or half a farthing in value per ounce. The deniers and grains, used by the assaymasters for this purpose, are real weights, made with the most scrupulous exactness in the above proportions to each other.

DENIZEN, in law, an alien made a subject by the king's letters-patent; otherwise called donation, because, "his legitimation proceeds ex donatione regis, from the king's gift." A denizen is in a kind of middle state between an alien and a natural born subject, and partakes of both of them. He may take lands by purchase or devise, which an alien may not; but cannot take by inheritance; for his parent, through whom he must claim, being an alien, had no inheritable blood, and therefore could convey none to the son; and upon a like defect of blood, the issue of a denizen born before denization cannot inherit to him; but his issue born after may. A denizen is not excused from paying the alien's duty, and some other mercantile burdens. And no denizen can be of the privy council, or either house of parliament, or have any office of trust civil or military, or be capable of any grant of lands, &c. from the crown.

DENMARK, one of the most ancient monarchies in Europe, comprehending the peninsula of Jutland, and the islands of Zealand, Funen, &c. But Denmark, properly so called, is only that part of Scandinavia, which formerly went by the name of Cimbrica Chersonesus, and is now called Jutland. Including Holstein, it is bounded by the Categate on the N. by the Baltic on the E. by the Elbe, which separates it from Bremen, on the S. and by the duchy of Saxe-

Saxe-Lawenburg towards the S. E. extending from 54. 40. to 58. 20. Lat. N. The kingdom of Denmark is divided into six grand districts or provinces; viz. 1. Denmark properly so called, comprehending the islands of Zealand, Funen, Langeland, Laaland, Falstria, Mona, Samsoe, Arroe, Bornholm, Anholt, Lessaw, and that part of the continent called North Jutland. 2. The duchy of Sleswick, or South Jutland. 3. The duchy of Holstein. 4. The earldoms of Oldenburgh and Delmenhorst. 5. The kingdom of Norway; and 6. Iceland, with the islands lying in the Northern Seas. The whole kingdom is also divided into six dioceses; viz. one in Zealand, one in Funen, and four in Jutland. Saxo Grammaticus, the most ancient and best of the Danish historians, derives the name of Denmark from Dan the son of Humble, the first king, and Mark, a word signifying a country in several dialects of the Teutonic; according to which etymology, the word Denmark signifies the country of Dan. This Dan is said to have flourished about A. D. 1038, or 1050. The language of Denmark is a dialect of the Teutonic, and bears a strong affinity to the Norwegian tongue; but is disagreeable to strangers, on account of the drawling tone with which it is pronounced. They have borrowed many words from the German; and, indeed, the high Dutch is used in common discourse by the court, the gentry, and the burghers; who likewise understand French, and speak it fluently. The Lutheran doctrine is universally embraced throughout all Denmark, Sweden, and Norway; so that there is not another sect in these kingdoms. The laws of Denmark are so concise, that the whole body is contained in one 4to volume, written in the language of the country. Every man may plead his own cause, without employing either counsel or attorney: but there are a few advocates for the benefit of those who cannot or will not speak in their own defence. The proceedings are so summary, that a suit may be carried through all the courts, and finally decided, in 13 months. There are three courts in Denmark, and an appeal lies from the inferior to the superior tribunal. The lowest of these is, in cities and towns, denominated the Byfogtids court; and in the country the Herredsfogds. Causes may be appealed from this to the Landstag, or general head court for the province: but the final appeal lies to the High Right in Copenhagen, where the king presides in person, assisted by the prime nobility.

DENN, a town of Arabia, in the county of Yemen. Lon. 43 43. E. Lat. 14. 15. N.

DENOMINATION, [*denominatio*, Lat.] a name given to a thing, which commonly marks some principal quality of it.

DENOMINATOR OF A FRACTION, is the number below the line, shewing the nature and quality of the parts which any integer is supposed to be divided into: thus in $\frac{2}{8}$, 8 the denominator shews you, that the integer is supposed to be divided into eight parts, or half-quarters: and the numerator six shews, that you take six of such parts, i. e. three quarters of the whole. See ARITHMETIC.

DENOMINATOR OF A RATIO, is the quotient arising from the division of the antecedent by the consequent. Thus 8 is the denominator of the ratio 40 : 5, because 40 divided by 5, gives 8, for a quotient. It is also called the exponent of a ratio. See EXPONENT.

DENSITY OF BODIES, is that property directly opposite to rarity, whereby they contain a certain quantity of matter under a certain bulk. Accordingly, a body is said to have double or triple the density of another body, when, their bulk being equal, the quantity of matter is in the one double or triple the quantity of matter in the other.

DENSITY OF THE AIR, is a property that has employed the later philosophers, since the discovery of the Torricellian experiment. It is demonstrated, that in the same vessel, or even in vessels communicating with each other, at the same distance from the centre, the air has every where the same density. The density of air, *ceteris paribus*, increases in proportion to the compressing powers. Hence the inferior air is denser than the superior; the density, however, of the lower air is not proportional to the weight of the atmosphere on account of heat and cold, and other causes perhaps which make great alterations in density and rarity. However, from the elasticity of the air, its density must be always different at different heights from the earth's surface; for the lower parts being pressed by the weight of those above, will be made to accede nearer to each other, and the more so as the weight of the incumbent air is greater. Hence the density of the air is greatest at the earth's surface, and decreases upwards in geometrical pro-

portion to the altitudes taken in arithmetical progression. If the air be rendered denser, the weight of bodies in it is diminished: if rarer, increased, because bodies lose a greater part of their weight in denser than in rarer mediums. Hence, if the density of the air be sensibly altered, bodies equally heavy in a rarer air, if their specific gravities be considerably different, will lose their equilibrium in the denser, and the specifically heavier body will preponderate. See PNEUMATICS, and HYDROSTATICS.

DENSITIES OF THE PLANETS. See ASTRONOMY.

DENTALIUM, TOOTH-SHELL, in natural history, a genus of the class and order vermes testacea. Animal a terebella; shell univalve, tubular, straight or slightly curved, with the cavity open at both ends, and undivided. It has twenty two species, some of which are found in the fossil state. There are but few species in this country, and those principally of the minuter kind.

DENTARIA, TOOTH-WORT, or TOOTH-VIOLET: a genus of the siliquosa order, and tetradynamia class of plants; natural order, Siliquose. Siliqua parts with a spring; valvules roll spirally backwards; stigma emarginated; calyx closing longitudinally. There are four species, hardy perennials; producing annual stalks twelve or eighteen inches high, adorned with many lobed-leaves, and spikes of quadripetalous cruciform flowers of a red or purple colour. They delight in shady places; and are propagated either by seeds or parting the roots.

DENTATUS, SICCUS, a hero of ancient Rome, of the plebeian order, but of uncommon merit, who flourished about A. U. C. 300. When disputes ran high between the patricians and plebeians, about the Agrarian law, Dentatus, loaded with glory, and advanced in years, but still exhibiting an admirable person, set off with all the dignity of a military veteran, addressed the people and expatiated upon his achievements and his hardships. He had served his country in the wars forty years; he had been an officer thirty; first a centurion and then a tribune; he had fought in 120 battles, and by the force of his single arm had saved the lives of a multitude of his fellow-citizens: He had gained fourteen civic, three mural, and eight golden crowns; besides 83 chains, 60 bracelets, 18 gilt spears, and 23 horse trappings, whereof nine were for killing the enemy in single combat; and he had received 45 wounds, all before, none behind. These were his honours; yet notwithstanding all this, he had never received any share of those lands which were won from the enemy, but continued to drag on a life of poverty and contempt, whilst others possessed those very territories which his valour had won, without any merit to deserve them, or ever having contributed to the conquest. Dentatus's speech, and the hardship of his case, had a strong effect. The people unanimously demanded that the law might be passed, and that such high merit should not pass unrewarded. Some of the senators attempted to speak but were overpowered by the cries of the people. At last a number of resolute young patricians rushing furiously amongst the crowd, broke the balloting urns, and dispersed the multitude. For this riot they were fined by the tribunes, but they gained their object for the time, by getting the Agrarian law postponed. Such was the justice of the Roman patricians, at one of the most virtuous periods of that celebrated republic; for it was the age of Cincinnatus himself.

DENTELLA, a genus of the monogynia order, and pentandria class of plants. Calyx a five-parted perianthium, with small subulated leaves; filaments short; anthera subulated, small; capsule globular, bilocular, egg-shaped, very numerous. It has one species, a native of New Caledonia.

DENTIFRICE, [*dens* and *frico*, Lat.]. a powder made to scour the teeth.

DENTIFRICES are of different kinds; generally made of earthy substances finely pounded, and mixed with alum, or some other saline substances: but these are pernicious, on account of their wearing away the enamel of the teeth; but more especially by the septic quality with which these earthy substances are endowed. On this account, a portion of Peruvian bark finely pounded is now commonly added, which answers the double purpose of cleaning the teeth, and preserving them afterwards from corruption.

DENTILES, or DENTILS, in architecture, an ornament in corniches bearing some resemblance to teeth, particularly used in the Ionic and Corinthian orders. See ARCHITECTURE.

DENTISCALPRA, in surgery, an instrument for scouring yellow, livid, or black teeth; to which being applied near the gums, it scrapes off the foul morbid crust.

DENTITION.

DENTITION. See MEDICINE.

DENTON, the chief town of Caroline county in Maryland, 37 miles S. S. E. of Chester.

DENYS, *Str.*, a town of France, in the department of Paris, five miles N. of Paris.

DEOBSTRUENT, [*deobstruens*, Lat.] a medicine that has power to resolve viscidities, or to open by any means the animal passages. See DETERGENT.

DEODAND, [*Deo dandum*, Lat.] a thing given or consecrated to God for the pacifying of his wrath, in case of any misfortune, by which any Christian comes to a violent end, without the fault of any reasonable creature; as, if a horse should strike his keeper, and so kill him; if a man, in driving a cart, and endeavouring to rectify something about it, should fall so as the cart-wheels, by running over him, should press him to death; if any one should be felling a tree, and giving warning to company by, when the tree was near falling, to look to themselves, and any of them should nevertheless be slain by the fall of the tree: in these cases the horse, the cart-wheel, cart and horses, and the tree, are to be given to God; that is, sold and distributed to the poor, for an expiation of this dreadful event, though occasioned by unreasonable, senseless, and dead creatures; and though this be giving to God, yet it is forfeited to the king by law, as executor in this case, to see the price of these distributed to the poor.

DEOGUR, a town of Hindostan, in the country of Berar, 55 miles N. N. W. of Nagpore.

DEPARTMENT, in modern geography is used as a substitute for province, in the new divisions of the French Government.

DEPARTURE, in navigation, is the easting or westing of a ship in respect of the meridian it departed or sailed from: or it is the difference of longitude, either east or west, between the present meridian the ship is under, and that where the last reckoning or observation was made. This departure, any where but under the equator, must be accounted according to the number of miles in a degree, proper to the parallel the ship is under. See NAVIGATION.

DEPHLOGISTICATED, a term applied by Dr. Priestley, to what is now called oxygen gas, when he first discovered it. It was called by Scheele, who discovered it at the same time, vital air.

DEPILATORY MEDICINES, those applied to take off the hair: such are lime, and other caustic substances, which ought to be used with great caution.

DEPONENT, in Latin grammar, a term applied to verbs, which have active significations, but passive terminations or conjugations, and want one of their participles passive.

DEPORTATION, a sort of banishment used by the Romans, whereby some island or other place was allotted to a criminal for the place of his abode, with a prohibition not to stir out of the same on pain of death.

DEPOSIT, among civilians, something that is committed to the custody of a person, to be kept without any reward, and to be returned again on demand. Deposit is distinguished into simple and judiciary.

DEPOSITION. Proof in the high court of chancery is by the depositions of witnesses; and the copies of such, regularly taken and published, are read as evidence at the hearing. For the purpose of examining witnesses in or near London, there is an examiner's office appointed; but for such as live in the country, a commission to examine witnesses is usually granted to four commissioners, two named on each side, or any three or two of them, to take the depositions there. And if the witnesses reside beyond sea, a commission may be had to examine them there, upon their own oaths; and if foreigners, upon the oaths of two skilful interpreters. The commissioners are sworn to take the examinations truly, and without partiality, and not to divulge them till published in the court of chancery; and their clerks are also sworn to secrecy. The witnesses are compellable by process of subpoena, as in the courts of common law, to appear and submit to examination; and when their depositions are taken, they are transmitted to the court with the same care that the answer of a defendant is sent. 3 Black. 445.

DEPOSITION also signifies the sequestering or depriving of a man of some dignity and office, and is nearly the same with degradation. See DEGRADATION.

DEPOT, in military affairs any particular place in which military stores are deposited for the use of an army. In a more exten-

sive sense, it means several magazines collected together for that purpose. It also signifies an appropriated fort, or place, for the reception of recruits, or detached parties, belonging to different regiments. The barracks near Maidstone are depots for the British cavalry, and Chatham is allotted to the infantry.

DEPRECATION, in rhetoric, a figure whereby the orator invokes the aid of some one; or prays for some great evil to befall him who speaks falsely, either himself or his adversary.

DEPRESSION OF AN EQUATION, in algebra, is the bringing it into lower and more simple terms by division. See ALGEBRA.

DEPRESSION OF A STAR, with astronomers, is the distance of a star from the horizon below, and is measured, by the arch of the vertical circle or azimuth, passing through the star, intercepted between the star and the horizon.

DEPRESSION OF THE POLE. When a person sails or travels towards the equator, he is said to depress the pole; because as many degrees as he approaches nearer the equator, so many degrees will the pole be nearer the horizon. This phenomenon arises from the spherical figure of the earth.

DEPRESSION OF THE VISIBLE HORIZON, or DIP OF THE HORIZON, denotes its sinking or dipping below the true horizontal plane, by the observer's eye being raised above the surface of the sea; in consequence of which the observed altitude of an object is by so much too great. See NAVIGATION.

DEPRIVATION in law, is when a clergyman, as a bishop, parson, vicar, or prebend, is deprived, or deposed, from his preferment, for any matter in fact or law: it is of two kinds, viz.

1. DEPRIVATION A BENEFICIO, when for some crime a minister is for ever deprived of his living.

2. DEPRIVATION AB OFFICIO, when a minister is for ever deprived of his order. It is the same with deposition and degradation. It is usually for some heinous crime deserving death, and is performed by the bishop in a solemn manner. See DEGRADATION.

DEPTFORD, a town of England, situated on the Thames, partly in the county of Kent, and partly in Surry. It was generally known in ancient records by the name of Deptford Strond, alias West Greenwich, a name which, in later times, became solely appropriated to the lower parts of it, on the banks of the Thames, the upper town retaining that of Deptford only. It is four miles E. of London.

DEPTH, in geometry, the same with altitude; though, strictly speaking, we only use the depth to denote how much one body, or part of a body, is below another. See HEIGHT, &c.

DEPTH OF A BATTALION, SQUADRON, &c. the number of men in a file, or who stand before each other in a straight line. In the ancient armies this was very great.

DEPURATORY FEVER, a name given by Sydenham to a fever which prevailed much in 1661, 1662, 1663, and 1664. He supposed that nature regulated all the symptoms in such a manner, as to fit the febrile matter, prepared by proper concoction, for expulsion in a certain time, either by a copious sweat or a freer perspiration.

DEPUTATION, a mission of select persons out of a company, or body, to a prince or assembly, to treat of matters in their name. They are more or less solemn, according to the quality of those who send them, and the business they are sent upon.

DEPUTY, is one that exercises an office in another's right; and the forfeiture or misdemeanor of such deputy shall cause the person, whom he represents, to lose his office. There is a great difference between a deputy and assignee of an office; for an assignee has an interest in the office itself, and does all things in his own name, for which his grantor shall not answer unless in special case; but a deputy has not any interest in the office, but is only the shadow of an officer, in whose name he does all things. 9 Rep. 49. A superior officer must answer for his deputy in civil actions if he is not sufficient; but in criminal cases it is otherwise, where deputies are to answer for themselves. 2 Inst. 191.

DERAS, a large town of Asia, in Persia. Lon. 61. 56. E. Lat. 31. 32. N.

DERBEND, or DERBENT, a town of Persia, said to have been founded by Alexander the Great. It is seated near the Caspian Sea, at the foot of Mount Caucasus.

DERBEND, or DERBENT, a town of Turkey, in Romania, twenty miles N. of Adrianople.

DERBY, or DERBYSHIRE, a county of England, bounded on

on the N. by Yorkshire; on the E. by Nottinghamshire; on the S. by Leicestershire; and a point of Warwickshire; on the W. by Staffordshire; and on the N. W. by Cheshire. It extends 59 miles in length from N. to S. and 34 from E. to W. where broadest. The principal rivers are the Derwent, Dove, Erwash, and Trent.

DERBY, the county town of Derbyshire, seated on the Derwent, over which it has a handsome stone bridge. It is 36 miles N. of Coventry. Lon. 1. 25. W. Lat. 52. 58. N.

DERBY, HIGH PEAK OF, a chain of very high mountains in Derbyshire. In these mountains there are two remarkable caverns, called Elden-hole, and Pool's-hole. The soil is so shallow that it hardly admits of plowing, but affords good pasture for sheep. The Peak properly so called, is reckoned the highest mountain in England.

DEREHAM, a town of Norfolk, 14 miles W. of Norwich.

DERELICTS, such lands as the sea, by receding from them, leaves dry and fit for cultivation. If they are left by a gradual recess of the sea, they are adjudged to belong to the owner of the adjoining lands; but when an island is formed in the sea, or a large quantity of new land appears, such derelict lands belong to the King.

DEREOUTE, or **DEIROUTE**, a town of Egypt between Cairo and Rosetta.

DERHAM, Dr. WILLIAM, a celebrated English philosopher and divine, born in 1657. In 1682, he was presented to the vicarage of Wargrave in Berkshire, and, in 1689, to the rectory of Upminster in Essex. Applying himself with great eagerness to natural and experimental philosophy, he soon became a distinguished member of the Royal Society, whose Philosophical Transactions contain a great variety of curious and valuable pieces, the fruits of his laudable industry. In his younger years he published his Artificial Clock-maker, which has been often printed; and in 1711, 1712, and 1714, he preached those sermons at Boyle's lecture, which he afterward digested under the well-known titles of Physico-Theology and Astro-Theology, and enriched with valuable notes and copper-plates. The last thing he published was Christo-Theology, a demonstration of the divine authority of the Christian religion, being the substance of a sermon preached at Bath in 1729. This great and good man, after spending his life in the most agreeable as well as improving study of nature, died at Upminster in 1735; and, besides many other works, left a valuable collection of curiosities, particularly specimens of birds and insects of this island. Dr. Derham was well skilled in medical as well as in physical knowledge; and was constantly a physician to the bodies as well as the souls of his parishioners.

DERIG, a small island, near the west coast of Ireland, and county of Sligo. Lon. 8. 24. W. Lat. 54. 55. N.

DERIVATIVE, in grammar, a word which takes its origin from another word, called its primitive. Thus the word derivative itself takes its origin from the primitive rivus, a rivulet or channel, out of which no less streams are drawn; and thus deity, manhood, lawyer, &c. are derived from deus, man, law, &c.

DERMESTES, a genus of insects of the order coleoptera. Antennæ clavate, the club perfoliate, three of the joints thicker; thorax convex, slightly margined; head inflected, and hidden under the thorax. Gmelin reckons about 90 species, in three sections. A. jaw bifid. B. jaw one-toothed. C. feelers four, clavate, the last joint larger. This genus consists principally of small insects. Their larvæ are found among skins, furs, and various animal substances of a dry kind, on which they live. They are exceedingly destructive to books, furniture, and collections of natural history. In the grub state they are of a lengthened oval shape, and hairy, especially towards the end of the body. The complete insect has the habit of withdrawing the head beneath the thorax when handled.

D. VIOLACEUS is a beautiful little insect: its elytra are of a deep violet blue. The thorax is covered with greenish hairs, the legs are black. The whole animal being of a glittering brilliancy renders it a pleasing object. The larvæ, as well as the perfect insect, inhabits the bodies of dead animals.

DERNE, a town of Africa, in Tripoli, near the sea-coast. Lon. 29. 45. E. Lat. 32. 55. N.

DEROGATORY CLAUSE, in a testament, is a certain sentence, cipher, or secret character, which the testator inserts in his will, and of which he reserves the knowledge to himself alone, add-

ing a condition, that no will he may make hereafter is to be reckoned valid, if this derogatory clause is not inserted expressly and word for word. It is a precaution invented by lawyers against latter wills extorted by violence, or obtained by suggestion.

DERP, a palatinate of Livonia.

DERP, the capital of the above palatinate. Lon. 26. 15. E. Lat. 58. 30. N.

DERRY, or **LONDONDERRY**, a town and county of Ireland, in Ulster. See **LONDONDERRY**.

DERVENTIO, in ancient geography, 1. a river of the Brigantes in Britain; now called Darwent, in Yorkshire: 2. a town of the Brigantes, seated on the river; now called Auldbly.

DERVIS, or **DERVICH**, a name given to a sort of monks among the Turks, who lead a very austere life, and profess extreme poverty; though they are allowed to marry. The word is originally Persian, درویش, signifying a beggar, or person who has nothing; and because the religious, and particularly the followers of Mevelava, profess not to possess any thing, they call both the religious in general, and the Mevelavites in particular, dervises.

DERVISES, EGYPTIAN, AND SYRIAN. There are in Egypt several kinds: those that are in convents, are in a manner of the religious order, and live retired; though there are of these some who travel and return again to their convents. Some take this character, and yet live with their families, and exercise their trades: of this kind are the dancing dervises at Damascus, who go once or twice a week to a little uninhabited convent, and perform their extraordinary exercises: these also seem to be a good people: but there is a third sort of them who travel about the country, and beg, or rather oblige people to give, for whenever they sound their horn something must be given them. The people of these orders, in Egypt, wear an octagonal badge, of a greenish white-alabaster, at their girdles, and a high stiff cap without any thing round it.

DERVISES, PERSIAN. The dervises in Persia, are called Abdals, *q. d.* servants of God. They lead a very penurious, austere life, and preach the Alcoran in the streets, coffee-houses, and wherever they can meet with auditors. The Persian dervises retail little but fables to the people, and are in the utmost contempt among the men of sense and letters.

DERVISES, TURKISH. The dervises called Mevelavites, are a Mohammedan order of religious; the chief or founder whereof was one Mevelava. They are now very numerous. Their chief monastery is that near Cogna in Natolia, where the general makes his residence, and where all the assemblies of the order are held; the other houses being all dependent on this, by a privilege granted to this monastery under Ottoman I. The dervises affect a great deal of modesty, patience, humility, and charity. They always go bare-legged and open-breasted, and frequently burn themselves with hot irons, to inure themselves to patience. They always fast on Wednesdays, eating nothing on those days till after sun-set. Tuesdays and Fridays they hold meetings, at which the superior presides. One of them plays all the while on a flute, and the rest dance, turning their bodies round and round with the greatest swiftness imaginable. Long custom to this exercise from their youth has brought them to such a habitude, that it does not discompose them at all. This practice they observe with great strictness, in memory of Mevelava their patriarch's turning miraculously round, as they pretend, for the space of four days without any food or refreshment; his companion Hamsa playing all the while on the flute: after which he fell into an extasy, and therein received wonderful revelations for the establishment of his order. They believe the flute an instrument consecrated by Jacob and the shepherds of the Old Testament, because they sang the praises of God upon them. They profess poverty, chastity, and obedience, and really observe them while they remain dervises; but if they choose to go out and marry, they are always allowed. The generality of dervises are mountebanks: some apply themselves to legerdemain, impostures, &c. to amuse the people; others pretend to sorcery and magic: but all of them, contrary to Mohammed's precept, are said to drink wine, brandy, and other strong liquors, to give them the degree of gaiety their order requires. Besides their great saint Mevelava, there are particular saints honoured in particular monasteries: as Kidereli, greatly revered in the monasteries of Egypt, and held by some to be St. George; and by others, with more probability, the prophet Elias. The dervises

are great travellers; and, under pretence of preaching, and propagating their faith, are continually passing from one place to another: on which account they have been frequently used as spies.

DERWENT, the name of four rivers of England: viz. 1. in Cumberland: 2. in Derbyshire: 3. in Durham: 4. in Yorkshire, rising in the N. Riding, and running S. falls into the Ouse below York.

DERWENT FELS, or DERWENT WATER FELS, a chain of mountains in Cumberland, reckoned among the loftiest in England.

DERWENT WATER, or the LAKE of KESWICK, a beautiful lake of Cumberland, in the vale of Keswick, lying between the mountain of Skiddaw on the N. and the craggy hills of Borrodale on the S. whence it derives its chief supplies of water. It is four miles long and above one broad.

DESAGULIERS, JOHN THEOPHILUS, F. R. S. the son of John Desaguliers, a French protestant refugee, was born at Rochelle in 1683. His father brought him to England an infant; and at a proper age placed him at Christ-church college, Oxford: where he succeeded Dr. Keil in reading lectures on experimental philosophy at Hart Hall. The magnificent duke of Chandos made Dr. Desaguliers his chaplain, and presented him to the living of Edgware, near his seat at Cannons; and he was afterwards chaplain to Frederic prince of Wales. He introduced the practice of reading public lectures on experimental philosophy, in London: and continued them with great success to the time of his death in 1749. He made several improvements in mechanics, and communicated many curious papers printed in the Philosophical Transactions; published a valuable "Course of Experimental Philosophy," in 2 vols, 4to; and gave an edition of "Gregory's Elements of Catoptrics and Dioptrics," with an Appendix on reflecting telescopes, 8vo. He was also a member of several foreign academies.

DESART, or DESERT, a large extent of country entirely barren, and producing nothing. In this sense some are sandy deserts; as those of Lop, Xamo, Arabia, and several others in Asia; in Africa, those of Libya and Zara: others are stony, as the desert of Pharan in Arabia Petrea.

DESCANT, in music, the art of composing in several parts. Descant is three-fold, viz. plain, figurative, and double.

1. **DESCANT, DOUBLE**, is when the parts are so contrived, that the treble, or any high part, may be made the bass; and, on the contrary, the bass the treble.

2. **DESCANT, FIGURATIVE or FLORID**, is that part of an air of music wherein some discords are concerned, as well, though not so much, as concords. This may be termed the ornamental and rhetorical part of music, in regard that there are introduced all the varieties of points, syncopes, diversities of measures, and whatever is capable of adorning the composition.

3. **DESCANT, PLAIN**, is the ground work and foundation of all musical compositions, consisting altogether in the orderly placing of many concords answering to simple counterpoint.

DESCENDANT, in genealogy, a term relative to ascendant, and applied to a person who is born or issued from some other referred to: thus mankind are said to be the descendants of Adam. See the article **DESCENT**.

DESCENSION, or DESCENDING, in general, signifies much the same with descent.

DESCENSION, in astronomy, is either right or oblique.

DESCENSION, RIGHT, is an arch of the equinoctial, intercepted between the vernal equinoctial point and the intersection of the meridian, passing through the centre of the object, at its setting, in a right sphere. See **ASTRONOMY**, and **ASCENSION**.

DESCENSION, OBLIQUE, an arch of the equinoctial intercepted between the vernal equinoctial point and the horizon, passing through the centre of the object, at its setting, in an oblique sphere. See **ASTRONOMY**, and **ASCENSION**.

DESCENSIONAL, something belonging to descension. See **DESCENSION**.

DESCENSIONAL DIFFERENCE, that between the right and oblique descension of any heavenly body. See **DESCENSION**.

DESCENT, in general, is the tendency of a body from a higher to a lower place; thus all bodies, unless otherwise determined by a force superior to their gravity, descend towards the centre of the earth: the planets too may be said to descend from the aphelion to the perihelion of their orbits, as the moon does from

the apogee to the perigee. Heavy bodies, meeting with no resistance descend with an uniformly accelerated motion. See **MECHANICS**, and **GRAVITY**.

DESCENT, in heraldry, is used to express the coming down of any thing from above: as, a lion en descent is a lion with his head towards the base points, and his heels towards one of the corners of the chief, as if he were leaping down from some high place.

DESCENT, or HEREDITARY SUCCESSION, in law, is the title whereby a man, on the death of his ancestor, acquires his estate by right of representation, as his heir at law. An heir, therefore, is he upon whom the law casts the estate immediately on the death of the ancestor: and an estate so descending to the heir is in law called the inheritance. See **INHERITANCE**. Descent is either lineal or collateral:

1. **DESCENT, COLLATERAL**, is that springing out of the side of the line or blood; as from a man to his brother, nephew, or the like. See **CONSANGUINITY**.

2. **DESCENT, LINEAL**, is that conveyed down in a right line from the grandfather to the father, from the father to the son, and from the son to the grandson, &c.

DESCENT of DIGNITIES. A dignity differs from common inheritances, and goes not according to the rules of the common law: for it descends to the half-blood; and there is no coparcenership in it, but the eldest takes the whole. The dignity of peerage is personal, annexed to the blood; and so inseparable, that it cannot be transferred to any person, nor surrendered even to the crown: it can move neither forward nor backward, but only downward to posterity; and nothing but corruption of blood, as if the ancestor be attainted of treason or felony, can hinder the descent to the right heir.

DESCENTS, in fortification, are the holes, vaults, and hollow places, made by undermining the ground. The descent into the moat or ditch is a deep passage made through the esplanade and covert-way, in form of a trench, whereof the upper part is covered with madders and clays, to secure the besiegers from the enemy's fire. In wet ditches this trench is on a level with the surface of the water, but in dry ones it is sunk as deep as the bottom of the ditch.

DESCRIBENT, in geometry, a line or surface, which, by moving parallel to itself, describes a surface or solid.

DESCRIPTION, in the modern fashionable dialect, is used as a substitute for sort or kind, and in this sense is applied both to persons and things.

DESCRIPTION, in literary composition, is such a strong and beautiful representation of a thing, as gives the readers a distinct view and satisfactory notion of it. See **NARRATION**.

DESCRIPTION. In deeds and grants there must be a certain description of the lands granted, the places where they lie, and the persons to whom granted, &c. to make them good. But wills are more favoured than grants as to those descriptions; and a wrong description of the person will not make a devise void, if there be otherwise a sufficient certainty, what person was intended by the testator. Where a first description of land, &c. is false, though the second be true, a deed will be void: contra, if the first be true and the second false.

DESEADA, DESIRADA, or DESIDERADA, the first of the Caribbee islands, discovered by Columbus in his second voyage, anno 1494, when he gave it that name. It is situated E. of Guadaloupe.

DESEADA, or CAPE DESIRE, the S. point of the Straits of Magellan.

DESEADEN, a town of Persia, in the province of Segestan, 30 miles S. S. E. of Kin.

DESENZANO, or DISSENZANO, a town of the late Cisalpine republic, 15 miles E. of Brescia.

DESERT ISLAND, MOUNT, an island of the United States, on the coast of the district of Maine.

DESERTER, in a military sense, a soldier who, by running away from his regiment or company, abandons the service. A deserter is, by the articles of war, punishable by death, and, after conviction, is hanged at the head of the regiment he formerly belonged to, with his crime writ on his breast, and suffered to hang till the army leave that camp, for a terror to others.

DESHACHE, in heraldry, is where a beast has its limbs separated from its body, so that they still remain on the escutcheon, with only a small separation from their natural places.

DESIDERATUM,

DESIDERATUM, [Lat.] somewhat which enquiry has not yet been able to settle or discover; as, the longitude is a desideratum of navigation. The trisection of an angle, and the quadrature of a circle, are desiderata of geometry.

DESIGN, signifies the plan, order, representation, or construction, of a building, book, painting, &c. See **ARCHITECTURE**, **HISTORY**, **ORATORY**, **PAINTING**, and **POETRY**.

DESIGN, in manufactures, expresses the figures wherewith the workman enriches his stuff or silk, and which he copies after some painter or eminent draughtsman, as in diaper, damask, and other flowered silk and tapestry, and the like. In the undertaking of such kinds of figured stuffs, it is necessary, says Mons. Savary, that, before the first stroke of the shuttle, the whole design be represented on the threads of the warp, we do not mean in colours, but with an infinite number of little packthreads, which being disposed so as to raise the threads of the warp, let the workmen see, from time to time, what kind of silk is to be put in the eye of the shuttle for woof. This method of preparing the work is called reading the design, and reading the figure, which is performed in the following manner: A paper is provided, considerably broader than the stuff, and of a length proportionate to what is intended to be represented thereon. This they divide lengthwise, by as many black lines as there are intended threads in the warp; and cross these lines, by others drawn breadthwise, which, with the former, make little equal squares; on the paper thus squared, the draughtsman designs his figures, and heightens them with colours as he sees fit. When the design is finished, a workman reads it, while another lays it on the simblot. To read the design, is to tell the person who manages the loom, the number of squares or threads comprised in the space he is reading, intimating at the same time, whether it is ground or figure. To put what is read on the simblot, is to fasten little strings to the several packthreads, which are to raise the threads named; and this they continue to do till the whole design is read. Every piece being composed of several repetitions of the same design, when the whole design is drawn, the drawer, to re-begin the design afresh, has nothing to do but to raise the little strings, with slip-knots, to the top of the simblot, which he had laid down to the bottom: this he is to repeat as often as is necessary till the whole is manufactured. The ribbon weavers have likewise a design, but far more simple than that now described. It is drawn on paper with lines and squares, representing the threads of the warp and woof. But instead of lines, whereof the figures of the former consist, these are constituted of points only, or dots, placed in certain of the little squares formed by the intersection of the lines. These points mark the threads of the warp that are to be raised, and the spaces left blank denote the threads that are to keep their situation: the rest is managed as in the former.

DESIGN, in music, is justly defined by Rousseau to be the invention and the conduct of the subject, the disposition of every part, and the general order of the whole. It is in a distribution formed with intelligence and taste, in a just proportion between all the parts, that the perfection of design consists; and it is above all, in this point, that the immortal Pergolesi has shewn his judgement and his taste, and has left so far behind him all his competitors. His *Stabat Mater*, his *Orseo*, his *Serva Padrona*, are, in three different species of composition, three masterpieces of design equally perfect. This idea of the general design of a work is likewise particularly applicable to every piece of which it consists; thus the composer plans an air, a duett, a chorus, &c. For this purpose, after having invented his subject, he distributes it, according to the rules of a legitimate modulation, into all the parts where it ought to be perceived, in such a proportion, that its impression may not be lost on the minds of the audience; yet that it may never be reiterated in their ears, without the graces of novelty. The composer errs in designing who suffers his subject to be forgot; he is still more culpable who pursues it till it becomes trite and tiresome.

DESIGN is particularly used, in painting, for the first idea of a large work, drawn roughly, and in little, with an intention to be executed and finished in large. In this sense, it is the simple contour or outlines of the figures intended to be represented, or the lines that terminate and circumscribe them: such design is sometimes drawn in crayons or ink, without any shadows at all; sometimes it is hatched, that is, the shadows are expressed by sensible

outlines, usually drawn across each other with the pen, crayon, or graver.

DESIGNATOR OF AN ESTATE is made by the tenants, butments, and boundings. Among the Romans, there were designations of the consuls and other magistrates, some time before their elections.

DESIGNATOR, a Roman officer, who assigned and marked each person his place and rank in public ceremonies, shews, processions, &c. He was a kind of master of the ceremonies, who regulated the seats, march, order, &c.

DESIGNING, the art of delineating or drawing the appearance of natural objects, by lines, on a plane. To design, according to the rules of mathematics, makes the object of true perspective. See **PERSPECTIVE**.

DESOLATION. See **KERGUELEN'S LAND**.

DESPOT, [*despotes*], an absolute prince; one that governs with unlimited authority. Despot originally signified the same with *herus*, a master: but in time it underwent the same fate on medals as, among the Romans, Cæsar did with regard to Augustus; *BACIAEYC*, king, answering to Augustus, and *ΔΕCΙOTHC*, despot, to Cæsar. Thus, Nicephorus having ordered his son Stauracius to be crowned, the son, out of respect would only take the name *ΔΕCΙOTHC*, leaving to his father that of *BACIAEYC*. The following emperors however, preferred the quality of *ΔΕCΙOTHC* to that of *BACIAEYC*; particularly Constantine XII. Michael Ducas, Romanus Diogenes, Nicephorus Botoniates, the Comneni, and some others. In imitation of the princes, the princesses likewise assumed the title of *ΔΕCΙOINA*. It was the emperor Alexius Angelus that created the dignity of despot, and made it the first after that of emperor, or Augustus, above those of Sebastocrator and Cæsar. Despot is at present a title of quality given to the princes of Wallachia, Servia, and some of the neighbouring countries.

DESPOTISM is particularly used for an arbitrary government, where the power of the prince is unlimited, and his will a law to his subjects: such are those of Turkey, Persia, and most of the eastern governments; and even those of Europe, if we except our own government.

DESPOUILLE, in heraldry, the whole case, skin, or slough of a beast, with the head, feet, tail, and all appurtenances, so that being filled and stuffed it looks like the entire creature.

DESSAU, or **DESSAW**, a strong town of Germany, in Upper Saxony, 37 miles N. of Leipsic.

DESTINIES, in mythology. See **PARCÆ**.

DESTRUCTION, an alteration of any thing from its natural state, to one contrary to nature; whereby it is deemed the same with corruption.

DESTRUCTION, **CHEMICAL**, or **CORRUPTION**, is nothing but a resolution of the whole naturally mixt body into its parts.

DESULTOR, in antiquity, a vaulter or leaper, who, leading one horse by the bridle, and riding another jumped from the back of the one to the other, as the custom was, after they had run several courses or heats. This practice required great dexterity, being performed before the use of either saddles or stirrups.

DETACHED PIECES, in fortification, are such out-works as are detached, or at a distance from the body of the place; as demilunes, ravelines, bastions, &c. In painting, the figures are said to be well detached, when they stand free and disengaged from each other.

DETACHMENT, in military affairs, a certain number of soldiers drawn out from several regiments or companies equally, to be employed as the general thinks proper, whether on an attack, at a siege, or in parties to scour the country. A detachment of two or three thousand men, is a command for a brigadier; eight hundred, for a colonel; four or five hundred, for a lieutenant-colonel. A captain never marches on a detachment with less than fifty men, a lieutenant, an ensign, and two sergeants. A lieutenant is allowed thirty, and a serjeant; and a serjeant ten or twelve men. Detachments are sometimes made of intire squadrons and battalions.

DETAINDER, the name of a writ for holding one in custody.

DETENTS, in a clock, are those stops which, by being lifted up or let fall down, lock and unlock the clock in striking.

DETENT WHEEL, or **HOOP WHEEL**, in a clock, a wheel which has a hoop almost round it, wherein there is a vacancy, at which the clock locks.

DETERGENTS,

DETERGENTS, in pharmacy, such medicines as are not only softening and adhesive, but also, by a peculiar activity, conjoined with a suitable configuration of parts, are apt to abrade and carry along with them such particles as they lay hold on in their passage.

DETERMINATE PROBLEM, in geometry, that which has but one, or at least, a limited number of answers: as the following problem, which has but one only solution, viz. To describe an isosceles triangle on a given line, whose angles at the base shall be double that at the vertex. But the following hath two solutions, viz. To find an isosceles triangle, whose area and perimeter are given. A determinate problem may be either simple, linear, plain, solid, &c.

DETERMINATION, among divines, is an act of divine power, limiting the agency of second causes, in every instance, to what the Deity predestinated concerning them. See **PREDESTINATION**.

DETERMINATION, in mechanics, signifies much the same with tendency or direction of a body in motion. See **MECHANICS**.

DETERSIVE, an application that has the power of cleansing wounds.

DETHMOLD, or **DETMOLD**, a town of Germany, in Westphalia, 25 miles S. S. W. of Minden.

DETINUE, [*detenue*, Fr.] a writ that lies against him, who, having goods or chattels delivered him to keep, refuses to deliver them again.

DETINUE lies for any thing certain and valuable, wherein one may have a property or right; as for a horse, cow, sheep, hens, dogs, jewels, plate, cloth, bags of money, sacks of corn, &c. It must be laid so certain, that the thing detained may be known and recovered; and therefore, for money out of a bag, or corn out of a sack, &c. it lies not; for the money or corn cannot, in this case, be known from other money or corn; so that the party must have an action on the case, &c. Yet *detinue* may be brought for a piece of gold of the price of 22s. though not for 22s. in money. In this action, the thing detained is generally to be recovered, and not damages; but if one cannot recover the thing itself, he shall recover damages for the thing, and also for the detainer. In order, therefore, to ground an action of *detinue*, which is only for the detaining, these points are necessary: 1. That the defendant came lawfully by the goods, as either by delivery to him, or finding them. 2. That the plaintiff have a property. 3. That the goods themselves be of value. And 4. That they be ascertained in point of identity. Upon this, the jury, if they find for the plaintiff, assess the respective values of the several parcels detained, and also damages for the detention, and the judgement is conditional, that the plaintiff recover the said goods, or (if they cannot be had) their respective values, and also the damages for detaining them.

DETONATION, [*detono*, Lat] in chemistry, an explosion with noise, made by the inflammation of a combustible body. *Decrepitation* differs from *detonation* only as producing a fainter noise, or merely a kind of crackling sound peculiar to certain salts. *Fulmination* is a more quick and lively *detonation*, such as takes place with certain preparations of gold, silver, mercury, &c.

DETRANCHE, in heraldry, a line bend-wise, proceeding always from the dexter side, but not from the very angle diagonally athwart the shield.

D'ETROIT, or **D'ETROIT FORT**, one of the principal towns, and best fortified, in the north-western territory of the United States: situated on the W. bank of the D'Etoit, 78 miles N. of Lake Erie.

D'ETROIT RIVER, or **STRAIT OF ST. CLAIR**, flows from lake St. Clair into the W. end of lake Erie, forming part of the boundary between the United States, and Upper Canada.

DEVA, a sea-port town of Spain, 15 miles W. of St. Sebastian.

DEUCALION, king of Thessaly. The flood said to have happened in his time, about B. C. 1500, is supposed to have been only an inundation of that country, occasioned by heavy rains, and an earthquake that stopped the course of the river Peneus, where it usually discharged itself into the sea. According to the mythology, he was the son of Prometheus. He governed his people with equity; but the rest of mankind being extremely wicked, were destroyed by a flood, while Deucalion, and Pyrrha his queen, saved themselves by ascending mount Parnassus. When

the waters were decreased, they went and consulted the oracle of Themis, on the means by which the earth was to be re-peopled; when they were ordered to veil their heads and faces, to unloose their girdles, and throw behind their backs the bones of their great mother. At this advice Pyrrha was seized with horror; but Deucalion explained the mystery, by observing, that their great mother must mean the earth, and her bones the stones; when taking them up, those Deucalion threw over his head became men, and those thrown by Pyrrha women. Dr. Bryant and others have supposed, that Deucalion was the same with the patriarch Noah; and that his flood in Thessaly, as well as that of Ogyges in Attica, and of Prometheus in Egypt, were the same with that of Noah recorded in Scripture.

DEVENSHRING. See **DEVONSHEERING**.

DEVENTER, a large, strong, trading, and populous town of Holland, 50 miles E. of Amsterdam.

DEVICE, among painters. See **DEVISE**.

DEVICOTTA, a town of India, in the Carnatic, 20 miles N. of Tranquebar.

DEVIL, an evil angel, one of those celestial spirits cast down from heaven, for pretending to equal himself with God. The Ethiopians paint the devil white, to be even with the Europeans, who paint him black. There is no mention of the word devil in the Old Testament, but only of the words Satan and Belial; nor do we meet with it in any heathen authors, in the sense it is taken among Christians, that is, as a creature revolted from God. Their theology went no farther than to evil genii or demons. See **DÆMON**, and **DÆMONTAC**. Some of the American idolaters have a notion of two collateral independent beings, one of whom is good, and the other evil; which last they imagine has the direction and superintendence of this earth, for which reason they chiefly worship him; whence those that give us an account of the religion of these savages give out, that they worship the devil. The Chaldeans and Persians, in like manner, believed both a good principle and an evil one; which last they imagined was an enemy to mankind. Isaiah, speaking according to some commentators, of the fall of the devil, calls him Lucifer, from his former elevation and state of glory: but others explain this passage of Isaiah in reference to the king of Babylon, who had been precipitated from his throne and glory. The Arabians call Lucifer Eblis; which some think is only a diminutive, or corruption of the word Diabolus.

DEVIL ON THE NECK, a tormenting engine made of iron, straitening and wincing the neck of a man, with his legs together, in a horrible manner; so that the more he stirs in it, the straiter it presses him; formerly used by the persecuting papists.

DEVIL'S ARSE-A-PEAK, a great unfathomable hole or cavern in Derbyshire.

DEVILS BIT, in botany. See **SCABIOSA**.

DEVISE, or **DEVICE**, in heraldry, painting, and sculpture, an emblem used to represent a certain family, person, action, or quality; with a suitable motto, applied in a figurative sense. See **MOTTO**. The essence of a device consists in metaphorical similitude between the things representing and represented: thus, a young nobleman, of great courage and ambition, is said to have borne his devise, in a carousal at the court of France, a rocket mounted in the air, with this motto in Italian, "proco duri purehe m'inalzi;" expressing, that he preferred a short life; provided he might thereby attain to glory and eminence.

DEVISE, in law, the act whereby a person bequeaths his lands or tenements to another, by his last will and testament. The person who makes this act, is called the *devisor*, and he in whose favour the act is made, is termed in law the *devisee*.

DEVIZES, a populous borough of Wiltshire, 19 miles E. of Bath.

DEVON, a river of Scotland, in the counties of Perth and Clackmannan.

DEVONSHEERING, the burning of land by way of manure. The method is to cut off the turf about four inches thick, and burn it in heaps, and then spread the ashes upon the land.

DEVONSHIRE, a county of England, bounded on the S. and S. E. by the English channel, on the N. and N. W. by the Bristol channel, on the E. by Somersetshire and Dorsetshire, and on the W. by Cornwall. It is about 69 miles long from N. to S. and 64 broad. The soil is various; in the western parts it is coarse.

coarse and moorish, bad for sheep, but proper for black cattle. Its chief rivers are the Dart, the Ex, the Tamar, and the Teigne.

DEVOTION is defined by Jurieu, a softening and yielding of the heart, with an internal consolation, which the souls of believers feel in the exercise of piety. It also includes certain religious practices, which a person makes it a rule to discharge regularly; and with reason, if these be founded on solid piety; otherwise they are mere superstition. That devotion is vain, which we would accommodate both to God and to the world. The character of devotion has frequently suffered from the forbidding air which has been thrown over it, by bigotry and superstition. When freer and more cheerful minds have not had occasion to see it accompanied with those feelings of delight and benevolence which naturally attend it, they are apt to be prejudiced against piety, by mistaking this ungracious appearance for its genuine form. Wherever the vital spirit of Christian devotion, founded on genuine faith in Christ, prevails, its immediate objects will be to adore the perfections of God; to entertain with reverence and complacency the various intimations of his pleasure, especially those contained in holy writ; to acknowledge our absolute dependence, and infinite obligations to him; to confess and lament the disorders of our nature, and the transgressions of our lives; to implore his grace and mercy through Jesus Christ; to intercede for our brethren of mankind; to pray for the propagation and establishment of truth, righteousness, and peace, on earth; in fine, to long for a more entire conformity to the will of God, and to breathe after the everlasting enjoyment of his friendship. The effects of such a spirit habitually cherished, and feelingly expressed before him, must surely be important and happy. Among these may be reckoned, a profound humility in the sight of God, a high veneration for his presence and attributes, an ardent zeal for his worship and honour, a constant imitation of our Saviour's divine example, a diffusive charity for men of all denominations, a generous and unwaried self-denial for the sake of virtue and society, a total resignation to Providence, an increasing esteem for the gospel, with clearer and firmer hopes of that immortal life which it has brought to light.

DEVOTION, or **BEING DEVOTED**, among the ancient Romans, was a kind of sacrifice or ceremony, whereby they consecrated themselves to the service of some person. The ancients had a notion, that the life of one might be ransomed by the death of another; whence those devotions became frequent for the lives of the emperors.

DEVOURING, in heraldry, is when fishes are borne in an escutcheon in a feeding posture, for they swallow all the meat whole.

DEUTERO-CANONICAL, [from *deuteros*, second, and *kanonikos*, canonical,] in the school theology, an appellation given to certain books of holy scripture, which were added to the canon after the rest; either because they were not wrote till after the compilation of the canon, or by reason of some dispute as to their canonicalness. The Jews acknowledged several books in their canon, which were put there later than the rest. They say, that under Ezra, a great assembly of their doctors, which they call by way of eminence the great synagogue, made the collection of the sacred books which we now have in the Hebrew Old Testament. And they agree that they put books therein which had not been so before the Babylonish captivity; such are those of Ezra, Nehemiah, Esther, Ezekiel, Daniel, Haggai, Zechariah, and Malachi. The Latin church has since added others to the canon, that were not, and could not be, in the canon of the Jews; being wrote long after. Such are several of the apocryphal books, as the Maccabees, Ecclesiasticus, Wisdom, &c. Others were added still later, by reason their canonicalness had not been previously examined. The deuterocanonical books in the modern canon, are the epistle to the Hebrews; those of James, and Jude; the second of St. Peter; the second and third of St. John; and the Revelation.

DEUTERONOMY, [*deuteros*, Gr. second, and *nomos*, law,] one of the sacred books of the Old Testament, was the last of those written by Moses. See **PENTATEUCH**. It was written in the 40th year after the delivery from Egypt, in the country of the Moabites beyond Jordan; Moses being then in the 120th year of his age.

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DEUTEROPOTMI, in Grecian antiquity, a designation given to such of the Athenians as had been thought dead, and, after the celebration of the funeral rites, unexpectedly recovered.

DEUTEROSIS, [*deuteros*,] the Greek name by which the Jews called their Mischnah, or second law. See **MISCHNAH**.

DEUTZIA, in botany, a genus of the decandria trigynia class and order. Calyx one-leaved; capsule three-celled; filaments three-cusped. There is only one species, a native of Japan.

DEUX PONTS, a late duchy of Germany, in the circle of the Upper Rhine, annexed to the French republic, in December 1797.

DEUX PONTS, or **ZWEYBRUCKEN**, (as the Germans call it,) a town of Germany, now annexed to France, and included in the department of Sarre and Moselle. It is 46 miles W. of Mannheim.

DEW, [*deaw*, Sax. *daaw*, Dut.] a dense, moist vapour, found on the earth in spring and summer mornings in form of a misting rain, being collected there chiefly while the sun is below the horizon. Dr. Hutton defines it to be "a thin light insensible mist, or rain, ascending with a slow motion, and falling while the sun is below the horizon." He adds, "that it appears to differ from rain, as less from more. Its origin and matter are doubtless from the vapours and exhalations that rise from the earth and water." See **METEOROLOGY**.

DEW-BORN, in country affairs, a distemper in cattle, being a swelling in the body, as much as the skin can hold, so that some beasts are in danger of bursting. It proceeds from greediness in feeding, when put into a rank pasture; but commonly when the grass is full of water. In this case the beast should be stirred up and down, and made to purge well; but the proper cure is bleeding in the tail; then take a grated nutmeg, with an egg, and breaking the top of the shell, put out so much of the white as you may have room to slip the nutmeg into the shell; mix them together, and then let shell and all be put down the beast's throat; that done, walk him up and down, and he will soon mend.

DEXTANS, in Roman antiquity, ten ounces, or ten-twelfths of their libra. See **LIBRA**.

DEXTER, in heraldry, an appellation given to whatever belongs to the right side of a shield or coat of arms: thus we say, bend dexter, dexter point, &c.

DEXTROCHERE, or **DESTROHERE**, in heraldry, is applied to the right arm painted in a shield, sometimes naked; sometimes clothed, or adorned with a bracelet; and sometimes armed, or holding some moveable or member used in the arms.

DEY, the title of the sovereign of Algiers, under the protection of the grand seignor. A prince under this title was appointed by the sultan, at the request of the Turkish soldiers, in 1710. The term dey, in the Turkish language, signifies an uncle by the mother's side; and the reason of the denomination is this: that the Turkish military consider the grand seignor as their father; the state as their mother, by which they are nourished and maintained; and the dey as the brother of the state, and consequently the uncle of all who are under his dominion.

DEZKAK, a town of Persia, in the province of Segestan, 110 miles E. N. E. of Zareng.

DHAR, a town of Hindostan, in the country of Malwa, 42 miles W. of Indore.

DHOOLPOUR, a town of Hindostan, in the country of Agra, 32 miles S. of Agra.

DIABETES, [*διαβητης*,] a morbid copiousness of urine. See **MEDICINE**.

DIACAUSTIC CURVE, a species of the caustic curves formed by refraction. Thus if you imagine an infinite number of rays BA, BM, BD, &c. (Plate LIV. fig. 9,) issuing from the same luminous point B to be refracted to or from the perpendicular MC by the given curve AMD, and so that CE, the sines of the angles of incidence CME, be always to CG, the sines of the refracted angles CMG, in a given ratio; then the curve HFN, which touches all the refracted rays, is called the diacaustic, or caustic refraction. See **CAUSTIC CURVE**.

DIACHYLON, in pharmacy, an emollient digestive plaster composed of mucilages or viscid juices drawn from certain plants. See **PHARMACY**.

DIACODIUM, [*διακωδιον*,] the syrup of poppies.

2 N

DIACODIUM

DIACODIUM is also called *syrupus de meconio*. See **PHARMACY**.

DIACOUSTICS, or **DIAPHONICS**, the consideration of the properties of refracted sound, as it passes through different mediums. See **ACOUSTICS**. The word is formed from the Greek *δια*, per, through, which intimates a passage; and *ακουω*, I hear, *q. d.* the consideration of the passage of the sounds we hear.

DIACRII, in antiquity, the name of a faction at Athens. That city was divided into two parties. the one wished for an oligarchy, and would only have a few persons employed in the government; the others were for democratical government, wherein the whole people should have a share. The first were called diacrii, and the latter pediacy; the latter inhabiting the lower, and the former the *ακρον*, or upper part of the city.

DIADELPHIA, [from *δισ*, twice, and *αδελφος*, a brother,] the 17th class in the sexual system, comprehending those plants which bear hermaphrodite flowers with two sets of united stamina; but this circumstance must not be absolutely depended on. They are the papilionacei of Tournefort, the irregulares tetrapetali of Rivinus, and the leguminosa of Ray. See **BOTANY**.

DIADEM, in antiquity, was a head-band or fillet, worn by kings as a badge of their royalty. It was made of silk, thread, or wool, and tied round the temples and forehead, the ends being tied behind, and let fall on the neck. It was usually white, and quite plain; though sometimes embroidered with gold, and set with pearls and precious stones. In latter times, it came to be twisted round crowns, laurels, &c. and even appears to have been worn on divers parts of the body. See **CROWN**. The word is derived from the Greek verb, *διαδω*, to gird.

DIADEM, in heraldry, is applied to certain circles or rims serving to inclose the crowns of sovereign princes, and to bear the globe and cross, or the flower de lices, for their crest. The crowns of sovereigns are bound, some with a greater, and some with a less number of diadems. The bandage about the heads of Moors on shields is also called diadem, in blazoning.

DIERESIS, [*διαίρεσις*,] the separation or disjunction of syllables: as *aër*, *πληρώδης*, *Δι*, *Αἰὺλ*.

DIERESIS, in medicine, is the consuming of the vessels of an animal body, when from some corroding cause certain passages are made, which naturally ought not to have been; or certain natural passages are dilated beyond their ordinary dimensions, so that the humours which ought to have been contained in the vessels extravasate or run out.

DIERESIS, in surgery, an operation serving to divide and separate the part when the continuity is a hindrance to the cure.

DIÆRETICS, corrosive medicines.

DIETETÆ, in Grecian antiquity, a kind of judges, of which there were two sorts; viz.

1. **DIETETÆ CLEROTI**, public arbitrators, chosen by lot to determine all causes exceeding ten drachms, within their own tribe, and from their sentence an appeal lay to the superior courts.

2. **DIETETÆ DIALLECTERII**, private arbitrators from whose sentence there lay no appeal. They always took an oath to administer justice without partiality.

DIETETICS, that branch of medicine which relates to the rules respecting food. See **MEDICINE**.

DIAGLYPHICE, the art of cutting or engraving figures on metals, such as seals, intaglios, matrices of letters, &c. or coins for medals. See **ENGRAVING**.

DIAGNOSIS, [from *διαγιγνωσκω*, Gr. to distinguish,] the diagnostics or signs of a disease. See next article.

DIAGNOSTIC, [*διαγνωστικω*,] a symptom by which a disease is distinguished from others.

DIAGNOSTICS, are of two kinds; viz.

1. **DIAGNOSTICS, ADJUNCT**, are common to several diseases, and serve only to point out the difference between diseases of the same species.

2. **DIAGNOSTICS, PATHOGNOMONIC**, are those which always attend the disease, and distinguish it from all others.

DIAGONAL, [*διαγωνιω*,] in geometry, a right line drawn across a quadrilateral figure, from one angle to another; by some called the diameter, and by others the diametral, of the figure. See **GEOMETRY**.

DIAGORAS, surnamed the Atheist, lived in the 91st Olympiad. He was not a native of Athens, but he philosophised there. He delighted in making verses, and had composed a poem which a certain poet stole from him. He sued the thief, who swore it was his own, and got glory by it. This tempted Diagoras to deny a Providence. The Athenians summoned him to give an account of his doctrine. He fled, and they set a price upon his head, promising a reward to any who should kill him; but he took shipping, and was cast away.

DIAGRAM, [*διαγραμμα*,] a delineation of geometrical figures; a mathematical scheme.

DIAH, or **DIAT**, a name given by the Arabs to the punishment of retaliation. By the Mohammedan law, a brother, or the next relation of a murdered person, ought to take part against the murderer, and demand his blood in reparation for the murder.

DIAHEXAPLA, or **DIAHEXAPLE**, among farriers, a compound medicine, so called from its containing six ingredients, viz. birthwort and gentian roots, juniper berries, bay berries, myrrh, and ivory shavings. It is commended for colds, consumptions, purness, and many other disorders in horses.

DIAL, [from the Latin, *dies*, day, because it indicates the hour of the day,] the ancients also called it *Sciatherium*, from its effect by the shadow. See **DIALING**.

DIALECT, [*διαλεκτω*,] the subdivision of a language; as the Attic, Doric, Ionic, Æolic dialects.

DIALECT is an appellation given to the language of a province, in so far as it differs from that of the whole kingdom. The term is particularly used in speaking of the ancient Greek, whereof there are four dialects; each of which was a perfect language in its kind, that took place in certain countries, and had peculiar beauties. In Great Britain, besides the two grand dialects of English and Scotch, almost every county has a dialect of its own, all differing considerably in pronunciation, accent, and tone, although one and the same language.

DIALECTIC, [*ἡ διαλεκτικὴ τέχνη*,] logic; the act of reasoning.

DIALECTICS, in the literary history of the ancients, that branch of logic which taught the rules and modes of reasoning. See the article **LOGIC**. Zeno Eleates was the first who discovered the natural series of principles and conclusions observed in reasoning, and formed an art thereof in form of a dialogue; which, for this reason, was called dialectica. The dialectica of the ancients is usually divided into several kinds: 1. The first was the eleatica, that of Zeno Eleates, which was threefold; viz. consecutionem, colloquutionum, and contentionum: the first consisting of rules for deducing or drawing conclusions. The second, the art of dialogue; which became of such universal use in philosophy, that all reasoning was called interrogation: then, syllogism being laid aside, the philosophers did all by dialogue; it lying on the respondent to conclude and argue from the several concessions made. The last part of Zeno's dialectics, *ἐριστικη*, was contentious, or the art of disputing and contradicting; though some, particularly Laertius, ascribe this part to Protagoras a disciple of Zeno. 2. The second is the dialectica megarica, whose author is Euclid, not the mathematician, but another of Megara. He gave much into the method of Zeno and Protagoras; though there are two things appropriated to him: the first, that he impugned the demonstrations of others, not by assumptions, but conclusions; continually making illations, a proceeding from consequence to consequence: the second, that he set aside all arguments drawn from comparisons of similitude as invalid. He was succeeded by Eubulides, from whom the sophistic way of reasoning is said to be derived. In his time the art is described as manifold: mentions, fallens, electra, obvelata, arcevalis, cornuta, and calva. See **SOPHISM**. 3. The third is the dialectics of Plato, which he proposes as a kind of analysis to direct the human mind, by dividing, defining, and bringing things to the first truth; where being arrived, and stopped there a little, it applies itself to explain sensible things, but with a view to return to the first truth where alone it can rest. Such is the idea of Plato's analysis. 4. The fourth is Aristotle's dialectics; containing the doctrine of simple words, delivered in his book "De Interpretatione;" and that of the several kinds of syllogism, in his books of *Analytics*, *Topics*, and *Elenchuses*. 5. The fifth is the dialectics of the Stoics; which they call a part of philosophy, and divide into rhetoric and dialectic; to which some add the definitive, whereby things are justly defined; comprehending likewise the canons or criterions of

of truth. The Stoics, before they treat of syllogisms, have two principal places; the one about the signification of words, the other about the things signified. 6. The sixth is Epicurus's dialectics; for though he seems to have despised dialectic, he cultivated it with vigour. He was only averse to that of the Stoics; who he thought attributed too much to it, as pronouncing him alone wise who was well versed in dialectics. For this reason, Epicurus, seeming to set aside the common dialectics, had recourse to another way; viz. to certain canons which he substituted in their stead, the collection whereof he called canonica; and all questions in philosophy are either *de re* or *de voce*, he gave separate rules for each.

DIALITHA, in the writings of the ancients, a word used to express the elegant ornaments of the Greeks and Romans, composed of gold and gems. They also called these Lithocolia, *q. d.* cemented stones or gems; the gold being in this case as a cement to hold the stones together.

DIALIUM, in botany, a genus of the monogynia order, and diandria class of plants. Corolla regular, pentapetalous; no calyx; stamina at the upper side of the receptacle. It has but one species, a native of the East Indies.

DIALLAGA, [*Διαλλαγή*, Gr.] in rhetoric, a figure, wherein many arguments are adduced, but none of them conclusive.

DIALING.

The art of drawing dials upon any given surface, whether plane or curved. This art is of great antiquity, for we read in Isaiah xxxviii. 8, of the dial of Ahaz who began to reign 400 years before Alexander, and within 12 years of the building of Rome. Among the ancients Anaximenes the Milesian, and Thales, are said to have made dials, and Vitruvius mentions one made by the ancient Chaldee historian Berosus, on a reclining plane almost parallel to the equator. Aristarchus of Samos invented the hemispherical dial, and there were at the same time some spherical ones, with a needle for a gnomon. The discus of Aristarchus was an horizontal dial with its rim raised up all around to prevent the shadow from stretching too far. The first sun-dial at Rome was set up by Papirius Cursor, about A. U. C. 460; before which time says Pliny there is no mention of any account of time but by the sun's rising and setting: it was set up at or near the temple of Quirinus, but was very inaccurate. About 30 years after, M. Valerius Messala, being consul, brought out of Sicily another dial, which he set up on a pillar near the rostrum; but because it was not made for the latitude, it did not shew the time truly. They made use of it 99 years; till Martius Philippus set up another more exact. The first professed writer on dialing is Clavius; who demonstrates both the theory and the operations, after the rigid manner of the ancient mathematicians; but with so much intricacy, that few perhaps ever read them all. Dechaes and Ozanam give much easier demonstrations in their "Courses," and Wolfius in his "Elements." M. Picard has given a new method of making large dials, by calculating the hour-lines; and M. de la Hire, in his "Dialing," printed in 1683, a geometrical method of drawing hour-lines from certain points determined by observation. Eberhardus Welperus, in 1625, published his "Dialing," wherein he lays down a method of drawing the primary dials on a very easy foundation. The same foundation is described at length by Sebastian Munster, in his "Rudimenta Mathematica," published in 1551. Stermius, in 1672, published a new edition of Welperus's "Dialing," with the addition of a whole second part, about inclining and declining dials, &c. In 1708, the same work, with Sturm's addition, was republished with the addition of a fourth part, containing Picard's and de la Hire's methods of drawing large dials. Paterson, Michael, and Muller, have each wrote on dialing, in the German tongue; Coetsius in his "Horologigraphia Plana," printed in 1689; Gauppenius, in his "Gnomonica Mechanica;" Bion, in his "Use of Mathematical Instruments;" the late ingenious Mr. Ferguson, in his "Select Lectures;" Mr. Emerson, in his "Dialing;" and Mr. W. Jones, in his "Instrumental Dialing." Mr. Ferguson having treated this subject in a clear and satisfactory manner, we shall make liberal use of his "Lecture on Dialing."

DEFINITIONS.

1. A dial is a surface, which is generally plane, upon which lines are described in such a manner, that the shadow of a wire, or of the upper edge of another plane, erected perpendicularly on the former, may shew the true time of the day.
2. The edge of the plane by which the time of the day is found, is called the style of the dial, which must be parallel to the earth's axis; and the line on which the said plane is erected, is called the substile.

3. The angle included between the substile and stile, is called the elevation or height of the stile.

4. Those dials whose planes are parallel to the plane of the horizon, are called horizontal dials; and those dials whose planes are perpendicular to the plane of the horizon, are called vertical or erect dials.

5. Those erect dials, whose planes directly front the north or south, are called direct north or south dials; and all other erect dials are called decliners, because their planes are turned away from the north or south.

6. Those dials whose planes are neither parallel nor perpendicular to the plane of the horizon, are called inclining or reclining dials, according as their planes make acute or obtuse angles with the horizon; and if their planes are also turned aside from facing the south or north, they are called declining inclining or declining reclining dials.

7. The intersection of the plane of the dial, with that of the meridian, passing through the stile, is called the meridian of the dial, or the hour-line of XII.

8. Those meridians, whose planes pass through the stile, and make angles of 15, 30, 45, 60, 75, and 90 degrees with the meridian of the place (which marks the hour-line of XII.) are called hour-circles; and their intersections with the plane of the dial are called hour-lines.

9. In all declining dials, the substile makes an angle with the hour-line of XII. and this angle is called the distance of the substile from the meridian.

10. The declining plane's difference of longitude, is the angle formed at the intersection of the stile and plane of the dial, by two meridians: one of which passes through the hour-line of XII. and the other through the substile.

ILLUSTRATION OF THE PRINCIPLES OF DIALING. See Plate LVI.

If the whole earth *a P e p*, (fig. 1,) were transparent, and hollow, like a sphere of glass, and had its equator divided into 24 equal parts by so many meridian semicircles, *a, b, c, d, e, f, g*, &c. one of which is the geographical meridian of any given place, as London, (which is supposed to be at the point *a*;) and if the hours of XII. were marked at the equator, both upon that meridian and the opposite one, and all the rest of the hours in order on the rest of the meridians, those meridians would be the hour-circles of London: then, if the sphere had an opaque axis, as *P E p*, terminating in the poles *P* and *p*, the shadow of the axis would fall upon every particular meridian and hour, when the sun came to the plane of the opposite meridian, and would consequently shew the time at London, and at all other places on the meridian of London. If this sphere were cut through the middle by a solid plane *ABCD*, in the rational horizon of London, one-half of the axis *EP* would be above the plane, and the other half below it; and if straight lines were drawn from the centre of the plane to those points where its circumference is cut by the hour-circles of the sphere, those lines would be the hour-lines of a horizontal dial for London: for the shadow of the axis would fall upon each particular hour-line of the dial, when it fell upon the like hour-circle of the sphere. If the plane which cuts the sphere be upright, as *AFCG*, (fig. 2,) touching the given place (London) at *F*, and directly

directly facing the meridian of London, it will then become the plane of an erect direct south dial: and if right lines be drawn from its centre *E* to those points of its circumference where the hour-circles of the sphere cut it, these will be the hour-lines of a vertical or direct south dial for London, to which the hours are to be set as in the figure, (contrary to those on a horizontal dial,) and the lower half *Ep* of the axis will cast a shadow on the hour of the day in this dial, at the same time that it would fall upon the like hour-circle of the sphere, if the dial plane was not in the way. If the plane (still facing the meridian) be made to incline, or recline, any given number of degrees, the hour-circles of the sphere will still cut the edge of the plane in those points to which the hour-lines must be drawn straight from the centre; and the axis of the sphere will cast a shadow on these lines at the respective hours. The like will still hold, if the plane be made to decline by any given number of degrees from the meridian toward the east or west: provided the declination be less than 90 degrees, or the reclination be less than the co-latitude of the place: and the axis of the sphere will be a gnomon, or stile, for the dial. But it cannot be a gnomon, when the declination is quite 90 degrees, nor when the reclination is equal to the co-latitude: because, in these two cases, the axis has no elevation above the plane of the dial. And thus it appears, that the plane of every dial represents the plane of some great circle upon the earth; and the gnomon the earth's axis, whether it be a small wire as in the above figures, or the edge of a thin plate, as in the common horizontal dials. The whole earth, as to its bulk, is but a point, if compared to its distance from the sun: and therefore, if a small sphere of glass be placed upon any part of the earth's surface, so that its axis be parallel to the axis of the earth, and the sphere have such lines upon it, and such planes within it, as above described; it will shew the hours of the day as truly as if it were placed at the earth's centre, and the shell of the earth were as transparent as glass. But because it is impossible to have a hollow sphere of glass perfectly true, blown round a solid plane; or if it was, we could not get at the plane within the glass to set it in any given position; we make use of a wire sphere to explain the principles of dialing, by joining 24 semicircles together at the poles, and putting a thin flat plate of brass within it. See fig. 1 and 2.

DIALING BY THE TERRESTRIAL GLOBE.

A common globe of 12 inches diameter, has generally 24 meridian semicircles drawn upon it. If such a globe be elevated to the latitude of any given place, and turned about until one of these meridians cut the horizon in the north point, where the hour of XII is supposed to be marked, the rest of the meridians will cut the horizon at the respective distances of all the other hours from XII. Then if these points of distance be marked on the horizon, and the globe be taken out of the horizon, and a flat board or plate be put into its place, even with the surface of the horizon; and if straight lines be drawn from the centre of the board, to those points of distance on the horizon which were cut by the 24 meridian semicircles; these lines will be the hour-lines of a horizontal dial for that latitude, the edge of whose gnomon must be in the very same situation that the axis of the globe was before it was taken out of the horizon: that is, the gnomon must make an angle with the plane of the dial, equal to the latitude of the place for which the dial is made. If the pole of the globe be elevated to the co-latitude of the given place, and any meridian be brought to the north point of the horizon, the rest of the meridians will cut the horizon in the respective distances of all the hours from XII, for a direct south dial, whose gnomon must make an angle with the plane of the dial, equal to the co-latitude of the place; and the hours must be set the contrary way on this dial to what they are on the horizontal. But if the globe have more than 24 meridian semicircles upon it, we must take the following method for making horizontal and south dials. Elevate the pole to the latitude of the place, and turn the globe until any particular meridian (suppose the first) comes to the north point of the horizon, and the opposite meridian will cut the horizon in the south. Then, set the hour-index to the uppermost XII on its circle; which done, turn the globe westward until 15 degrees of the equator pass under the brazen meridian, and then the hour index will be at I, (for the sun moves 15 degrees every hour,) and the first meridian will cut the horizon in the number of degrees from the north point that I is distant from XII. Turn on until other 15-degrees of the equa-

tor pass under the brazen meridian, and the hour index will then be at II, and the first meridian will cut the horizon in the number of degrees that II is distant from XII: and so, by making 15 degrees of the equator pass under the brazen meridian for every hour, the first meridian of the globe will cut the horizon in the distances of all the hours from XII to VI, which is just 90 degrees; and then the distances of XI, X, IX, VIII, VII, and VI, in the forenoon, will be same from XII, as the distances of I, II, III, IV, V, and VI, in the afternoon; and these hour lines continued through the centre, will give the opposite hour lines on the other half of the dial. To make a horizontal dial for the latitude of London, which is $51\frac{1}{2}$ degrees north, elevate the north pole of the globe $51\frac{1}{2}$ degrees above the north point of the horizon; and then turn the globe, until the first meridian (which is that of London on the English terrestrial globe) cuts the north point of the horizon, and set the hour index to XII at noon. Then turning the globe westward until the index points successively to I, II, III, IV, V, and VI, in the afternoon, or until 15, 30, 45, 60, 75, and 90 degrees of the equator pass under the brazen meridian, the first meridian of the globe will cut the horizon in the following numbers of degrees from the north towards the east, viz. $11\frac{3}{4}$, $24\frac{1}{2}$, $38\frac{1}{2}$, $53\frac{1}{2}$, $71\frac{1}{2}$, and 90; which are the respective distances of the above hours from XII, upon the plane of the horizon. To transfer these, and the rest of the hours, to a horizontal plane, draw the parallel right lines *ac*, and *db*, fig. 3, upon that plane, as far from each other as is equal to the intended thickness of the gnomon or stile of the dial, and the space included between them will be the meridian or twelve o'clock line on the dial. Cross this meridian at right angles with the six o'clock line *kh*, and setting one foot of the compasses in the intersection *a*, as a centre, describe the quadrant *ke* with any convenient radius or opening of the compasses: then, setting one foot in the intersection *b*, as a centre, with the same radius describe the quadrant *fh*, and divide each quadrant into 90 equal parts or degrees, as in the figure. As the hour-lines are less distant from each other about noon, than in any other part of the dial, it is best to have the centres of these quadrants at a little distance from the centre of the dial plane, on the side opposite to XII, in order to enlarge the hour-distances thereabouts, under the same angles on the plane. Thus, the centre of the plane is at *C*, but the centres of the quadrants are at *a* and *b*. Lay a ruler over the point *b*, (and keeping it there for the centre of all the afternoon hours in the quadrant *fh*) draw the hour-line of I through $11\frac{3}{4}$ degrees in the quadrant; the hour-line of II, through $24\frac{1}{2}$ degrees; of III, through $38\frac{1}{2}$ degrees; IV, through $53\frac{1}{2}$; and V, through $71\frac{1}{2}$; and because the sun rises about 4 in the morning, on the longest days at London, continue the hour-lines of IV and V in the afternoon through the centre *b* to the opposite side of the dial. This done, lay the ruler to the centre *a* of the quadrant *ek*; and through the like divisions or degrees of that quadrant, viz. $11\frac{3}{4}$, $24\frac{1}{2}$, $38\frac{1}{2}$, $53\frac{1}{2}$, $71\frac{1}{2}$, draw the forenoon hour-lines of XI, X, IX, VIII, and VII; and because the sun sets not before 8 in the evening on the longest days, continue the hour-lines of VII and VIII in the forenoon, through the centre *a*, to VII and VIII in the afternoon; and all the hour-lines will be finished on this dial; to which the hours may be set, as in the figure. Lastly, through $51\frac{1}{2}$ degrees of either quadrant, and from its centre, draw the right line *ag* for the hypotenuse or axis of the gnomon *agi*; and from *g*, let fall the perpendicular *gi*, upon the meridian-line *ai*, and there will be a triangle made, whose sides are *ag*, *gi*, and *ia*. If a plate similar to this triangle be made as thick as the distance between the lines *ac* and *bd*, and set upright between them, touching at *a* and *b*, its hypotenuse *ag* will be parallel to the axis of the world, when the dial is truly set; and will cast a shadow on the hour of the day. The trouble of dividing the two quadrants may be saved by a scale with a line of chords upon it.

To make an ERECT DIRECT SOUTH DIAL, fig. 4, elevate the pole to the co-latitude of the place, and proceed in all respects as above for the horizontal dial, and from VI in the morning to VI in the afternoon; only the hours must be reversed, as in the figure; and the hypotenuse *ag* of the gnomon *agi*, must make an angle with the dial-plane equal to the co-latitude of the place. As the sun can shine no longer on this dial than from six in the morning until six in the evening, there is no occasion for having any more than 12 hours upon it.

To make an ERECT DIAL, DECLINING from the S. towards the E. or

E. or W. elevate the pole to the latitude of the place, and screw the quadrant of altitude to the zenith. Then, if the dial declines towards the E. (which we shall suppose it does), count in the horizon the degrees of declination, from the E. point towards the N. and bring the lower end of the quadrant to that degree of declination at which the reckoning ends. This done, bring any particular meridian of the globe (suppose the first) directly under the graduated edge of the upper part of the brazen meridian, and set the hour to XII at noon. Then, keeping the quadrant of altitude at the degree of declination in the horizon, turn the globe eastward on its axis, and observe the degrees cut by the first meridian in the quadrant of altitude (counted from the zenith) as the hour index comes to XI, X, IX, &c. in the forenoon, or as 15, 30, 45, &c. degrees of the equator pass under the brazen meridian at these hours respectively; and the degrees then cut in the quadrant by the first meridian, are the respective distances of the forenoon hours from XII on the plane of the dial. Then, for the afternoon hours, turn the quadrant of altitude round the zenith until it comes to the degree in the horizon opposite to that where it was placed before; namely, as far from the W. point of the horizon towards the S. as it was set at first from the E. point towards the N.; and turn the globe westward on its axis, until the first meridian comes to the brazen meridian again, and the hour index to XII: then continue to turn the globe westward, and as the index points to the afternoon hours I, II, III, &c. or as 15, 30, 45, &c. degrees of the equator pass under the brazen meridian, the first meridian will cut the quadrant of altitude in the respective number of degrees from the zenith that each of these hours is from XII on the dial. And when the first meridian goes off the quadrant at the horizon in the forenoon, the hour index shews the time when the sun will come upon this dial; and when it goes off the quadrant in the afternoon, the index will point to the time when the sun goes off the dial. Having thus found all the hour distances from XII, lay them down upon the dial plane, either by dividing a semicircle into two quadrants of 90 degrees each, (beginning at the hour-line of XII,) or by the line of chords, as above directed. In all declining dials, the line on which the stile or gnomon stands (commonly called the substile line) makes an angle with the 12 o'clock line, and falls among the forenoon hour-lines, if the dial declines towards the E.; and among the afternoon hour-lines, when the dial declines towards the W. that is, to the left hand from the 12 o'clock line in the former case, and to the right hand from it in the latter. To find the distance of the substile from the 12 o'clock line, if the dial declines from the S. toward the E. count the degrees of the declination in the horizon from the E. point toward the N. and bring the lower end of the quadrant of altitude to that degree of declination where the reckoning ends: then, turn the globe until the first meridian cuts the horizon in the like number of degrees, counted from the S. point toward the E. and the quadrant and first meridian will then cross one another at right angles; and the number of degrees of the quadrant, which are intercepted between the meridian and the zenith, is equal to the distance of the substile line from the 12 o'clock line; and the number of degrees of the first meridian, which are intercepted between the quadrant and the north pole, is equal to the elevation of the stile above the plane of the dial. If the dial declines westward from the S. count that declination from the E. point of the horizon towards the S. and bring the quadrant of altitude to the degree in the horizon at which the reckoning ends; both for finding the forenoon hours, and distance of the substile from the meridian: and for the afternoon hours, bring the quadrant to the opposite degree in the horizon, namely, as far from the W. towards the N. and then proceed in all respects as above. Thus when our declining dial is finished, we have four dials, viz. 1. A north dial declining eastward by the same number of degrees. 2. A north dial declining the same number west. 3. A south dial, declining east. And, 4. A south dial declining west; only, placing the proper number of hours, and the stile or gnomon respectively, upon each plane. For, in the S. W. plane, the substilar line falls among the afternoon hours; and in the S. E. of the same declination, among the forenoon hours, at equal distances from XII. And so all the morning hours on the W. decliner will be like the afternoon hours on the E. decliner; the S. E. decliner will produce the N. W. decliner; and the S. W. decliner, the N. E. decliner, by only extending the hour-lines, stile and

substile, quite through the centre: the axis of the stile (or edge that casts the shadow on the hour of the day) being in all dials whatever parallel to the axis of the world, and consequently pointing towards the north pole of the heaven in north latitudes, and towards the south pole, in south latitudes.

METHOD OF CONSTRUCTING DIALING LINES.

Describe, with any opening of the compasses, as EA, Fig. 5, according to the intended length of the scale, the circle ADCB, and cross it at right angles by the diameters CEA and DEB; divide the quadrant AB first into 9 equal parts, and then each part into 10; so shall the quadrant be divided into 90 equal parts or degrees. Draw the right line AFB for the chord of this quadrant; and setting one foot of the compasses in the point A, extend the other to the several divisions of the quadrant, and transfer these divisions to the line AFB by the arcs 10, 10, 20, 20, &c. and this will be a line of chords, divided into 90 unequal parts. Divide the quadrant CD into 90 equal parts, and from each point of division draw right lines, as *i, k, l*, &c. to the line CE; all perpendicular to that line, and parallel to DE, which will divide EC into a line of sines; and although these are seldom put among the dialing lines on a scale, yet they assist in drawing the line of latitudes. For if a ruler be laid upon the point D, and over each division in the line of sines, it will divide the quadrant CB into 90 unequal parts, as *Ba, Bb*, &c. shewn by the right lines *10a, 20b, 30c*, &c. drawn along the edge of the ruler. If the right line BC be drawn, subtending this quadrant, and the nearest distances *Ba, Bb, Bc*, &c. be taken in the compasses from B, and set upon this line in the same manner as directed for the line of chords, it will make a line of latitudes BC, equal in length to the line of chords AB, and an equal number of divisions, but very unequal as to their lengths. Draw the right line DGA, subtending the quadrant DA; and parallel to it, draw the right line *rs*, touching the quadrant DA at the numeral figure 3. Divide this quadrant into six equal parts, as 1, 2, 3, &c. and through these points of division draw right lines from the centre E to the line *rs*, which will divide it at the points where the six hours are to be placed, as in the figure. If every sixth part of the quadrant be sub-divided into four equal parts, right lines drawn from the centre through these points of division, and continued to the line *rs*, will divide each hour upon it into quarters.

METHOD OF CONSTRUCTING DIALS BY MEANS OF THE DIALING LINES.

This is the easiest of all mechanical methods, and by much the best, when the lines are truly divided: and not only the half-hours and quarters may be laid down by all of them, but every fifth minute by most, and every single minute by those where the line of hours is a foot in length. Having drawn the double meridian-line *ab, cd*, fig. 6, on the plane intended for a horizontal dial, and crossed it at right angles by the six o'clock line *fe* (as in fig. 3,) take the latitude of the place with the compasses, in the scale of latitudes, and set that extent from *c* to *e*, and from *a* to *f*, on the six o'clock line: then, taking the whole six hours between the points of the compasses in the scale of hours, with that extent set one foot on the point *e*, and let the other foot fall where it will upon the meridian-line *cd*, as at *d*. Do the same from *f* to *b*, and draw the right lines *ed* and *fb*, each of them will be equal in length to the whole scale of hours. This done, setting one foot of the compasses in the beginning of the scale at XII, and extending the other to each hour on the scale, lay off these extents from *d* to *e* for the afternoon hours, and from *b* to *f* for those of the forenoon; this will divide the lines *de* and *bf* in the same manner as the hour-scale is divided at 1, 2, 3, 4, and 5; on which the quarters may also be laid down, if required. Then, laying a ruler on the point *c*, draw the first five hours in the afternoon, from that point, through the dots at the numeral figures 1, 2, 3, 4, 5, on the line *de*; and continue the lines of IV and V through the centre *c*, to the other side of the dial, for the like hours of the morning; which done, lay the ruler on the point *a*, and draw the last five hours in the forenoon through the dots 5, 4, 3, 2, 1, on the line *fb*; continuing the hour-lines of VII and VIII through the centre *a* to the other side of the dial, for the like hours of the evening; and set the hours to their respective lines, as in the figure. Lastly, make

the gnomon the same way as directed above for the horizontal dial, and the whole will be finished.

To make an **ERECT SOUTH DIAL**, take the co-latitude of your place from the scale of latitudes, and then proceed in all respects for the hour-line as in the horizontal dial; only reversing the hours, as in fig. 4, and making the angle of the stile's height equal to the co-latitude.

GEOMETRICAL METHOD OF DRAWING THE HOUR LINES UPON DIALS.

I. To construct a **HORIZONTAL DIAL**, fig. 7. Describe with any opening of the compasses, as *ZL*, the two semicircles *LFh* and *LQh*, upon the centres *Z* and *z*, where the six o'clock line crosses the double meridian-line, and divide each semicircle into 12 equal parts, beginning at *L* (though strictly speaking, only the quadrants from *L* to the six o'clock line need be divided); then connect the divisions which are equidistant from *L*, by the parallel line *KM*, *IN*, *HO*, *GP*, and *FQ*. Draw *VZ* for the hypothenuse of the stile, making the angle *VZE* equal to the latitude of your place; and continue the line *VZ* to *R*. Draw the line *Rr* parallel to the six o'clock line, and set off the distance *aK* from *Z* to *Y*, the distance *bI* from *Z* to *X*, *cH* from *Z* to *W*, *dG* from *Z* to *T*, and *eF* from *Z* to *S*. Then draw the lines *Ss*, *Tt*, *Ww*, *Xx*, and *Yy*, each parallel to *Rr*. Set off the distance *yY*, from *a* to 11, and from *f* to 1; the distance *Xx* from *b* to 10, and from *g* to 2; *wW* from *c* to 9, and from *h* to 3; *tT* from *d* to 8, and from *i* to 4; *sS* from *e* to 7, and from *n* to 5. Then laying a ruler to the centre *Z*, draw the forenoon hour-lines through the points 11, 10, 9, 8, 7; and laying it to the centre *z*, draw the afternoon lines through the points 1, 2, 3, 4, 5; continuing the forenoon lines of VII and VIII through the centre *Z*, to the opposite side of the dial, for the like afternoon hours; and the afternoon lines IV and V through the centre *z*, to the opposite side, for the like morning hours. Set the hours to these lines as in the figure, and then erect the stile or gnomon, and the horizontal dial will be finished.

II. To construct a **SOUTH DIAL**, draw the line *VZ*, making an angle with the meridian *ZL*, equal to the co-latitude of your place; and proceed in all respects as in the above horizontal dial for the same latitude, reversing the hours as in fig. 4, and making the elevation of the gnomon equal to the co-latitude.

III. To construct a **NORTH DIAL**. See fig. 8. If the hour-lines IV and V, as also VII and VIII on the south dial, fig. 4, be continued beyond the line VI a VI, and the triangle *agh* turned about the point *a*, till *ah* fall on a XII produced, it is evident a north dial is thereby had. The hour-line for VII in the morning, on the south dial, when produced, forms the hour-line for V in the morning on the north dial; and the hour-line for V in the afternoon, on the south dial, forms the hour-line for VII in the evening on the north dial. The manner of placing the characters for the other hours is therefore obvious.

IV. To describe an **EAST DIAL**. On the eastern side of the plane of the meridian, draw a line *AB*, fig. 9, parallel to the horizon; draw also a line *AK*, making with *AB* an angle *KAB* equal to the complement of the latitude of the place for which the dial is made. Take a point *D* in *AK*, and on that point for a centre describe a circle. Through *D* draw *EC* perpendicular to *AK*, thus the circle will be divided into four quadrants; divide two of these quadrants into 6 equal parts, as in the figure. Draw a straight line *FEG* perpendicular to *EC*, the diameter of the circle, and from the centre *D*, through the several divisions, draw the right lines *DIV*, *DV*, *DVI*, *DVII*, *DVIII*, *DIX*, *DX*, *DXI*. Through *IV*, *V*, *VI*, *VII*, &c. draw lines *IVIV*, *VV*, &c. parallel to *EDC*. Lastly, in *D* erect a stile equal to the radius *DE*, perpendicular to the plane; or on two little pieces perpendicularly fixed in *EC*, and equal to the same *DE*, fit an iron rod parallel to *EC*, thus will each index at the several hours project a shadow to the respective hour-lines *IVIV*, *VV*, *VI VI*, &c. The east dial, it is obvious, can only shew the hours till twelve o'clock.

V. To describe a **WEST DIAL**. The construction is perfectly the same as that of an east dial, only that its situation is inverted, and the hours are written accordingly. A west dial, it is obvious, can only be illuminated after noon, and therefore, joined with an east dial, shews all the hours of the day.

VI. To describe a **PORTABLE DIAL**. This dial is represented in fig. 10, and may be drawn upon a card and carried in a pocket book. Draw the occult line *AB*, fig. 11, parallel to the top of the card, and cross it at right angles with the six o'clock line *ECD*; then upon *C*, as a centre, with the radius *CA*, describe the semicircle *AEL*, and divide it into 12 equal parts (beginning at *A*), as *Ar*, *As*, &c. and from these points of division draw the hour-lines *r*, *s*, *t*, *u*, *v*, *E*, *w*, and *x*, all parallel to the six o'clock line *EC*. If each part of the semicircle be subdivided into four equal parts, they will give the half hour-lines and quarters, as in fig. 12. Draw the right line *ASDo*, making the angle *SAB* equal to the latitude of your place. Upon the centre *A* describe the arch *RST*, and set off upon the arcs *SR* and *ST*, each equal to $23\frac{1}{2}$ degrees for the sun's greatest declination; and divide them into $23\frac{1}{2}$ equal parts, as in fig. 12. Through the intersection *D* of the lines *ECD* and *ADo*, draw the right line *FDG* at right angles to *ADo*. Lay a ruler to the points *A* and *R*, and draw the line *ARF* through $23\frac{1}{2}$ degrees of south declination in the arc *SR*; and then laying the ruler to the points *A* and *T*, draw the line *ATG* through $23\frac{1}{2}$ degrees of north declination in the arc *ST*: so shall the lines *ARF* and *ATG* cut the line *FDG* in the proper lengths for the scale of months. Upon the centre *D*, with the radius *DF*, describe the semicircle *FoG*; which divide into six equal parts, *Fm*, *mn*, *no*, &c. and from these points of division draw the right lines *mh*, *ni*, *pk*, and *ql*, each parallel to *oD*. Then setting one foot of the compasses in the point *F*, extend the other to *A*, and describe the arc *AZH* for the tropic of φ ; (see fig. 10 and 11,) with the same extent, setting one foot in *G*, describe the arc *AEO* for the tropic of $\ominus$. Next setting one foot in the point *h*, and extending the other to *A*, describe the arc *ACI* for the beginnings of the signs ♈ and ♉ ; and with the same extent, setting one foot in the point *i*, describe the arc *AN* for the beginnings of the signs ♊ and ♋ . Set one foot in the point *z*, and having extended the other to *A*, describe the arc *AK* for the beginnings of the signs ♌ and ♍ ; and with the same extent, set one foot in *k*, and describe the arc *AM* for the beginning of the signs ♎ and ♏ . Then setting one foot in the point *D*, and extending the other to *A*, describe the curve *AL* for the beginnings of ♐ and ♑ ; and the signs will be finished. This done, lay a ruler from the point *A* over the sun's declination in the arch *RST*; and where the ruler cuts the line *FDG*, make marks: and place the days of the months right against these marks, in the manner shewn by fig. 10. Lastly, draw the shadow-line *PQ* parallel to the occult line *AB*; make the gnomon, and set the hours to their respective lines, as in fig. 10, and the dial will be finished. The lines *a d*, *a b*, and *b e* of the gnomon, must be cut quite through the card; and as the end *a b* of the gnomon is raised occasionally above the plane of the dial, it turns upon the uncut line *c d* as on a hinge. The dotted line *AB* must be slit quite through the card, and the thread *C* must be put through the slit, and have a knot tied behind, to keep it from being easily drawn out. On the other end of this thread is a small plummet *D*, and on the middle of it a small bead for shewing the hour of the day. To rectify this dial, set the thread in the slit right against the day of the month, and stretch the thread from the day of the month over the angular point where the curve lines meet at XII; then shift the bead to that point on the thread, and the dial will be rectified. To find the hour of the day, raise the gnomon, (no matter how much or how little) and hold the edge of the dial next the gnomon towards the sun, so as the uppermost edge of the shadow of the gnomon may just cover the shadow-line; and the bead then playing freely on the face of the dial, by the weight of the plummet, will shew the time of the day among the hour-lines as it is forenoon or afternoon. To find the time of sun rising and setting, move the thread among the hour-lines, until it either covers some one of them, or lies, parallel betwixt any two; and then it will cut the time of sun-rising among the forenoon hours; and of the sun-setting among the afternoon hours, for that day of the year to which the thread is set in the scale of months. To find the sun's declination, stretch the thread from the day of the month over the angular point at XII, and it will cut the sun's declination, as it is north or south, for that day, in the proper scale. To find on what days the sun enters the signs: when the bead, as above rectified, moves along any of the curve lines which have the signs of the zodiac marked upon them, the sun enters those signs on the days pointed out by the thread in the scale of months.

OF UNIVERSAL DIALS.

I. The Universal Dial, invented by Pardie, fig. 12, consists of three principal parts; the first whereof is called the horizontal plane (A,) because in practice it must be parallel to the horizon. In this plane is fixed an upright pin, which enters into the edge of the second part BD, called the meridional plane; which is made of two pieces, the lowest whereof (B) is called the quadrant, because it contains a quarter of a circle, divided into 90 degrees; and it is only into this part, near B, that the pin enters. The other piece is a semicircle (D) adjusted to the quadrant, and turning in it by a groove, for raising and depressing the diameter (EF) of the semicircle, which diameter is called the axis of the instrument. The third piece is a circle (G,) divided on both sides into 24 equal parts, which are the hours. This circle is put upon the meridional plane so, that the axis (EF) may be perpendicular to the circle, and the point C be the common centre of the circle, semicircle, and quadrant. The straight edge of the semicircle is chamfered on both sides to a sharp edge, which passes through the centre of the circle. On one side of the chamfered part, the first six months of the year are laid down, according to the sun's declination for their respective days, and on the other side the last six months. And against the days on which the sun enters the signs, there are straight lines drawn upon the semicircle, with the characters of the signs marked upon them. There is a black line drawn along the middle of the upright edge of the quadrant, over which hangs a thread (H,) with its plummet (I,) for levelling the instrument. From the 23d Sept to the 21st March, the upper surface of the circle must touch both the centre C of the semicircle, and the line of φ and $\simeq$; and from the 21st March to the 23d Sept. the lower surface of the circle must touch that centre and line. To find the time of day by this dial, set it on a level place in sun-shine, and adjust it by the levelling screws *k* and *l*, until the plumb-line hangs over the back line upon the edge of the quadrant, and parallel to the said edge; move the semicircle in the quadrant, until the line of φ and $\simeq$ (where the circle touches) comes to the latitude of your place in the quadrant; then turn the whole meridional plane BD, with its circle G, upon the horizontal plane A, until the edge of the shadow of the circle falls precisely on the day of the month in the semicircle; and then the meridional plane will be due N. and S. the axis EF will be parallel to the axis of the world, and will cast a shadow upon the true time of the day among the hours of the circle. When the instrument is thus rectified, the quadrant and semicircle are in the plane of the meridian, and the circle is then in the plane of the equinoctial. Therefore, as the sun is above the equinoctial in summer (in northern latitudes,) and below it in winter; the axis of the semicircle will cast a shadow on the hour of the day, on the upper surface of the circle, from the 21st March till the 23d of Sept.; and from the 23d of Sept. to the 21st March, the hour of the day will be determined by the shadow of the semicircle upon the lower surface of the circle. In the former case, the shadow of the circle falls upon the day of the month, on the lower part of the diameter of the semicircle; and in the latter case, on the upper part. The method of laying down the months and signs upon the semicircle is as follows: Draw the right line ACB, fig. 13, equal to the diameter of the semicircle ADB, and cross it in the middle at right angles with the line ECD, equal in length to ADB; then EC will be the radius of the circle FCG, which is the same as that of the semicircle. Upon E, as a centre, describe the circle FCG, on which set off the arcs Ch and Ci, each equal to $23\frac{1}{2}$ degrees, and divide them accordingly into that number for the sun's declination. Then laying the edge of a ruler over the centre E, and also over the sun's declination for every fifth day of each month (as in the card dial,) mark the points on the diameter AB of the semicircle from *a* to *g*, which are cut by the ruler; and there place the days of the months accordingly, answering to the sun's declinations. This done, setting one foot of the compasses in C, and extending the other to *a* or *g*, describe the semicircle *abcdefg*; which divide into six equal parts, and through the points of division draw right lines parallel to CD, for the beginning of the signs (of which one-half are on one side of the semicircle and the other half on the other,) and set the characters of the signs to their proper lines, as in the figure.

II. An Universal Dial on a plain cross, fig. 14, 15, 16, as described by Mr. Ferguson. It is moveable on a joint C, for elevating it to any given latitude on the quadrant Co 90, as it stands

upon the horizontal board A. The arms of the cross stand at right angles to the middle part; and the top of it, from *a* to *n*, is of equal length with either of the arms *ne* or *mk*. See fig. 14. The dial is rectified by setting the middle line *tu* to the latitude of the place on the quadrant, the board A level, and the point N. northward by the needle; thus, the plane of the cross will be parallel to the plane of the equator. Then, from III o'clock in the morning till VI, the upper edge *k* of the arm *io* will cast a shadow on the time of the day on the side of the arm *cm*; from VI. till IX., the lower edge *i* of the arm *io* will cast a shadow on the hours on the side *og*. From IX. in the morning to XII. at noon, the edge *ab* of the top part *an* will cast a shadow on the hours on the arm *nef*; from XII. to III. in the afternoon, the edge *cd* of the top part will cast a shadow on the hours on the arm *klm*; from III. to VI. in the evening, the edge *gh* will cast a shadow on the hours on the part *pu*; and from VI. till IX. the shadow of the edge *ef* will shew the time on the top part *an*. The breadth of each part *ab, ef, &c.* must be so great, as never to let the shadow fall quite without the part or arm on which the hours are marked, when the sun is at his greatest declination from the equator. To determine the breadth of the sides of the arms which contain the hours, so as to be in just proportion to their length; make an angle ABC (fig. 16,) of $23\frac{1}{2}$ degrees, which is equal to the sun's greatest declination: and suppose the length of each arm, from the side of the long middle part, and also the length of the top part above the arms, to be equal to Bd. Then as the edges of the shadow, from each of the arms, will be parallel to Be, making an angle of $23\frac{1}{2}$ degrees with the side Bd of the arm, when the sun's declination is $23\frac{1}{2}$; it is plain, that if the length of the arm be Bd, the least breadth that it can have, to keep the edge Be of the shadow Begd from going off the side of the arm de before it comes to the end of it ed, must be equal to ed or dB. But to keep the shadow within the quarter divisions of the hours, when it comes near the end of the arm, the breadth of it should be still greater, so as to be almost doubled, on account of the distance between the tips of the arms. The hours may be placed on the arms, by laying down the cross *abcd*, fig. 15, on a sheet of paper: and with a black lead pencil held close to it, drawing its shape and size on the paper. Then take the length *ae* in the compasses, and with one foot in the corner *a* describe with the other the quadrant *cef*. Divide this arc into six equal parts, and through the points of division draw light lines *ag, ah, &c.* continuing three of them to the arm *ce*, which are all that can fall upon it; and they will meet the arm in those points through which the lines that divide the hours from each other, as in fig. 14, are to be drawn right across it. Divide each arm for the three hours contained in it, in the same manner; and set the hours to their proper places, on the sides of the arms, as they are marked in fig. 14. Each of the hour-spaces should be divided into four equal parts, for the half-hours and quarters, in the quadrant *cef*; and right lines should be drawn through these division-marks in the quadrant, to the arms of the cross, in order to determine the places thereon where the subdivision of the hours must be marked. This kind of universal dial is easily made, and has a pretty uncommon appearance in a garden.

III. The Universal Mechanical Dial, fig. 17, affords, by its equinoctial circle, an easy method of describing a dial on any kind of plane. For example: Suppose a dial is required on an horizontal plane. If the plane be immoveable as ABCD, find a meridian-line as GF; or if moveable, assume the meridian at pleasure: then by means of the triangle EKE, whose base is applied on the meridian-line, raise the equinoctial dial H till the index GI becomes parallel to the axis of the earth, (which is so, if the angle KEF be equal to the elevation of the pole,) and the 12 o'clock line on the dial hang over the meridian-line of the plane or the base of the triangle. If then, in the night, or in a dark place, a lighted candle be successively applied to the axis GI, so as the shadow of the index or style GI shall fall upon one hour-line after another, the same shadow will mark out the several hour-lines on the plane ABCD. Noting the points therefore on the shadow, draw lines through them to G; then an index being fixed on G, according to the angle IGF, its shadow will point out the several hours by the light of the sun. If a dial were required on a vertical plane, having raised the equinoctial circle as directed, push forward the index GI till the tip thereof I touch the plane. If the plane be inclined to the horizon, the elevation of the pole should be found on the same;

same; and the angle of the triangle KEF should be made equal thereto. The hour-lines may be found by projection thus, on the centre Z, Plate LVII. fig. 25, describe a circle as ENWS to represent the horizon of the given place, suppose London; draw N. S. and E. W. at right angles to it, find the pole P by the stereographic projection of the sphere, see PROJECTION OF THE SPHERE. then project the meridians 1 P a, 2 P b, 3 P c, &c. making the angles N P a, N P b, N P c, &c. equal to 15°, 30°, 45°, &c. Lay a ruler from the points in which these hour-circles cut the horizon, and draw the lines 1 I., 2 II., 3 III., 4 IV., &c. and they will be the true hour-lines of the dial. Set off the latitude from S to A, in this case 51° 32', and draw Z A for the stile, which placed over Z S will complete the dial. The arcs N a, N b, N c, &c. may be easily calculated trigonometrically since in triangles N P a, N P b, N P c, &c. there is given the side N, P and the angle at P, the angle at N being a right angle. We proceed to the calculation as follows.

DIALING by SPHERICAL TRIGONOMETRY.

The construction of sun-dials on all planes whatever may be included in one general rule: intelligible, if that of a horizontal dial for any given latitude be well understood. For there is no plane, however obliquely situated with respect to any given place, but what is parallel to the horizon of some other place; and therefore if we can find that other place by a problem on the terrestrial globe, or by a trigonometrical calculation, and construct a horizontal dial for it; that dial applied to the plane where it is to serve will be a true dial for that place.—Thus, an erect direct S. dial in 51½ degrees N. latitude, would be a horizontal dial on the same meridian, 90° southward of 51½ degrees of N. latitude: which falls in with 38½ degrees of S. latitude. But if the upright plane declines from facing the S. at the given place, it would still be a horizontal plane 90° from that place, but for a different longitude, which would alter the reckoning of the hours accordingly. To calculate the angles which the hour-lines of a horizontal dial make with the meridian or twelve o'clock line: See fig. 18. Let N E S W represent the horizon of any place, P S N the meridian, and P the north pole of the sphere: let K P H be any hour-circle, for example the circle which makes with the meridian an angle of 15 degrees; then it is evident from what has been said in the preceding part of this article, that N H, the arc of the horizon intercepted between N, the north, and P H the hour-circle in whose plane the sun is at XI or 1 o'clock, measures the angle contained by the substile of the dial, and the hour-lines corresponding to these hours. In the spherical triangle P N H, right-angled at N, there are given the side P N which is the elevation of the pole above the horizon, and the angle N P H which is contained by the meridian and hour-circle, to find N H the arc of the horizon opposite that angle. By spherical trigonometry, radius is to the sine of P N as the tangent of N P H to the tangent of N H the side required. Hence we have this practical rule. To find the angle which any hour-line of a horizontal dial makes with the meridian, or which is the same, to find the angle which the hour-lines on any dial make with the substile:—To the logarithmic sine of the latitude of the place for which the dial is made, add the log. tangent of the sun's distance from the meridian for the hour required, the sum, abating 10, is the log. tangent of the angle required.

Example. To find the angles which the hour-lines of XI or I make with the meridian of a horizontal dial for the latitude of London, which is 51½°

To log. sine of 51° 30'	9.89354
Add log. tan. of 15°	9.42805
Sum, rejecting 10, is	9.32159

which is the tangent of 11° 51' nearly. In like manner it will be found, that the hour-lines of X and II make each with the meridian an angle of 24° 18' &c. And by computing in this manner, with the sine of the latitude, and the tangents of 30, 45, 60, and 75°, for the hours of II, III, IV, and V, in the afternoon; or of X, IX, VIII, and VII, in the forenoon; you will find their angular distances from XII to be 24° 18', 38° 3', 53° 35', and 71° 6'; which are all that there is occasion to compute for.—And these distances may be set off from XII by a line of chords; or rather, by taking 1000 from a scale of equal parts, and setting that extent as a radius from C to XII, fig. 19, and then, taking 209 of the same parts (which are the natural tangents of 11° 50'), and setting them

from XII to XI and I, on the line *ho*, which is perpendicular to C XII: and so for the rest of the hour-lines, which in the table of natural tangents, against the above distances, are 452, 782, 1355, and 2920, of such equal parts from XII as the radius C XII contains 1000. And, lastly, set off 125, (the natural tangent of 51° 30') for the angle of the stile's height, which is equal to the latitude of the place.

DECLINING DIALS. Let us suppose that an upright plane at London declines 36 degrees westward from facing the south, and that it is required to find a place on the globe to whose horizon the said plane is parallel; and also the difference of longitude between London and that place. Let N E S W be the horizon of London, fig. 21, whose zenith is Z, and P the north pole of the sphere; and let Z h be the position of a vertical plane at Z, declining westward from S (the south) by an angle of 36 degrees; on which plane an erect dial for London at Z is to be described. Make the semi-diameter ZD perpendicular to Zh; and it will cut the horizon in D, 36 degrees west of the south S. Then a plane, in the tangent HD, touching the sphere in D, will be parallel to the plane Zh; and the axis of the sphere will be equally inclined to both these planes. Let W Q E be the equinoctial, whose elevation above the horizon of Z (London) is 38½ degrees; and PRD be the meridian of the place D, cutting the equinoctial in R. Then it is evident, that the arc RD is the latitude of the place D (where the plane Zh would be horizontal) and the arc RQ is the difference of longitude of the planes Zh and DH. 1. In the spherical triangle W D R, the arc W D is given, for it is the complement of the plane's declination from S the south; which complement is 54° (viz. 90° — 36°) the angle at R, in which the meridian of the place D cuts the equator, is a right angle; and the angle R W D measures the elevation of the equinoctial above the horizon of Z, namely 38½ degrees. Say therefore, As radius is to the co-sine of the plane's declination from the south, so is the co-sine of the latitude of Z to the sine of RD the latitude of D: which is of a different denomination from the latitude of Z, because Z and D are on different sides of the equator.

As radius	10.00000
To co-sine 36° 0' = RQ	9.90796
So co-sine 51° 30' = QZ	9.79415

To sine 30° 14' = DR (9.70211) = the latitude of D, whose horizon is parallel to the vertical plane Zh at Z. 2. To find RQ the difference of longitude of the places D and Z, say, As radius is to the cosine of R W D 38½ degrees, the height of the equinoctial at Z, so is the co-tangent of DW 36 degrees, the plane's declination, to the co-tangent of RQ the difference of longitudes. Thus,

To the logarithmic sine of 51° 30'	9.89354
Add to the logarithmic tang. of 54° 0'	10.13874

Their sum rejecting 10.....10.03228 is the nearest tangent of 47° 8' = WR; which is the co-tangent of 42° 52' = RQ, the difference of longitude sought. Which difference, being reduced to time, is 2 hours 51½ minutes. 3. And thus having found the latitude and longitude of the place D, to whose horizon the vertical plane at Z is parallel, we proceed to the construction of a horizontal dial for the place D, whose latitude is 30° 14' south; but anticipating the time at D by 2 hours 51 minutes (neglecting the ½ min. in practice,) because D is so far westward in longitude from the meridian of London; and this will be a true vertical dial at London, declining westward 36 degrees. Assume any right line CSL, fig. 19, for the substile of the dial, and make the angle KCP equal to the latitude of the place (viz. 30° 14'), to whose horizon the plane of the dial is parallel; then CRP will be the axis of the stile, or edge that casts the shadow on the hours of the day, in the dial. This done, draw the contingent line EQ, cutting the substilar line at right angles in K; and from K make KR perpendicular to the axis CRP. Then KG (=KR) being made radius, that is, equal to the chord of 60° or tangent of 45°, on a good sector take 42° 52' (the difference of longitude of the places Z and D) from the tangents, and having set it from K to M, draw CM for the hour-line of XII. Take KN, equal to the tangent of an angle less by 15 degrees than KM; that is, the tangent of 27° 52'; and through the point N draw CN for the hour-line of I. The tangent of 12° 52' (which is 15° less than 27° 52'), set off the same way, will give a point between K and N, through which the hour-
line

line of II is to be drawn. The tangent of $2^{\circ} 8'$ (the difference between 45° and $50^{\circ} 52'$) placed on the other side of CL, will determine the point through which the hour-line of III is to be drawn: to which $2^{\circ} 8'$, if the tangent of 15° be added, it will make $17^{\circ} 8'$; and this set off from K towards Q on the line EQ, will give the point for the hour-line of IV: and so of the rest. — The forenoon hour-lines are drawn the same way, by the continual addition of the tangents 15° , 30° , 45° , &c. to $42^{\circ} 52'$ (= the tangent KM) for the hours of XI, X, IX, &c. as far as necessary; that is, until there be five hours on each side of the substile. The 6th hour, accounted from that hour or part of the hour on which the substile falls, will be always in a line perpendicular to the substile, and drawn through the centre C. 4. In all erect dials, CM, the hour-line of XII, is perpendicular to the horizon of the place for which the dial is to serve; for that line is the intersection of a vertical plane with the plane of the meridian of the place, both which are perpendicular to the plane of the horizon: and any line HO, or ho, perpendicular to CM, will be a horizontal line on the plane of the dial, along which line the hours may be numbered; and CM being set perpendicular to the horizon the dial will have its true position. 5. If the plane of the dial had declined by an equal angle toward the east, its description would have differed only in this, that the hour-line of XII would have fallen on the other side of the substile CL, and the line HO would have a subcontrary position to what it has in this figure. 6. And these two dials, with the upper points of their stiles turned toward the N. pole, will serve for other two planes parallel to them; the one declining from the N. toward the E. and the other from the N. toward the W. by the same quantity of angle. The like holds true of all dials in general, whatever be their declination and obliquity of their planes to the horizon.

RECLINERS. If the plane of the dial not only declines, but also reclines. Suppose its declination from fronting the south S be equal to the arc SD, fig. 20, on the horizon; and its reclination be equal to the arc Dd of the vertical circle DZ: then it is plain, that if the quadrant of altitude Zdd on the globe, cuts the point D in the horizon, and the reclination is counted upon the quadrant from D to d; the intersection of the hour-circle PRd, with the equinoctial WQE, will determine Rd, the latitude of the place d, whose horizon is parallel to the given plane Zh at Z; and RQ will be the difference in longitude of the places at d and Z. Trigonometrically thus: Let a great circle pass through the three points, W, d, E; and in the triangle Wdd, right-angled at D, the sides WD and Dd are given; and thence the angle DWd is found, and so is the hypotenuse Wd. Again, the difference, or the sum, of DWd and DWR, the elevation of the equinoctial above the horizon of Z, gives the angle dWR; and the hypotenuse of the triangle WRd was just now found; whence the sides Rd and WR are found, the former being the latitude of the place d, and the latter the complement of RQ, the difference of longitude sought. Thus, if the latitude of the place Z be $52^{\circ} 30'$ north; the declination SD of the plane Zh (which would be horizontal at d) be 36° , and the reclination be 15° , or equal to the arc Dd; the south latitude of the place d, that is, the arc Rd, will be $15^{\circ} 9'$; and RQ, the difference of the longitude, $36^{\circ} 2'$. From these data, therefore, let the dial, fig. 22, be described, as in the former example. 8. There are several things requisite in the practice of dialing; the chief of which shall be given in the form of arithmetical rules, simple and easy to those who have learned the elements of trigonometry. For in practical arts of this kind, arithmetic should be used as far as it can go; and scales never trusted to, except in the final construction, where they are absolutely necessary in laying down the calculated hour-distances on the plane of the dial. The latitude of the place, the sun's declination, and his hour-distance from the meridian, being given, to find, 1st, his altitude, 2d, his azimuth. 1. Let d, fig. 20, be the sun's place, dR, his declination; and in the triangle PZd, Pd the sum, or the difference, of dR, and the quadrant PR, being given by the supposition, as also the complement of the latitude PZ, and the angle dPZ, which measures the horary distance of d from the meridian; we shall (by spheric trigonometry) find the base Zd, which is the sun's distance from the zenith, or the complement of his altitude. And 2. as sine Zd : sine Pd :: sine dPZ : dZP, or of its supplement DZS, the azimuthal distance from the south. Or the practical rule may be as follows: Write A for the sine of the sun's altitude, L and l for the sine and co-sine of the latitude, D and d for

the sine and co-sine of the sun's declination, and H for the sine of the horary distance from VI. Then the relation of H to A will have three varieties. 9. When the declination is toward the elevated pole, and the hour of the day is between XII and VI; it is

$$A = LD, \text{ and } H = \frac{LD - A}{ld}. \quad 2. \text{ When the hour is after VI, it is } A = LD - Hld, \text{ and } H = \frac{LD - A}{ld}.$$

$$3. \text{ When the declination is toward the depressed pole, we have } A = Hld - LD, \text{ and } H = \frac{A + LD}{ld}.$$

These theorems will be found useful, and expeditious enough for solving those problems in geography and dialing, which depend on the relation of the sun's altitude to the hour of the day.

Example 1. Suppose the latitude of the place to be $51\frac{1}{2}$ degrees north: the time five hours distant from XII, that is, an hour after VI in the morning, or before VI in the evening; and the sun's declination 20° north. Required the sun's altitude?

$$\text{Then to log. } L = \log. \sin. 51^{\circ} 30' = 1.89354 \\ \text{add log. } D = \log. \sin. 20^{\circ} 0' = 1.53405$$

Their sum = 1.42759 gives

LD = logarithm of 0.267664, in the natural sines

$$\text{And, to log. } H = \log. \sin. 15^{\circ} 0' = 1.41300$$

$$\text{add } \left\{ \begin{array}{l} \log. l = \log. \sin. 38^{\circ} 0' = 1.79414 \\ \log. d = \log. \sin. 70^{\circ} 0' = 1.97300 \end{array} \right.$$

Their sum = 1.18014 gives

Hld = logarithm of 0.151408, in the natural sines. And these two numbers (0.267664 and 0.151408) make 0.419072 = A; which, in the table, is the nearest natural sine of $24^{\circ} 47'$, the sun's altitude sought. In these calculations the radius is considered as unity, and not 10,00000, by which, instead of the index 9, we have —1, which only makes the work a little easier. The same hour-distance being assumed on the other side of VI, then LD — Hld is 0.116256, the sine of $6^{\circ} 40\frac{1}{2}'$; which is the sun's altitude at V in the morning, or VII in the evening, when his N. declination is 20° . But when the declination is 20° S. (or towards the depressed pole) the difference Hld — LD becomes negative; and thereby shews, that an hour before VI in the morning, or past VI in the evening, the sun's centre is $6^{\circ} 40\frac{1}{2}'$ below the horizon.

Example II. From the same data, to find the sun's azimuth. If H, L, and D, are given, then from H having found the altitude and its complement Zd: and the arc Pd (the distance from the pole) being given; say, as the co-sine of the altitude is to the sine of the distance from the pole, so is the sine of the hour-distance from the meridian to the sine of the azimuth distance from the meridian. Let the latitude be $51^{\circ} 30'$ north, the declination $15^{\circ} 9'$ S, and the time II h. 24 m. in the afternoon, when the sun begins to illuminate a vertical wall, and it is required to find the position of the wall. Then, by the foregoing theorems, the complement of the altitude will be $81^{\circ} 32\frac{1}{2}'$, and Pd, the distance from the pole being $109^{\circ} 5'$, and the horary distance from the meridian, or the angle dPZ, 36° .

$$\text{To log. sin. } 74^{\circ} 51' = 1.98464 \\ \text{Add log. sin. } 36^{\circ} 0' = 1.76922$$

$$\text{And from the sum} = 1.75386$$

$$\text{Take log. sine } 81^{\circ} 32\frac{1}{2}' = 1.99525$$

Remains = 1.75861 = log. sin.

35° , the azimuth distance sought. When the altitude is given, find from thence the hour, and proceed as above. This praxis is of singular use on many occasions; as, 1. in finding the declination of vertical planes more exactly than in the common way, especially if the transits of the sun's centre are observed by applying a ruler with sights, either plain or telescopic, to the wall or plane whose declination is required: 2. In drawing a meridian-line, and finding the magnetic variation: 3. In finding the bearings of places in terrestrial surveys; the transits of the sun over any place, or his horizontal distance from it, being observed, together with the altitude and hour; and thence determining small differences of longitude: 4. In observing the variations at sea, &c.

OF FINDING THE DECLINATION, INCLINATION, AND RECLINATION, OF PLANES.

The declination, inclination, and reclination, of planes, are frequently taken with a sufficient degree of accuracy by an instrument called a declinator, or declinatory.

The construction of this instrument, as somewhat improved by Mr. Jones, is as follows: On a mahogany board *ABIK*, fig. 23, is inserted a semicircular arc *AGEB* of ivory or box-wood, divided into two quadrants of 90° each, beginning from the middle *G*. On the centre *C* turns a vertical quadrant *DFE*, divided into 90° , beginning from the base *E*; on which is a moveable index *CF*, with a small hole at *F* for the sun's rays to pass through, and from a spot on a mark at *C*. The lower extremity of the quadrant at *E* is pointed, to mark the linear direction of the quadrant when applied to any other plane; as this quadrant takes off occasionally, and a plumb-line *P* hangs at the centre on *C*, for taking the inclinations and reclinations of planes. At *H*, on the plane of the board, is inserted a compass of points and degrees, with a magnetical needle turning on a pivot over it. The addition of the moveable quadrant and index considerably extend the utility of the declinator, by rendering it convenient for taking equal altitudes of the sun, the sun's altitude, and bearing, at the same time, &c. To apply this instrument in taking the declination of a wall, or plane: place the side *ACB*, in an horizontal direction, to the plane proposed, and observe what degree, or point of the compass the *N*. part of the needle stands over from the north, or the south, and it will be the declination of the plane from the north, or south, accordingly. In this case, allowance must be made for the variation of the needle (if any) at the place; and which, if not previously known, will render this operation very inaccurate. At London it is now $22^\circ 30'$ to the west. Another way more exact may be used, when the sun shines out half an hour before noon. The side *ACB* being placed against the plane, the quadrant must be so moved on the semicircle *AGC*, and the index *CF* on *DE*, till the sun's rays passing through the hole at *F* fall exactly on the mark at *G*, and continue so till the sun requires the index to be raised no higher: you will then have the meridian or greatest altitude of the sun; and the angle contained between *G* and *E*, will be the declination required. The position of *CE* is the meridian, or 12 o'clock line. But the most exact way for taking the declination of a plane, or finding a meridian-line, by this instrument, is, in the forenoon, about two or three hours before 12 o'clock, to observe two or three heights or altitudes *EF* of the sun; and at the same time the respective angular polar distances *GE* from *G*: write them down; and in the afternoon watch for the same, or one of the same altitudes, and mark the angular distances, or distance on the quadrant *AG*: Now, the division or degree exactly between the two noted angular distances will be the true meridian, and the

distance at which it may fall from the *C* of the divisions at *G* will be the declination of the plane. The reason for observing two or three altitudes and angles in the morning is, that in case there should be clouds in the afternoon, we may have the chance of one corresponding altitude. The quadrant may be occasionally taken off at *C*, in order to place it on the surface of a pedestal or plane intended for an horizontal dial; and thereby form equal altitudes of the sun, as above, to draw a meridian or 12 o'clock line to set the dial by. The base *ABIK* serves to take the inclination, and reclination of planes. In this case the quadrant is taken off, and the plummet *P* is fitted on a pin at the centre *C*: then the side *IGK* being applied to the plane proposed, as *QL*, fig. 24, of the plumb-line cuts the semicircle in the point *G*, the plane is horizontal; or if it cut the quadrant in any point at *S*, then will *GCS* be the angle of inclination. Lastly, if applying the side *ACB* to the plane, the plummet cuts *G*, the plane is vertical; or if it cuts either of the quadrants, it is accordingly the angle of reclination. Hence, if the quantity of the angle of inclination be compared with the elevation of the pole and equator, it is easily known whether the plane be inclined, or reclined.

OF THE RIGHT PLACING OF DIALS.

The plane on which the dial is to rest being duly prepared, and every thing necessary for fixing it, take the sun's altitude by a good quadrant, noting the precise time of observation by a clock or watch. Then compute the time for the altitude observed; and set your watch to agree with that time, according to the sun. A Hadley's quadrant is very convenient for this purpose: for by it you may take the angle between the sun and his image reflected from a basin of water; the half of which angle, subtracting the refraction, is the altitude required. This is best done in summer; and the nearer the sun is to the prime vertical (the *E*. or *W*. azimuth) when the observation is made, so much the better. Or, take two equal altitudes of the sun in the same day; one any time between seven and ten in the morning, the other between two and five in the afternoon; noting the moments of these two observations by a clock or watch: and if the watch shews the observations to be at equal distances from noon, it agrees exactly with the sun: if not, the watch must be corrected by half the difference of the forenoon and afternoon intervals; and then the dial may be set true by the watch. For example, suppose you had taken the sun's altitude when it was 20 minutes past VIII. in the morning by the watch; and found, by observation in the afternoon, that the sun had the same altitude ten minutes before III; then it is plain, that the watch was five minutes too fast for the sun: for five minutes after XII is the middle time between VIII h. 20 m. in the morning, and III h. 50 m. in the afternoon; and therefore to make the watch agree with the sun, it must be set back five minutes.

DIALING IN A MINE, called also *plumming*, is the using of a compass which the miners call a dial, and a long line, to know which way the load or vein of ore inclines, or where to shift an air-shaft, or bring an adit to a desired place.

DIALING LINES, or DIALING SCALES. See **DIALING**, and Plate LVI. fig. 5.

DIALING SECTOR is a sector having upon it, besides other lines, the dialing lines the construction of which is shewn under dialing. It is evident that some advantage will be obtained in the practice of dialing by having the lines placed on a sector.

DIALING SPHERE, is an instrument made of brass, with several semicircles sliding over one another, on a moving horizon, to demonstrate the nature of the doctrine of spherical triangles, and to give a true idea of the drawing of dials on all manner of planes.

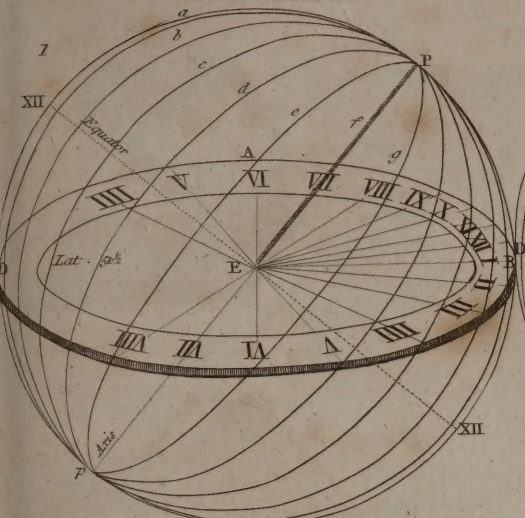
DIALING TRIGON, an instrument invented by the late Mr. Benjamin Martin, consisting of two graduated scales and a plane; used by some in the practice of dialing.

DIALOGISM, in rhetoric, the soliloquy of persons deliberating with themselves. See **SOLILOQUY**.

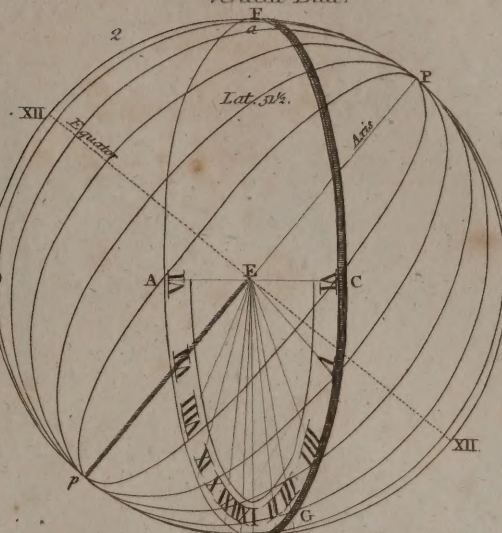
DIALOGUE, [*dialogos*,] a conference; a conversation between two or more, either real or feigned. As the end of speech is conversation, no kind of writing can be more natural than dialogue, which represents this. Accordingly we find it was introduced very early; for there are several instances of it in the Mosaic history. The ancient Greek writers also fell very much into

it, especially the philosophers, as the most agreeable method of communicating their sentiments and instructions to mankind. Indeed it seems to be attended with very considerable advantages, if judiciously managed. For it is capable of making the driest subjects entertaining and pleasant, by its variety, and the different characters of the speakers. Besides, things may be canvassed more minutely, and many less matters, which serve to clear up a subject, may be introduced with a better grace, by questions and answers, objections and replies, than can be conveniently done in a continued discourse. There is likewise a further advantage in this way of writing, that the author is at liberty to choose his speakers; and therefore, as Cicero has well observed, when we imagine that we hear persons of an established reputation for wisdom and knowledge talking together, it necessarily adds a weight and authority to the discourse, and more closely engages the attention. The subject matter of it is very extensive: for whatever is a proper argument of discourse, public or private, serious or jocose; whatever is fit for wise and ingenious men to talk upon either for improvement or diversion, is suitable for a dialogue. The greatest regard is to be had in the choice of the persons, who ought to be such as are well acquainted with the subject upon which they discourse; in the dialogues of Cicero, the two principal disputants are Crassus and Antony, the greatest orators of that age, and therefore the most proper persons to dispute upon the qualifications necessary for their art. One would think it scarce necessary to observe, that the conference should be held by persons who lived

Horizontal Dial.



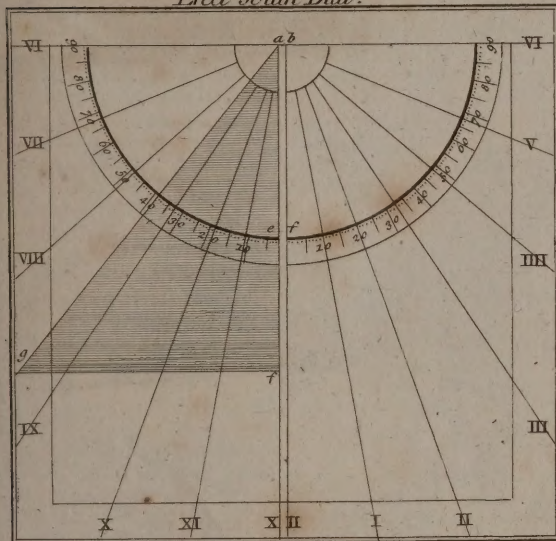
Vertical Dial.



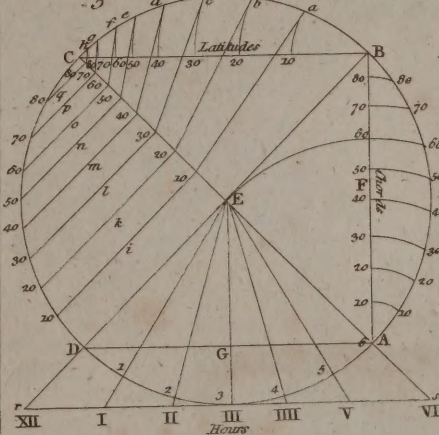
Horizontal Dial.



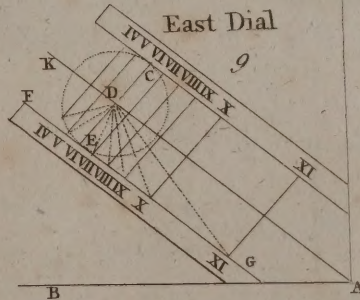
Erect South Dial.



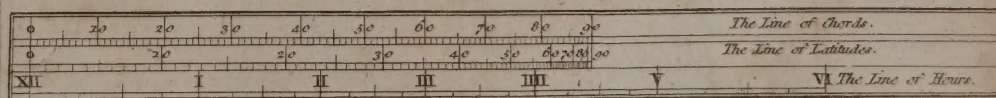
Dialling Lines.



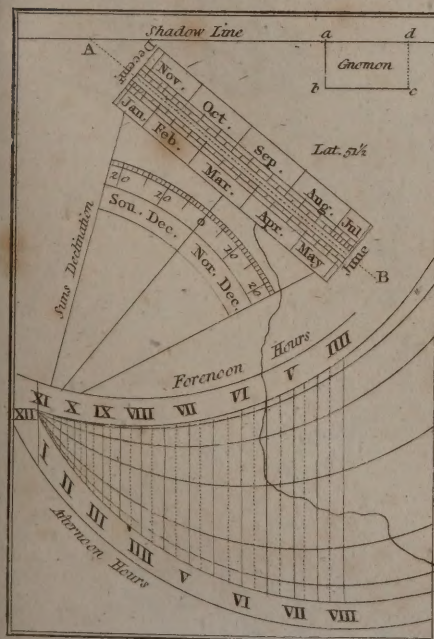
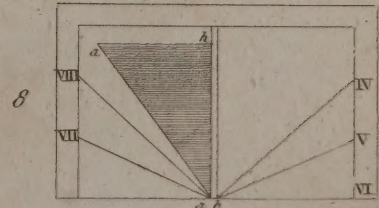
East Dial



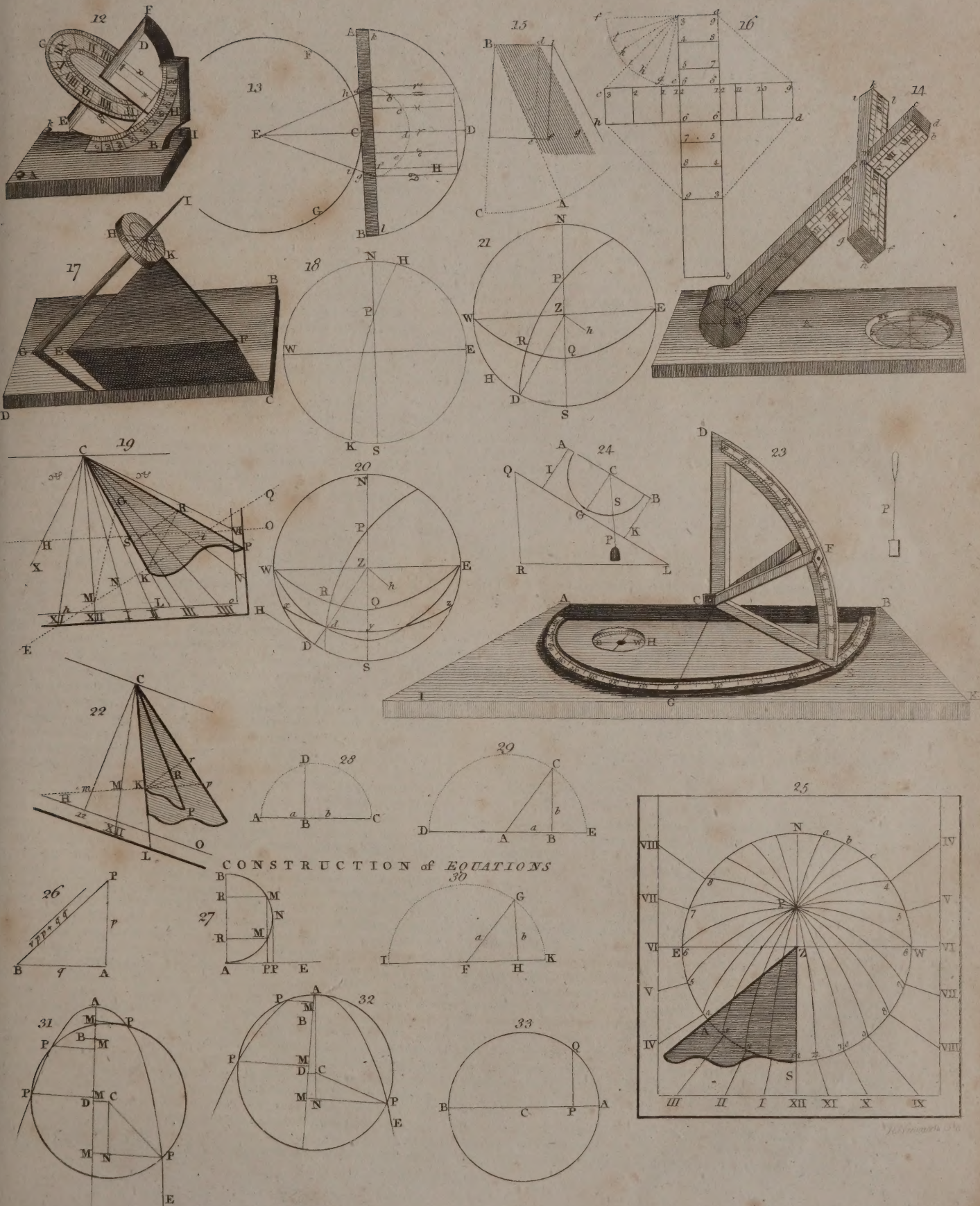
Dialling Scale from fig. 5.



Vertical North Dial.



Portable Dial



CONSTRUCTION of EQUATIONS

lived at the same time, and so were capable to converse together. But yet some good writers have run into the impropriety of feigning dialogues between persons who lived at distant times. Plato took this method, in which he has been followed by Macrobius. But others, who have been willing to bring persons to discourse together, who lived in different ages, without such inconsistency, have wrote Dialogues of the Dead.

DIALTHÆA, in pharmacy, an unguent much used as a resolvent; so called from althæa, or marshmallows, which is the principal ingredient in it.

DIALYSIS, [διαλυσις,] the figure in rhetoric by which syllables or words are divided.

DIALYSIS, in grammar, a mark or character, consisting of two points (") placed over two vowels, because otherwise they would make a diphthong, as Mosâic, Phaëton, &c.

DIAMANT, a town of the island of Martinico, on the south coast.

DIAMASTIGOSIS, a festival at Sparta in honour of Diana Orthia, which received that name *απο του μασιγουν*, from whipping, because boys were whipped before the altar of the goddess. These boys, called bomonice, were originally free-born Spartans, but in the more delicate ages they were of mean birth, and generally of a slavish origin.

DIAMETER, [δια and μετρον,] the line, which passing through the centre of a circle or other curvilinear figure, divides it into equal parts.

DIAMETER, in conic sections. See CONIC SECTIONS.

DIAMOND, [*diamant*, Fr. *adamas*, Lat.] the most valuable and hardest of all the gems, is, when pure, perfectly clear and pellucid as the purest water; and is eminently distinguished from all other substances by its vivid splendour, and the brightness of its reflections. It is extremely various in shape and size, being found in the greatest quantity very small, and the larger ones extremely seldom met with. But most commonly it is crystallized in the form of a six-sided prism, terminated by a six-sided pyramid. Its brilliancy arises from its greater refractive power, which is such as to cause all the light to be reflected which falls on it at an angle of incidence greater than $24\frac{1}{2}$ degrees; and it is capable of being rendered still more brilliant by its surface being cut into facets, which multiply the reflections of light. From its hardness its lustre remains uninjured: this hardness is such, that it can be cut, or rather worn down only by rubbing one diamond against another, and is polished only by the finer diamond powder. Diamonds are found in India, in the districts of Visapore, Golconda, Bengal, and the island of Ceylon, and in Brazil in South America. It is not found in its original situation, but in the beds of streams, or in a loose ferruginous sand beneath the soil. The Brazilian diamonds are inferior in transparency and purity to the Oriental. The diamond is colourless, or tinged of various shades of white or grey, and sometimes also, though more rarely, of brown, green, yellow, blue, and red, frequently with darker coloured spots. It is generally transparent, though not perfectly so, and has the property of single refraction; its fracture is lamellated, and it can be split by striking it in the direction of the plates. Its specific gravity is from 3500 to 3600. It is phosphorescent, or, when it has been exposed to the light, is luminous in the dark. It is rendered electrical by rubbing, the electricity being positive. The diamond was long thought to be an incombustible substance since it was found to resist the action of the strongest fires. However, Sir Isaac Newton observing that combustibles refract light more powerfully than other bodies, and that the diamond possesses this property in great perfection, suspected it, from that circumstance, to be capable of combustion. This singular conjecture was verified in 1694 by the Florentine academicians, in the presence of Cosmo III. grand duke of Tuscany. By means of a burning-glass, they consumed several diamonds. Francis I. emperor of Germany, afterwards witnessed the destruction of several more in the heat of the furnace. These experiments were repeated by Rouelle, Macquer, and Darcet; who proved that the diamond was not merely evaporated but actually burnt; and that if air was excluded it underwent no change. No attempt, however, was made to ascertain the product till 1772. Lavoisier, in a memoir published that year, shewed that when the diamond is burnt, carbonic acid gas is obtained, and that there is a striking analogy between it and charcoal. In 1785 Guyton-Morveau found that the diamond is combustible when dropped into melted nitre; that it burns without leaving any resi-

duum, and in a manner analogous to charcoal. This experiment was repeated with more precision by Mr. Tennant in 1797. The conclusion which he drew from it was, that when a diamond is burnt the whole of the product is carbonic acid gas; that a given weight of diamond yields just as much carbonic acid gas as the same weight of charcoal; and that diamond and charcoal are both composed of the very same substance. The conclusion that diamond is nothing else than charcoal, was directly contrary to what one would have expected from comparing the two substances together. Their colour, hardness, specific gravity, and electrical properties, are exceedingly different; nor do they resemble each other more nearly in their combustibility. Charcoal takes fire at a red heat; and when once kindled in oxygen gas continues to burn till it is wholly consumed. According to Morveau, the diamond, before it can be burnt, must be exposed to the sun's rays in the focus of a large burning glass, or to a heat not under 5000° . But Sir George M'Kenzie found that diamonds will burn in a muffle, when heated no higher than 14° or 15° Wedgewood; which must be considerably lower than 5000° Fahrenheit. Its surface assumes a black colour like charcoal: this crust is soon wasted, and another is formed in its place. It was in this manner that a diamond weighing 3.089 grains troy, gradually wasted away completely when exposed by Morveau for one hour and forty minutes in the focus of the celebrated burning glass of Tschirnhausen, while a thermometer exposed to the sun stood at 104° . Morveau found that one part of the diamond during its combustion combines with 4.592 parts of oxygen, and the carbonic acid gas formed amounts to 5.592 parts: consequently, carbonic acid gas is composed of one part of diamond and 4.592 of oxygen; or, which is the same thing, 100 parts of carbonic acid gas are composed of

17.88 diamond

82.12 oxygen

100.00

But Lavoisier, ascertained that one part of charcoal, when burnt, combines with 2.5714 parts of oxygen, and forms 3.5714 parts of carbonic acid gas: consequently 100 parts of carbonic acid gas are composed of

28 charcoal

72 oxygen

100:

But 100 parts of carbonic acid gas are also composed of 17.88 diamond, and 82.12 oxygen. We have therefore this equation:

Diamond. Oxygen. Char. Oxygen.

17.88 + 82.12 = 28 + 72

Consequently, subtracting 72 parts of oxygen from both sides of the equation, we have

Diamond. Oxygen.

17.88 + 10.12 = 28 charcoal.

That is to say, 28 parts of charcoal are composed of 17.88 diamond and 10.12 oxygen. Of course, 100 parts of charcoal are composed of

63.85 diamond

36.15 oxygen

100.00

The diamond, from these experiments, appears to be that substance in a state of purity to which Lavoisier and his associates gave the name of carbon; and therefore charcoal is not carbon, as they supposed, but the oxide of carbon. Thus charcoal is a compound substance, and hence the different qualities of charcoal and carbon, or diamond. See CARBON. Sir George Mackenzie, likewise, repeated and confirmed an experiment of the French chemists, in which a piece of soft iron was converted into steel by being heated with diamonds, in the same manner as it would have been by being heated in the usual manner with charcoal powder; and his experiments are more satisfactory, as having been made with a diamond in its purest state. (Nicholson's Journal, 4to. vol. iv. p. 103.) The first water in diamonds means the greatest purity and perfection of their complexion, which ought to be that of the purest water. When diamonds fall short of this perfection, they are said to be of the second or third water;

&c.

&c. till the stone may be properly called a coloured one: for it would be an impropriety to speak of an imperfectly coloured diamond, or one that has other defects, as a stone of a bad water only. The names of oriental and occidental, given by jewellers to this and all other precious stones, have a different meaning from the obvious sense; the finest and hardest being always called oriental, whether they be produced in the east or not. Those called occidental are of inferior value; but according to Mr. Jefferies, who has written a treatise on the subject, the diamonds of Brasil equal the finest oriental ones. Diamonds are also distinguished according to their figure, by the names of rose diamonds, brilliant, and rough diamonds.

1. **DIAMONDS, BRILLIANT**, are those cut in faces both at top and bottom; and whose table, or principal face at top, is flat. To make a complete square brilliant, if the rough diamond be not found of a square figure, it must be made so; and if the work is perfectly executed, the length of the axis will be equal to the side of the square base of the pyramid. Jewellers then form the table and collet by dividing the block, or length of the axis, into 18 parts. They take five-18ths from the upper part, and one-18th from the lower. This gives a plane at four-18ths from the girdle for the table; and a smaller plane at five-18ths distance for the collet; the breadth of which will be one-5th of the breadth of the table. In this state the stone is said to be a complete square table diamond. The brilliant is an improvement on the table diamond, and was introduced within the last century, according to Mr. Jefferies. To render a brilliant perfect, each corner of the above described table diamond, must be shortened by one-20th of its original. The corner ribs of the upper sides must be flattened, or run towards the centre of the table one-6th less than the sides; the lower part, which terminates in the girdle, must be one-8th of one side of the girdle; and each corner rib of the under sides must be flattened at the top, to answer the above flattening at the girdle, and at bottom must be one-4th of each side of the collet. The parts of the small work, which complete the brilliant, or the star and skill facets, are of a triangular figure. Both of these partake equally of the depth of the upper sides from the table to the girdle; and meet in the middle of each side of the table and girdle, as also at the corners. Thus they produce regular lozenges on the four upper sides, and corners of the stone. The triangular facets, on the under sides, joining to the girdle, must be half as deep again as the above facets, to answer to the collet-parts. The stone here described is said to be a full-substantiated brilliant. If the stone is thicker than in the proportion here mentioned, it is said to be an over-weighted brilliant. If the thickness is less than in this proportion, it is called a spread brilliant. The beauty of brilliants is diminished by their being either over-weighted or spread. The true proportion of the axis, or depth of the stone to its side, is as two to three. Brilliants are distinguished into square, round, oval, and drops, from the figure of their respective girdles.

2. **DIAMONDS, ROSE**, are quite flat underneath, with their upper part cut in divers little faces, usually triangles, the uppermost of which terminate in a point. The depth of the stone from the base to the point must be half the breadth of the diameter of the base of the stone. The diameter of the crown must be two-5ths of the diameter of the base. The perpendicular, from the base to the crown, must be three-5ths of the diameter of the stone. The lozenges which appear in all circular rose diamonds, will be equally divided by the ribs that form the crown; and the upper angles or facets will terminate in the extreme point of the stone, and the lower in the base or girdle.

3. **DIAMONDS, ROUGH**, are the stones, as nature produces them in the mines. They should be chosen uniform, of a good shape, transparent, not quite white, and free of flaws and shivers. Black, rugged, dirty, flawey, veiny stones, and all such, are not fit for cutting, they use to pound in a steel mortar made for that purpose; and when pulverized, they serve to saw, cut, and polish, the rest. Shivers are occasioned in diamonds by this, that the miners, to get them more easily out of the vein, which winds between two rocks, break the rocks with huge iron levers, which shakes, and fills the stone with cracks and shivers. Lewis Berquen, a native of Bruges, in 1476, invented the art of cutting diamonds. The diamond is so hard, that it can only be cut and ground by itself and its own substance. To bring it to that perfection which augments its price so considerably, they begin by rubbing several against each other, while rough; after having fixed them to the

ends of two wooden blocks, thick enough to be held in the hand, with a mixture of rosin and brick dust. It is this powder, thus rubbed off the stones, and received in a little box for the purpose, that serves to grind and polish the diamonds. This is done by means of a mill, which turns a wheel of soft iron, sprinkled over with diamond dust mixed with oil of olives. The same dust, well ground, and diluted with water and vinegar, is used in the sawing of diamonds; which is performed with an iron or brass wire, as fine as a hair. Sometimes, in lieu of sawing the diamonds, they cleave them, especially if there be any large shivers therein. But the Europeans are not usually daring, or expert enough to run the risk of cleaving, for fear of breaking. The greatest diamond ever known in the world belongs to the king of Portugal, and was found in Brazil. It is still uncut; and Mr. Magellan informs us, that it was of a larger size; but a piece was broken off by the ignorant countryman, who chanced to find this great gem, and tried its hardness by the stroke of a large hammer upon an anvil. This prodigious diamond weighs 1680 carats; and although it is uncut, Mr. Rome de l'Isle says that it is valued at 224 millions sterling, which gives the estimation of 79.36, or about 80*l.* sterling for each carat; viz. for the multiplicand of the square of its whole weight. But even in case of any error of the press in this valuation, if we employ the general rule of valuation, this great gem must be worth at least 5,644,800*l.* sterling, which are the product of 1680 by two pounds, viz. much above five millions and a half sterling. The famous diamond, which adorns the imperial sceptre of Russia under the eagle at the top of it, weighs 779 carats, and is worth at least 4,854,728*l.* sterling, although it hardly cost 135,417 guineas. This diamond was one of the eyes of a Malabarian idol, named Scheeringham. A French grenadier, who had deserted from the Indian service, contrived to become one of the priests of that idol, from which he had the opportunity to steal one of its eyes: he then ran away to the English at Trichinapetty, and thence to Madras. A ship's captain bought it for 20,000 rupees: afterwards a Jew gave 17, or 18,000*l.* sterling for it: at last a Greek merchant, named Gregory Suffras, offered it to sale at Amsterdam, in 1766: and the late prince Orloff purchased it, as he himself told Mr. Magellan in London, for the empress Catharine II. The figure and size of this diamond may be seen in the British Museum in London: it is not of a regular form. For the valuation of diamonds of all weights, Mr. Jefferies lays down the following rules. He first supposes the value of a rough diamond to be 2*l.* per carat, at a medium; then to find the value of diamonds of greater weights, multiply the square of their weight by two, and the product is the value required. E. G. to find the value of a rough diamond of two carats, $2 \times 2 = 4$, the square of the weight; which, multiplied by two, gives 8*l.* the true value of a rough diamond of two carats. For finding the value of manufactured diamonds, he supposes half their weight to be lost in manufacturing them: and therefore to find their value, we must multiply the square of double their weight by two, which will give their true value in pounds. Thus, to find the value of a wrought diamond weighing two carats; we first find the square of double the weight, viz. $4 \times 4 = 16$; then $16 \times 2 = 32$. So that the true value of a wrought diamond of two carats is 32*l.* On these principles Mr. Jefferies has constructed tables of the price of diamonds from 1 to 100 carats.

DIAMOND, in the glass trade, an instrument used for squaring the large plates, or pieces; and, among glaziers, for cutting their glass. These sorts of diamonds (which are small broken pieces of real diamonds) are differently fitted up. Those used for large pieces, as looking-glasses, &c. are set in an iron ferril, about two inches long, and a quarter of an inch in diameter; the cavity of the ferril being filled up with lead, to keep the diamond firm: there is also a handle of box or ebony fitted to the ferril, for holding it by.

DIAMOND, in heraldry, a term used for expressing the black colour in the achievements of peerage. Guillim does not approve of blazoning the coats of peers by precious stones instead of metals and colours; but the English practice allows it. Morgan says the diamond is an emblem of fortitude.

DIAMPER, or **UDEAMPER**, a town of India, in the country of Cochín, said to be inhabited by Christians of St. Thomas, 13 miles W. of Cochín.

DIANA, the goddess of hunting. According to Cicero, there were three of this name: a daughter of Jupiter and Proserpine, who became mother of Cupid; a daughter of Jupiter and Latona; and

and a daughter of Upis and Glauce. The second is the most celebrated, and to her all the ancients allude. She was born at the same birth as Apollo; and the pains which she saw her mother suffer during her labour, gave her such an aversion to marriage, that she obtained of her father to live in perpetual celibacy, and, to preside over the travails of women. To shun the society of men she devoted herself to hunting; and was always accompanied by a number of chosen virgins, who, like herself, abjured marriage. She is represented with a quiver, and attended with dogs, and sometimes drawn in a chariot by two white stags. Sometimes she appears with wings, holding a lion in one hand, and a panther in the other, with a chariot drawn by two heifers, or two horses of different colours, is represented as tall, her face has something manly; her legs are bare, well-shaped, and strong; and her feet are covered with a buskin worn by huntresses among the ancients. She received many surnames, particularly from the places where her worship was established, and from the functions over which she presided. She was called *Lacina*, *Ilythia*, or *Juno Pronuba*, when invoked by women in child-bed; and *Trivia* when worshipped in the cross-ways, where her statues were generally erected. She was supposed to be the same as the moon and Proserpine, or Hecate; hence she was called *Triformis*; and some of her statues represented her with three heads, that of a horse, a dog, and a boar. Her powers and functions under these three characters have been expressed in these lines:

Terret, lustrat, agit, Proserpina, Luna, Diana,

Ima suprema, feras, scepro, fulgore, sagittâ.

She was also called *Agrotera*, *Orithia*, *Taurica*, *Delia*, *Cynthia*, *Aricia*, &c. She was reckoned the same as the *Isis* of the Egyptians, whose worship was introduced into Greece with that of *Osiris* under the name of *Apollo*.

DIANÆ ARBOR, or **ARBOR LUNÆ**, in chemistry, the beautiful crystallizations of silver dissolved in aqua-fortis, to which some quicksilver is added; and so called from their resembling the trunk, branches, leaves, &c. of a tree. See **ARBOR DIANÆ**.

DIANDRIA, [from *di*, twice, and *andros*, a man,] the second class in Linnaeus's sexual system, consisting of hermaphrodite plants, which have flowers with two male organs. See **BOTANY**.

DIANIUM, in ancient geography, a town of the Contestani, in the Hither Spain; now called *Denia*.

DIANTHERA, in botany, a genus of the monogynia order, and diandria class of plants; natural order, *Personatæ*. Corolla ringent; capsule bilocular, parting with a spring at the heel; stamina, each furnished with two antheræ placed alternately. Twelve species.

DIANTHUS, the **CLOVE-GILLIFLOWER**, **CARNATION**, **PINK**, **SWEET-WILLIAM**, &c.; a genus of the digynia order, and decandria class of plants; natural order, *Carophyllei*. Calyx cylindric, one-leaved, with four-scales at the base; petals five, with claws; capsule cylindric, one-celled. There are thirty species. These beautiful plants are chiefly herbaceous; some few however are suffruticose. Most of them are hardy, and perennial or biennial; some of the smaller wild sorts only are annual; stalks annual, from one to three feet in height; leaves opposite, narrow, entire; flowers terminating, many aggregate, some solitary, or several together, but distinct. This numerous genus includes the sweet-williams, carnations, and pinks, with their several varieties.

DIAPASON, [*δια πασων*,] in music, a musical interval, by which most authors, who have wrote upon the theory of music, use to express the octave of the Greeks. See **OCTAVE**. The diapason is the first and most perfect of the concords; if considered simply, it is but one harmonical interval; though, if considered diatonically, by tones and semitones, it contains seven degrees, viz. the three greater tones, two less tones, and two greater semitones. The interval of a diapason, that is the proportion of its grave sounds to its acute, is duplicate, i. e. as 2 : 1. See the article **INTERVAL**, and **MUSIC**.

DIAPASON, among the musical instrument makers, a kind of scale whereby they adjust the pipes of their organs, and cut the holes of their hautboys, flutes, &c. in due proportion for performing the tones, semi-tones, and concords, just.

DIAPASON DIAEX, a kind of compound concord, whereof there are two sorts; the greater, which is in the proportion of 10-3; and the less in that of 16-5.

DIAPASON DIAFENTE, a compound consonance in a triple ratio, as 3-9. This interval, says *Martianus Capella*, consists of 9

tones and a semitone; 19 semitones, and 38 dieses. It is a symphony made when the voice proceeds from the first to the twelfth sound.

DIAPASON DIATESSARON, a compound concord founded on the proportion of 8 to 3. To this interval *Martianus Capella* allows 8 tones and a semitone; 17 semitones, and 34 dieses. This is when the voice proceeds from its first to its 11th sound. The moderns would rather call it the 11th.

DIAPASON DITONE, a compound concord, whose terms are as 10-4, or as 5-2.

DIAPASON SEMIDITONE, a compound concord, whose terms are in the proportion of 12-5.

DIAPÉDESIS, in medicine, a transudation of the fluids through the sides of the vessels that contain them, occasioned by the blood's becoming too much attenuated, or the pores too open.

DIAPENSIA, a genus of the monogynia order, and pentandria class of plants; natural order, *Preciæ*. Corolla salver-shaped; calyx five-leaved, imbricate, with three other leaflets; stamina placed on the tube of the corolla; capsule three-celled. There is but one species, viz. *D. laponica*, a native of the mountains of Lapland.

DIAPENTE, in the ancient music, an interval marking the second of the concords; and, with the diatessaron, an octave. This is what in the modern music is called a fifth.

DIAPERED, or **DIAPRE'**, in heraldry, the dividing of a field in planes, like fret-work, and filling the same with variety of figures.

DIAPHORESIS, in medicine, an elimination of the humours in any part of the body through the pores of the skin. See **PERSPIRATION**.

DIAPHANOUS, [*διαφανης*,] an appellation given to all transparent bodies, or such as transmit the rays of light.

DIAPHORETICS, among physicians, all medicines which promote perspiration.

DIAPHRAGM, in anatomy, a large, robust, musculous membrane of skin, placed transversely in the trunk, and dividing the thorax from the abdomen, whence the Latin writers call it *septum transversum*. See **ANATOMY**. Plato, as *Galen* informs us, first called this muscle diaphragm, from the verb, *διαφραττω*, to separate or be between two. Till his time it had been called *πνευγ*, from a notion that an inflammation of this part produced phrensy.

DIAPORESIS, [*διαπορησις*,] in rhetoric, a figure used to express the hesitation or uncertainty of the speaker. It is most naturally placed in the exordium of a discourse. See **DOUBTING**. We have an example in *Homer*, where *Ulysses*, going to relate his sufferings to *Alcinoüs*, begins thus:

Τὴν πρώτην, τί δ' ἔπειτα, τί δ' ὕστατον, καταλέξω.

Quid primum, quid deinde, quid postremo, alloquar?

DIARBECK, **DIARBEKAR**, **DIARBEKER**, or **DIARBEKIR**, an extensive province of Eastern Asiatic Turkey, comprehending, in its latest extent, *Diarbekir*, properly so called, *Yerack* or *Chaldea*, and *Curdistan*, which were the ancient countries of *Mesopotamia*, *Chaldea*, and *Assyria*, with *Babylon*. It is called *Diarbeck*, *Diarbekir*, or *Diarbekr*, as signifying the duke's country, from the word *dhvar*, a duke, and *bekr*, country. It extends along the banks of the *Tigris* and *Euphrates* from N. N. W. to S. E. that is, from *Mount Taurus*, which divides it from *Turcomania* on the N. to the inmost recess of the *Persian gulph* on the S. about 600 miles; and from E. to W. i. e. from *Persia* on the E. to *Syria* and *Arabia Deserta* on the W. in some places 200, and in others about 300 miles, but in the southern or lower parts not above 150 miles. It enjoys a good temperature of air, as well as, in the greater part of it, a rich and fertile soil. There are indeed, as in all hot countries, some large deserts in it, which produce no sustenance for men or cattle, nor have any inhabitants. Being a considerable frontier towards the kingdom of *Persia*, it is very well guarded and fortified; but as for those many cities once so renowned for their greatness and opulence, they are at present almost dwindled into heaps of ruins. *Bagdad*, *Mossul*, *Carahmed*, and a few more, indeed continue populous and wealthy; but the rest are sorry places. The rivers *Euphrates* and *Tigris* have almost their whole course through this country.

DIARBEKIR, or **DIARBECK PROPER**, is bounded on the N. by *Turcomania*, on the W. by *Syria*, on the S. by part of *Arabia Deserta* and *Yerack Proper*, and on the E. by *Curdistan*. It was named by *Moses Padan-Aram*; the latter being the general name

of Syria, and the former signifying fruitful, a proper epithet for this country, which is really so to a very high degree, especially on the N. side, where it yields corn, wine, oil, fruits, and all the necessities of life, in great abundance. The principal towns are, Diarbekir, Rika, Moussul, Orsa, or Edessa, Elbir, Nisibis, Gezir Merdin, Zibin, Ur of the Chaldees, Amad, and Carasara. Diarbekir, the capital, is 600 miles N. W. of Ispahan, and 540 E. S. E. of Constantinople.

DIARRHŒA, [*diarrhœa*,] in medicine, is a frequent and copious evacuation of liquid excrement, by stool. See **MEDICINE**.

DIARY, [*diarium*, Lat.] an account of the transactions, accidents, and observations, of every day; a journal.

DIASCHISM, among musicians, denotes the difference between the comma and enharmonic diesis, commonly called the less comma.

DIASCORDIUM, in pharmacy, a celebrated composition, so called from scordium, one of its ingredients.

DIASIA, [*Διασία*,] in antiquity, a festival held at Athens, in honour of Jupiter.

DIASTOLE, [*διαστολή*,] among physicians, signifies the dilatation of the heart, auricles, and arteries; and stands opposed to the systole, or contraction of the same parts. See **ANATOMY**.

DIASTOLE, in grammar, a figure of prosody, whereby a syllable naturally short is made long: such is the first syllable of *Priamides*, in the following verse of Virgil.

Atque hic Priamides: nihil o tibi, amice relictum.

This figure is used either out of mere poetic licence without any necessity for so doing, or through necessity, for the sake of the verse; as when three or more short syllables follow each other in hexameter verse.

DIASTYLE, [*δια* and *στυλος*,] a pillar, in architecture, a sort of edifice where the pillars stand at such a distance from one another, that three diameters of their thickness are allowed for intercolumniation.

DIASYMUS, in rhetoric, a kind of hyperbole, being an exaggeration of some low, ridiculous thing.

DIATESSERON, [of *δια* and *τεσσαρες*, four] an interval in music, composed of one greater, one less, and one greater semitone; its proportion being as 4 to 3. It is called, in musical composition, a perfect fourth.

DIATHESIS, [*διαθεσις*, i. e. disposition] the natural or preternatural disposition of the body. "This term, says Mr. Chambers, is used by some writers in the same sense with constitution; and by others, for a disposition of the blood to a faulty state."

DIATHYRUM, [from *δια* and *θυρα*, a door,] in architecture, a fence before a door.

DIATONI, [*διατονοι*,] corner-stones.

DIATONIC, in music, is compounded of two Greek words, viz. the preposition *δια*, signifying a transition from one thing to another, and the substantive *τονος*, importing a given degree of tension and musical note. It is indifferently applied to a scale or gamut, to intervals of a certain kind, or to a species of music, whether in melody or harmony, composed of these intervals. See **INTERVAL**.

DIATRETE, in Roman antiquity, a kind of cups and vases made of the purest rock crystal, and esteemed of great value, being engraved with various devices.

DIATRAGACANTH, in pharmacy, a name applied to certain powders, of which gum tragacanth is the chief ingredient.

DIATRIBA, or **DIATRIBE**, a continued discourse; a place where disputations are held.

DIATRIBUS, a composition of three ingredients.

DIATYPOSIS, [*διατυπωσις*,] in rhetoric, a lively description of any thing.

DIABOLO, an island in the Archipelago.

DIAZEUtic TONE, [of *δια* and *ευνωω*,] in the ancient Greek music, disjoined two-fourths, one on each side of it; and which being joined to either, made a fifth. This is, in our music from A to B. They allowed to this diazeutic tone, which is our Ia, Mi, the proportion of nine to eight, as being the unalterable difference of the fifth and fourth.

DIBBLE, or **DIBBER**, a simple but useful implement in gardening, for the purpose of setting out young plants, &c. Within these few years, it has been employed for dibbling wheat, and the whole process consists in making perpendicular holes an inch and a half or two inches deep, in the same manner as is usually

done in planting potatoe-roots. These holes are made by a man who has a proper staff, shod with iron, in each hand; and, as he walks backwards, is able, by looking at the part of the row already formed, to keep nearly in a strait line, and to make two holes at once, about four inches distant from set to set in the rows. Two or more children attend him, and drop two, three, or four seeds into every hole, which are afterwards covered by drawing over them what is called a bush-harrow. This method is deservedly considered one of the greatest improvements in agriculture. It appears to have originated from the planting of grain in a garden, from mere curiosity, by persons who neither designed, nor had any opportunity of extending it to a lucrative purpose. Nor was it attempted on a larger scale, till an industrious farmer, in the vicinity of Norwich, began to-dibble on less than an acre of land. The success of this experiment induced others to follow his example, and notwithstanding the ridicule they incurred for adopting so singular a practice, their crops were not only larger, but likewise so much superior to those of others, that dibbling has become the practice of every intelligent agriculturist in Norfolk, whence it has spread into several other countries.

DICE, among gamblers, cubical pieces of bone or ivory, marked with dots on each side of their faces, from one to six. Sharpers have several ways of falsifying dice.

DICERA, a genus of the polyandria monogynia class and order. Petals four or five, ovate and trifid; nectarium four or five emarginate corpuscles; anthers two, horned. It has two species, trees of New Zealand.

DICHONDRIA, a genus of the class and order pentandria digynia. Calyx five-leaved; corolla rotate, inferior; capsule dicoccus. One species, an herb of New Zealand.

DICHORD, [*δις*, and *χορδή*,] the name given to the two-stringed lyre, said to have been invented by the Egyptian Mercury. Apollodorus accounts for its invention in the following manner. "Mercury," says he, "walking on the banks of the river Nile, happened to strike his foot against the shell of a tortoise, the flesh of which had been dried away by the heat of the sun, and nothing left of its contents but the nerves and cartilages; he was so pleased with the sound it produced, that he hence conceived the idea of a lyre, which he afterwards constructed in the form of a tortoise, and strung it with the dried sinews of animals."

DICHOTOMY, [*διχοτομία*,] a term used by astronomers for that appearance on the moon, wherein she is bisected, or shews just half her disk. In this situation the moon is said to be in a quadrate aspect, or to be in her quadrature, and is thus represented by astronomers: ☐ ⊙ ☐

DICKER, [*dicra*, low Latin,] in old writers, the quantity of ten hides. It was also applied to other articles; as ten pair of gloves, ten bars of iron, and the like.

DICKSONIA, in botany, a genus of the cryptogamia filices class and order. Natural order filices, or ferns. Fructifications kidney-shaped, lying under the edge of the frond at the lower surface; outer valve formed of the substance of the leaf itself; inner membranaceous; involucre double, one from the surface, opening outwards; the other from the inflated margin of the frond, often embracing the former, opening inwards. There are thirteen species. *D. arborescens*, tree dicksonia, was found by Sir Joseph Banks in the island of St. Helena. It flowers most part of the winter.

DICRA, in old records, ten.

DICRANIUM, in botany, a genus of the class and order cryptogamia musci. Capsule ovate, oblong; fringe simple, of sixteen infected, cloven teeth. This is a very numerous genus.

DICRICH, a town of France, in the late Austrian Netherlands, and province of Luxemburg, 15 miles N. of Luxemburg.

DICTAMNUS, **WHITE DITTANY**, or **FRAXINELLA**, a genus of the monogynia order, and decandria class of plants; natural order, Multisiliquæ. Calyx pentaphyllous; petals five, patulous; filaments sprinkled with glandulous points; the capsules five, coalited. It has two species. They are very ornamental plants, and succeed in any of the common borders. The dittany which grows in Crete, Dalmatia, and the Morea, formerly constituted an article in the *Materia Medica*. The leaves in smell and taste somewhat resemble lemon thyme, but have more of an aromatic flavour, as well as a greater degree of pungency; when fresh, they yield a considerable quantity of essential oil.

DICTATE, [*dictamen*, Lat.] among schoolmen, a motion, or suggestion

suggestion of a man's conscience, contrary to which if any action is performed, it is properly termed a bad one, even if the consequences should prove otherwise. See CONSCIENCE.

DICTATE, [*dictata*, Lat.] is also used in the schools for the lecture of a master, which the scholars take down in writing; whence this act of the master is termed dictating.

DICTATOR, in the polity of the ancient Romans, a magistrate invested with sovereign and even arbitrary power. He had power of life and death: also to raise or disband troops, make war or peace, and that without the consent either of the senate or people; or being accountable for his proceedings. He was elected by one of the consuls in the night-time on the frontiers of the commonwealth, and no where else; and the ordinary duration of his office was only for six months, during which time all other magistracies ceased, the tribunship excepted. Whenever he appeared in public, he was attended by twenty-four lictors, or double the number allowed a consul. However, notwithstanding all this power, he could not go out of Italy, or even ride on horseback during a march, without leave from the people. This office was accounted the safeguard of the commonwealth for four hundred years together, till Sylla and Cæsar, by assuming the title of perpetual dictators, converted it into tyranny, and rendered the very name odious.

DICTION, the phrase, elocution, or style, of a writer, or speaker. It is required that the diction, or language, of an orator, should be pure, proper to the subject, rich without affectation, strong and close without dryness, and suitable to the person, time, place, and audience.

DICTIONARY, a collection, or catalogue, of all the words of a language, art, science, &c. with their explanations, ranged in alphabetical order. A performance of this kind being a digest of the body of learning, or, rather, of general knowledge, is thought capable of being made universally useful and instructive; and as the objects of our knowledge grow daily more numerous, and improvements in arts and sciences are continually made, a work of this kind is continually capable of new improvements. It is farther advanced, that besides preventing, in some measure, the necessity and expence of a multitude of books, which too frequently retard rather than promote, and bewilder rather than guide in the pursuit of knowledge, there is no form or method of writing so advantageously disposed to propagate knowledge through the body of a people, or that can be made to comprehend so great a part of the circle of learning, and so well answer the purposes of a library, as a dictionary of this nature. The writers of a dictionary of arts and sciences, are exempted from the observation of certain laws concerning property; never pretending to build entirely upon their own foundation, or treat at their own expence, being privileged to raise contributions for the public service wherever they can do it to the best advantage. In effect, their quality as dictionarists, or collectors, give them a title to every thing that may suit their purpose, without rendering them liable to the imputation of plagiarism. Their merit, therefore, chiefly consists in selecting, abridging, and disposing, their materials, in the most advantageous manner for public utility.

DICTYMNIA, or DICTYNNA, in antiquity, feasts celebrated at Lacedæmon and in Crete, in honour of Diana, or of a nymph taken for her, who, having plunged herself into the sea, to escape the passion of Minos, was caught in a fisherman's net or *dictyon*, whence the name.

DIDACTIC, or DIDACTICAL, [*didaktikós*,] in the schools, signifies the manner of speaking, or writing, adapted to teach or explain the nature of things. There are many works, ancient and modern, both in prose and verse, written after this method: such are Horace "De Arte Poeticâ," Lucretius's poem "De Rerum Naturâ," Pope's "Essays on Criticism and on Man," &c. &c.

DIDELPHIS, the OPOSSUM, in zoology, a genus of the class mammalia, and order feræ. Teeth small and rounded; upper, ten; intermediate two, longer; lower eight; intermediate two, broader and very short; tusks long; grinders denticulated; tongue fringed with papillæ; abdominal pouch, in most species, containing the teats. There are 21 species first known since the discovery of America. The female has a bag or pouch in the lower part of the abdomen, which is opened and closed at pleasure, and to which her young resort for shelter and security in a variety of dangers. Some females possess, according to Gmelin,

two or three of these pouches, and the male is stated also, in the same author, occasionally to have one. These animals live in the woods, burrowing in the earth, and, by means of a prehensile tail, are alert in climbing trees. Their general motion is slow, and their food consists of insects, worms, and vegetables, young birds, and particularly poultry. They are by no means peculiar to the Western continent, but are to be found in various other parts of the world.

D. CANCRIVORA, the CRAB-EATER of Buffon, or the CAYENNE OPOSSUM, has a long slender face: ears erect, pointed, and short; the coat woolly, mixed with very coarse hairs, three inches long; tail very long, taper, naked, and scaly. Length 17 French inches; of the tail 15½. The subject measured was young. It inhabits Cayenne; is very active in climbing trees, on which it lives the whole day: in marshy places, it feeds on crabs, which, when it cannot draw out of their holes with its feet, it hooks them by means of its long tail. If the crab pinches its tail, the animal sets up a loud cry, resembling the human voice, which may be heard afar; but its common voice is a grunt like a young pig. It is well furnished with teeth, and will defend itself stoutly against dogs; brings forth four or five young, which it secures in some hollow tree. The natives eat these animals, and say their flesh resembles that of a hare.

D. CAUDIVOLVULA, or the NEW HOLLAND OPOSSUM, has the upper part of the head, and the back and sides, covered with long, soft, glossy hairs, of a dark cinereous colour at the bottoms, and of a rusty brown towards the ends: the belly is of a dirty white.

D. GIGANTEA, the KANGUROO. This animal has a small head, neck, and shoulders; the body increasing in thickness to the rump. The head is oblong, formed like that of a fan, and tapering from the eyes to the nose; end of the nose naked, black; the upper lip divided. The nostrils are wide and open; the lower jaw is shorter than the upper; and the aperture of the mouth small: there are whiskers on both jaws, those on the upper longest. The belly is convex and great. The fore legs are very short, scarcely reaching to the nose; and useless for walking. The hind legs are almost as long as the body; and the thighs are very thick: on the fore feet are five toes, with long conic and strong claws; on the hind feet, only three: the middle toe is very long and thick, like that of an ostrich; the two others are placed very distinct from it, and are small: the claws are short, thick, and blunt: the bottom of the feet, the hind part, black, naked, and tuberculated, as the animal rests often on them. The tail is very long, extending as far as the ears; thick at the base, tapering to a point. See Plate LXVI.

D. MACULATA, the QUOLL, or SPOTTED OPOSSUM, is described as in length from the nose to the beginning of the tail about 15 inches, and the tail about 9 or 10. The general colour is black, inclining to brown beneath; the neck and body, spotted with irregular roundish patches of white; the ears pretty large and erect; the visage pointed, the muzzle furnished with long slender hairs; the legs, from the knees downward, always naked, and ash-coloured; on the fore feet are five claws, and on the hind, four and a thumb without a claw; the tail, for about an inch and an half from the root, is covered with hairs of the same length as those on the body, from thence to the end with long ones not unlike those of a squirrel. The female has six teats placed in a circle within the pouch. See Plate LXVI.

D. MURINA, the MURINE OPOSSUM, has the face and upper parts of the body of a tawny colour; the belly of a yellowish white: the tail is slender, and covered with minute scales to the very rump: the length of the animal from nose to tail, is about six inches and a half; the tail of the same length. See Plate LXVI.

D. OPOSSUM, the SARIGUE of Buffon, or MOLUCCA OPOSSUM of Pennant, has long, oval, and naked ears: the mouth is very wide: the lower side of the upper jaw, throat, and belly, is of a whitish ash-colour; the rest of the hair a cinereous brown tipped with tawny, darkest on the back: the tail is as long as the body; near the base covered with hair; the rest naked: the claws are hooked. Marcgrave found six young within the pouch of the female. Over each eye is an oblong white spot. The length of the animal from nose to tail is ten inches; and the tail exceeds the length of the head and body. Its whole figure is of a slender and elegant make. This species is found in great numbers in Arôe and

and Solor: it is called in the Indies pelandor Aroe, or the Aroe rabbit. They are reckoned very delicate eating; and are very common at the tables of the great, who rear the young in the same places in which they keep their rabbits. It inhabits also Surinam, and the hot parts of America.

D. TRIDACTYLA, PHILLIP'S OPOSSUM, or the KANGAROO RAT, is described as similar, both in the general shape of the body and the conformation of the legs, to the kangaroo; but the visage having a strong resemblance to that of the rat, and the colour of the whole not ill resembling that animal, it has obtained the name of the kangaroo rat. It is an inhabitant of New Holland.

D. VOLANS, the FLYING OPOSSUM, a beautiful species, and clothed with fur of the most exquisite texture, is an inhabitant of New South Wales. In length, from the tip of the nose to the root of the tail, it is 20 inches; the tail itself is twenty-two inches, at the base quite light, increasing gradually to black at the end: the ears are large and erect: the coat or fur is of a rich and most delicate texture; appearing, on the upper parts of the body at first sight, of a glossy black, but on a nicer inspection is found to be mixed with grey; the under parts are white, and on each hip is a tan-coloured spot nearly as big as a shilling; at this part the fur is thinnest, but at the root of the tail it is so rich and close that the hide cannot be felt through it. The fur is also continued to the claws. On each side of the body is a broad or flat membrane (as in the flying squirrels,) which is united to both the fore and hind legs. See Plate LXVI.

DIDELTA, a genus of the class and order syngenesia polygamia frutraneta. Calyx expanding; receptacle honey-combed dividing into parts, which retain the seeds; down chaffy, many-leaved. There are two species, annuals of the Cape.

DIDO, or **ELISA**, a daughter of Belus king of Tyre, who married Sichæus or Sicharbas her uncle, priest of Hercules. Her brother, Pygmalion, who succeeded Belus, murdered Sichæus to get possession of his immense riches; and Dido, disconsolate for the loss of her husband, whom she tenderly loved, and by whom she was equally esteemed, set sail in quest of a settlement with a number of Tyrians, to whom the cruelty of the tyrant became odious. According to some accounts, she threw into the sea the riches of her husband which Pygmalion so greedily desired, and by that artifice compelled the ships to fly with her that had come by order of the tyrant to obtain the riches of Sichæus. But it is more probable that she carried the riches along with her, and by their powerful influence prevailed on the Tyrian tars to follow her. During her voyage, Dido visited the coast of Cyprus; where she carried away fifty prostitutes, and gave them as wives to her Tyrian followers. A storm drove her fleet on the African coast, where she bought of the inhabitants as much land as could be surrounded by a bull's hide cut into thongs. Upon this land she built a citadel called Byrsa; and the increase of population, and the rising commerce among her subjects, soon obliged her to enlarge her city and the boundaries of her dominions. Her beauty, as well as the fame of her enterprise, gained her many admirers; and her subjects wished to compel her to marry Iabas king of Mauritania, who threatened them with a dreadful war. Dido begged three months to give her decisive answer; and during that time she erected a funeral pile, as if wishing by a solemn sacrifice to appease the manes of Sichæus, to whom she had promised eternal fidelity. When all was prepared, she stabbed herself on the pile in presence of her people; and by this uncommon action obtained the name of Dido, "valiant woman," instead of Elisa. According to Virgil and Ovid, the death of Dido was caused by the sudden departure of Æneas; of whom she was deeply enamoured, and whom she could not obtain as a husband. This poetical fiction represents Æneas as living in the age of Dido, and introduces an anachronism of near 300 years. Dido left Phenicia 247 years after the age of Æneas, and about B. C. 953. This chronological error proceeded not from the ignorance of the poets, but from a voluntary fiction. While Virgil describes, in a beautiful episode, the desperate love of Dido, and the submission of Æneas to the will of the gods, he traces the origin of the hatred which existed between the republics of Rome and Carthage, from their very first foundation, and pretends that it was kindled by a more remote cause than the jealousy and rivalry of two flourishing empires. Dido after her death was honoured as a deity by her subjects.

DIDUS, or **DODO**, in ornithology, a genus of the order gallinae. Bill contracted in the middle by two transverse rugæ; each mandible inflected at the point; face is bare behind the eyes. It has three species.

D. INEPTUS, the DRONTE of Buffon, or HOODED DODO, is somewhat bigger than a swan, and near three feet in length. The bill is strong, large, and hooked at the end; the gape stretches beyond the eyes: the colour is a very pale blue; except the end of the upper mandible, which is yellowish, and a red spot on the bend of it; the end of the lower is blackish; the irides are white. The plumage is soft to the touch. The head is large, and seems as if it were covered with a black hood or cowl. The wings are very short, and of a yellowish ash-colour: the tail feathers are curled, stand up on the rump, and incline to yellow. It inhabits the islands of Mauritius and Bourbon in the Indian Ocean. See Plate LVIII.

D. NAZARENUS, the NAZARENE DODO is bigger than a swan. The bill is a little bent downwards and large: instead of feathers, the whole is covered over with a black down; but the wings are feathered, and it has some frizzled ones upon the rump, which serve instead of a tail: the legs are long and scaly, and there are three toes on each foot.

D. SOLITARIUS, the SOLITAIRE of Buffon, or SOLITARY DODO, is a large bird, and the male is said to weigh sometimes 45 pounds. The neck is of a proportionable length, and the eye black and lively: the head is not crested, and the general colour of the plumage is grey and brown mixed: it has scarce any tail, and the bastard wing swells out into a round knob: the wings are too short for flight; and the hind parts are rounded like a horse's rump, being clothed with feathers, which may be termed coverts. The females are covered with sometimes brown and sometimes light yellow feathers, and appear very beautiful. They are chased in the winter season, viz. from March to September; being then fat, and the young birds are much esteemed for the table.

DIDYNAMIA, [from *dis*, twice, and *δυναμις*, power,] the name of the 14th class in Linnaeus's sexual method; consisting of plants with hermaphrodite flowers, which have four male organs, two long and two short. See BOTANY.

DIE, in geography, a town of France, in the department of Drome, 24 miles S. E. of Valence.

DIEGEM, a town of France, in the department of Dyle, 3 miles N. of Brussels.

DIEGO DE RAMIRES, an island near the coast of Terra del Fuego, S. S. W. of Cape Horn.

DIEGO GARCIAS, or **CHAGAS**, an island of Africa, in the Indian sea. Lon. 68. 10. E. Lat. 8. 45. S.

DIEGO RIAS, or **RODRIGUEZ**, an island of Africa, in the Indian ocean, 100 leagues E. from the island of Mauritius. Lon. 57. 32. E. Lat. 19. 30. S.

DIEGO SOUREZ, an island in the Indian sea, near the E. coast of the island of Madagascar.

DIEMEN, a town of Holland, in the province of Holland, 4 miles S. E. of Amsterdam.

DIEMEN, STRAITS OF, lie between the coast of Asia and the islands of Japan.

DIEP BAY, a bay on the N. W. coast of the island of St. Christopher.

DIEP TOWN, or **DEEP TOWN**, a town of St. Christopher, seated on the bay.

DIEPHOLT, or **DIEPHOLZ**, a county of Germany, in the circle of Westphalia.

DIEPHOLZ, the capital of the above county, situated on the Hunte, 30 miles S. S. W. of Bremen.

DIEPPE, a town of France, in the department of Lower Seine and late province of Normandy, with a good harbour, formed by the mouth of the river Arques, capable of containing 200 ships, an old castle, and two piers. It lies 30 miles N. of Rouen.

DIES, [Lat. a day,] in doomsday book, signifies one day's entertainment for the king.

DIES DATUS, in law, days of respite allowed by the court to a defendant.

DIES MARCHE was the day of congress or meeting of the English and Scots, annually appointed to be held on the marches or borders, in order to adjust all differences between them.

DIESIS, in music, is the division of a tone less than a semitone;

tone; or an interval consisting of a less or imperfect semitone. Diesis is the smallest and softest change or inflexion of the voice imaginable: it is called a faint, expressed thus (X,) by a St. Andrew's cross or saltier.

DIESPITER, in antiquity, a name given to Jupiter; and signifying diei pater, father of the day. St. Augustin derives the name from *dies*, day, and *partus*, bringing forth; Jupiter being reputed to bring forth the day.

DIESENHOFEN, a large and elegant town of the Helvetic republic, in the late canton of Schaffhausen, 5 miles S. of Schaffhausen.

DIEST, a town of France, in the department of Dyle, 15 miles N. E. of Louvain, and 22 W. of Maestricht.

DIET, [*dieta*, low Lat. *diata*.] in medicine, according to some, comprehends the whole regimen of life, with regard to air, meat, drink, sleep, watching, motion, rest, the passions, retentions, and excretions. Others restrict the term to eating and drinking alone. The natural constitution of the body of man is such, that it can easily bear some changes and irregularities without much injury. Had it been otherwise, we should be almost constantly put out of order by every slight cause. This advantage is from those wonderful communications of the inward parts, whereby, when one part is affected, another comes immediately to its relief. Thus, when the body is too full, nature causes evacuations through some of the outlets; and for this reason, diseases from absolute inanition are generally more dangerous than from repletion, unless the latter be excessive; because we can more expeditiously diminish than increase the juices of the body. Upon the same account, though temperance be beneficial to all men, the ancient physicians advised persons in good health, now and then to eat and drink more plentifully than usual. But, of the two, intemperance in drinking is safer than eating. If a man be obliged to fast, he ought to avoid all laborious work. From satiety it is not proper to pass directly to sharp hunger, nor from hunger to satiety: neither will it be safe to indulge absolute rest immediately after excessive labour, nor suddenly to fall to hard work after long idleness. In a word, all changes in the way of living should be made by degrees. The softer and milder kinds of aliment are proper for children, and for youth the stronger. Old people ought to lessen the quantity of their food, and increase that of their drink: but some allowance is to be made for custom, especially in cold climates like ours; for as in these the appetite is keener, so is the digestion better performed. Mead's "Mona et Precapta." Milk pottage for breakfast is far more wholesome than tea with bread and butter; and, if made after the following manner, is in many respects preferable to milk alone: let equal quantities of milk and water be boiled up with a little oatmeal, which will break the viscosity of the milk, and be at the same time more easily digested than the latter in an undiluted state. Besides oatmeal is a much warmer nourishment than wheaten flour, and agrees better with weak stomachs.

DIET DRINKS, in physic, include all the medicated wines, ales, and wheys, used in chronic cases. They require continuation to answer any good purpose.

DIET OF APPEARANCE, in Scots law, the day to which a defender is cited to appear in court: and every other day to which the court shall afterwards adjourn the consideration of the question.

DIET, [from *dies*, an appointed day, Skinner: from *diet*, an old German word signifying a multitude, Junius.] in matters of policy, was used for the general assembly of the states or circles of the empire of Germany, and formerly of Poland, to deliberate and concert measures proper to be taken for the good of the public. The general diet of the empire was usually held at Ratisbon: it consisted of the emperor, the ten electors, and the ecclesiastical princes; viz. the archbishops, bishops, abbots, and abbesses; the secular princes, who were dukes, marquises, counts, viscounts, or barons; and the representatives of the imperial cities. It met on the emperor's summons, and any of the princes might send their deputies thither in their stead. The diet made laws, raised taxes, determined differences between the several princes and states, and could relieve the subjects from the oppressions of their sovereigns.

DIETETICS, [*διαίτητικα*.] the science or philosophy of diets: that which teaches us to adapt particular foods to particular organs

of digestion, or to particular states of the same organs; so that the greatest possible portion of nutriment may be extracted from a given quantity of nutritive matter; or a sufficient portion may be obtained with the least possible quantity of organic action and exhaustion. In this sense the science of dietetics embraces a knowledge as well of the organs and economy of digestion, as of the substances to be digested. See **ANATOMY**, and **MEDICINE**.

DIETFURTH, a town of Germany, in the circle of Bavaria, 19 miles W. of Ratisbon.

DIETZ, or **MASSAU DIETZ**, a county of Germany, in the circle of Upper Rhine.

DIETZ, the capital of the above county, 16 miles E. of Cologne, and 25 N. of Mentz.

DIEU ET MON DROIT, [Fr. *i. e.* God and my right,] the motto of the arms of England, first assumed by Richard I. to intimate that he did not hold his empire in vassalage of any mortal. It was afterwards taken up by Edward III. and was continued without interruption to the time of king William III. who used the motto *Je maintiendrai*, though the former was still retained upon the great seal. After him queen Anne used the motto *Seniper eadem*, which had been before used by queen Elizabeth; but ever since queen Anne, *Dieu et mon droit* has been the royal motto.

DIEU ET SON ACTE, in common law, a maxim that the act of God shall hurt no man: so that if a house be beat down by a tempest, the lessee shall not only be free from an action of waste, but also have a right to take timber to rebuild the house.

DIEU, **ISLE DE**, a small island in the Atlantic, near the coast of France, 13 miles S. S. W. of Noirmoutier.

DIEUSE, or **DIEUZE**, a town of France, in the department of Meuse, 22 miles N. E. of Nanci.

DIEZ, **Str.** a town of France, in the department of Vosges, 30 miles S. E. of Luneville.

DIEZEUGMENON, [*διεζευγμενον*, Gr.] in rhetoric, a figure, whereby several clauses in a sentence relate to one verb.

DIF, the name of an instrument in music among the Arabs, serving chiefly to beat time to the voice: it is a hoop, sometimes with pieces of brass fixed to it to make a gingling, over which a piece of parchment is distended. It is beat with the fingers, and is the true tympanum of the ancients.

DIFFARREATION, in Roman antiquity, a ceremony whereby the divorce of their priests was solemnized. The word comes from the proposition *dis*, used, in composition, for division, and *farreatio*, a ceremony with wheat, of *far*, wheat.

DIFFERENCE, in heraldry, a term given to a certain figure added to coats of arms, serving to distinguish one family from another; and to shew how distant younger branches are from the elder or principal branch.

DIFFERENCE, in logic, an essential attribute belonging to some species, and not found in the genus; being the idea that defines the species. Thus, body and spirit are the two species of substance, which in their ideas include something more than is included in the idea of substance. In body, for instance, is found impenetrability and extension; in spirit, a power of thinking and reasoning: so that the difference of body is impenetrable extension, and the difference of spirit is cogitation.

DIFFERENCE, in mathematics, is the remainder, when one number or quantity is subtracted from another.

DIFFERENCE OF LONGITUDE, of two places on the earth, is an arch of the equator, comprehended between the meridians of these two places.

DIFFERENCE OF LATITUDE, of two places on the earth, is an arch of a meridian contained between the parallels of latitude of the two places.

DIFFERENTIAL, **DIFFERENTIALE**, in the higher geometry is an infinitely small quantity, or a particle of quantity so small as to be less than any assignable one. It is called a differential, or differential quantity, because frequently considered as the difference of two quantities; and, as such, is the foundation of the differential calculus: Sir Isaac Newton, and the English, call it a moment, as being considered as the momentary increase of quantity. See **FLUXIONS**.

DIFFERENTIAL METHOD is applied to the doctrine of infinitesimals, or infinitely small quantities, called the arithmetic of fluxions. It consists in descending from whole quantities to their infinitely

infinitely small differences, and comparing together these infinitely small differences, of what kind soever they be: and from thence it takes the name of the differential calculus, or analysis of infinitesimals. See CALCULUS DIFFERENTIALIS, and FLUXIONS.

DIFFUSE WRITINGS, such as are wrote in a prolix manner. Among historians, Sallust is reckoned sententious, and Livy diffuse. Thus also among the orators, Demosthenes is close and concise; Cicero, on the other hand, is diffuse.

DIFFUSION, the dispersion of the subtile effluvia of bodies into a kind of atmosphere all round them. Thus the light diffused by the rays of the sun, issues all round from that amazing body of supposed fire.

DIGAMMA, [*Διγάμμα*, Gr.] the letter F, so called because it seems to represent a double Gamma r.

DIGBY Sir KENELM, an illustrious author and statesman of the 17th century. He was descended of an ancient family in England. His great-grandfather, accompanied by six of his brothers, fought valiantly at Bosworth-field on the side of Henry VII. against the usurper Richard III. But his father, Everard, was beheaded for being engaged in the gun-powder plot against king James I. The son wiped off that stain, and was restored to his estate. King Charles I. made him gentleman of the bed-chamber, commissioner of the navy, and governor of Trinity house. He granted him letters of reprisals against the Venetians, by virtue whereof he took several prizes with a small fleet. He fought the Venetians near the port of Scanderoon, and bravely made his way through them with his booty. He was a great lover of learning, and translated several authors into English; and his "Treatise of the Nature of Bodies, and the Immortality of the Soul," discovers great penetration and extensive knowledge. He applied himself to chemistry; and found out several useful medicines, which he gave freely away to people of all sorts, especially to the poor. He indulged a whim, however, respecting a sympathetic powder for the cure of wounds at a distance; his discourse concerning which made a great noise for a while. He had conferences with Des Cartes about the nature of the soul. In the beginning of the civil wars, he exerted himself vigorously in the king's cause; but he was afterwards imprisoned, by order of the parliament, in Winchester house, and had leave to depart thence in 1643. He afterwards compounded for his estate, but was ordered to leave the nation; when he went to France, and was sent on two embassies to Pope Innocent X. from the queen, widow of Charles I. whose chancellor he then was. On the restoration of Charles II. he returned to London; where he died in 1665, aged 60.

DIGEST, **DIGESTUM**, is a collection of the Roman laws, arranged and digested under proper titles by order of the emperor Justinian. That prince gave his chancellor Tribonianus a commission for this purpose; who, in consequence thereof, chose sixteen jurisconsulti, or lawyers, to work upon the same. These, accordingly took out the best and finest decisions from the 2000 volumes of the ancient jurisconsulti, and reduced them all into one body; which was published A. D. 529, under the name of the Digest. To this the emperor gave the force of a law, by a letter at the head of the work, which serves it as a preface. The Digest makes the first part of the Roman law, and the first part of the corpus or body of the civil law, contained in 50 books. It was translated into Greek under the same emperor, and called Pandecta. See PANDECTS. Cujas says, that Digest is a common name for all books disposed in a good order and economy; and hence Tertullian calls the Gospel of St. Luke a Digest.

DIGESTER, an instrument serving to dissolve solid animal substances, in a manner similar to that performed by the stomach. This vessel was invented by Papin: after putting meat into it, together with a sufficient quantity of water, a lid is closely screwed on, so as to admit no external air. By a moderate fire, the meat will, in the course of six or eight minutes, be reduced to a perfect pulp: by augmenting the heat of the fire, or extending the time of digestion, the hardest bones may be converted into a pulp or jelly. This effect is produced by the most perfect closure of the vessel, which prevents the access or escape of air, so that the reverberations occasioned by the expansion of the aerial fluid, dissolve the whole into an uniform body, and mix the aqueous, saline, oleaginous, and other particles so strongly together, that they cannot be easily separated; but, while hot, appear one liquor, and, when cold, form a jelly, of a strength proportionate to the quantity

of flesh or bones dissolved in the water. This useful instrument has not been hitherto applied to culinary purposes; though within the last two years an imperfect imitation of it has been vended in the shops; and we state with satisfaction, that even the latter is incomparably more economical than the various kinds of stew-pans formerly employed. Cast-iron digesters are now manufactured, of various sizes and prices.

DIGESTION, in animal economy, signifies the dissolution of food taken into the stomach, in order to supply the continual loss sustained by perspiration, the different functions, or by exercise. As soon as the food is taken into the mouth, it is first broken and divided by the teeth, being at the same time moistened with a liquor supplied by the salival glands, and consequently formed into a kind of paste. Thus prepared, it passes into the stomach to ferment; a process which is effected, 1. By the salival and gastric juices, which have an effect on aliment similar to that of leaven, or yeast, on dough; 2. By the vital heat of the stomach and viscera of the abdomen; 3. By the remains of food, which adhere to the folds of the stomach, and there become acid and acrimonious; 4. By the agitation arising from the pressure of the abdomen, and the continual pulsation of the contiguous blood-vessels; 5. By the liquor which the repeated compression of those muscles causes to be discharged from the glands of the stomach: and, lastly, by air itself, which being mixed with alimentary matter, dilates by the heat of the stomach, and separates the particles of food which, from the concurrence of these causes, are converted into chyle. From the stomach, the chyle descends into the intestines, where it incorporates with the blood; which, by its volatile nature, together with the saline and nitrous parts of the air, subtilizes the aliment, and perfects its digestion.

DIGESTIVES, in medicine, such remedies as strengthen and increase the tone of the stomach, and assist in the digestion of food. To this class belong all stomachics and strengtheners, or corroborants.

DIGGING, among miners, is appropriated to the operation of freeing any kind of ore from the bed or stratum in which it lies, where every stroke of their tools turns to account: in contradistinction to the openings made in search of ore, which are called hatches, or essay hatches; and the operation itself, tracing of mines, or hatching. When a bed of ore is discovered, the beelmen free the ore from the fossils around it; and the shovelmen throw it from one shamble to another, till it reaches the mouth of the hatch.

DIGIT, [*digitus*, Lat.] in astronomy, the twelfth part of the diameter of the sun or moon, is used to express the quantity of an eclipse. Thus an eclipse is said to be of six digits, when six of these parts are hid.

DIGIT, or **MONAD**, in arithmetic, signifies any integer under 10, as 1. 2. 3. 4. 5. 6. 7. 8. 9.

DIGIT is also a measure taken from the breadth of the finger. It is properly $\frac{1}{4}$ of an inch, and contains the measure of four barley-corns laid breadth-wise.

DIGITALIS, **FOX GLOVE**: a genus of the angiospermia order, and didynamia class of plants; natural order, *Luridæ*. Calyx quinquepartite; corolla campanulated, quinquefid, ventricose; capsule ovate, bilocular. Twelve species, chiefly herbaceous; biennial, and perennial plants, which rise two or three feet high, crowned with spikes of yellow iron-coloured or purple flowers. An ointment made of the flowers of purple fox-glove and May butter, is much commended by some physicians for scrophulous ulcers which run much and are full of matter. Taken internally, this plant is a violent purgative and emetic; and is therefore only to be administered to robust constitutions.

DIGITATED, among botanists, an appellation given to compound leaves, each of which is composed of a number of simple foliola, placed regularly on a common petiole; though, strictly speaking, there must be more than four foliola to make a digitated leaf. See BOTANY.

DIGLYPH, in architecture, a kind of imperfect triglyph, console, or the like; with two channels or engravings, either circular or angular.

DIGNAN, or **DIGNANT** a town of Italy, in Istria, 3 miles from the coast.

DIGNE, a town of France, in the department of the Lower Alps, 30 miles S by W. of Embrun.

DIGNITARY,

DIGNITARY, in the canon law, a person who holds a dignity, that is, a benefice which gives him some pre-eminence over mere priests and canons. Such is a bishop, dean, arch-deacon, prebendary, &c. See **BISHOP**, **DEAN** &c.

DIGNITY, as applied to the titles of noblemen, signifies honour and authority. And dignity may be divided into superior and inferior; as the titles of duke, marquis, earl, baron, &c. are the highest names of dignity; and those of baronet, knight, serjeant at law, &c. the lowest. Nobility only can give so high a name of dignity as to supply the want of a surname in legal proceedings; and as the omission of a name of dignity may be pleaded in abatement of a writ, &c. so it may be where a peer who has more than one name of dignity, is not named by the Most Noble. No temporal dignity of any foreign nation can give a man a higher title here than that of Esquire.

DIGNITY, in the human character, the opposite of Meanness. Man is endued with a sense of the worth and excellence of his nature: he deems it more perfect than that of the other beings around him; and he perceives that the perfection of his nature consists in virtue, particularly in virtues of the highest rank. To express that sense, the term dignity is appropriated. Further, to behave with dignity, and to refrain from all mean actions, is felt to be, not a virtue only, but a duty; it is a duty every man owes to himself. By acting in that manner, he attracts love and esteem: by acting meanly, or below himself, he is disapproved and contemned.

DIGNITY, in oratory, one of the three parts of general elocution; consisting of the right use of tropes and figures. See **ORATORY**.

DIGRESSION, in oratory, is defined by Quintilian, agreeably to the etymology of the word, to be, a going off from the subject we are upon to some different thing, which, however may be of service to it. See **ORATORY**.

DIGYNIA, [from *δίς* twice, and *γυνή* a woman,] the name of an order in the first 13 classes, except the ninth, in Linnaeus's sexual method; consisting of plants, which have two female organs.

DII, the divinities of the ancient heathens, were very numerous. Every object which caused terror, inspired gratitude, or bestowed affluence, received the tribute of veneration. Man saw a superior agent in the stars, the elements, or the trees, and supposed that the waters which communicated fertility to his fields and possessions, were under the influence and direction of some invisible power inclined to favour and to benefit mankind. Thus arose a train of divinities which imagination arrayed in different forms, and armed with different powers. They were supposed to be endowed with understanding, and actuated by the same passions which daily afflict the human race; and to be appeased or provoked, like the imperfect beings whose fears gave them birth. Their wrath was to be mitigated by sacrifices and incense; and sometimes human victims bled; and thus real crimes were committed, to expiate crimes, which superstition alone supposed to exist.

DIJON, or **DIGON**, an ancient town of France, in the department of Cote d'Or, 48 miles N. E. of Autun.

DIJONNOIS, a late territory of France in the late province of Burgundy, now included in the department of Cote d'Or. Dijon was the Capital.

DIKE a ditch or drain, made for the passage of waters. The word seems formed from the verb to dig; though others derive it from the Dutch, *diik*, or dyke, a dam, sea-bank, or wall.

DIKE also signifies a work of stone, timber, earth, fascines, &c. raised to oppose the entrance of the waters of the sea, a river, lake, &c. The most stupendous works of this kind are the Dikes of Holland.

DILAPIDATION, [*dilapidatio*, Latin,] The incumbent's suffering the chancel, or any other edifices of his ecclesiastical living, to go to ruin or decay, by neglecting to repair the same; and it likewise extends to his committing, or suffering to be committed, any wilful waste in or upon the glebe-woods, or any other inheritance of the church.

DILATATION, in physics, a motion of the parts of any body, by which it is so expanded as to occupy a greater space. This expansive motion depends upon the elastic power of the body; whence it appears that dilatation is different from rarefaction, this last being produced by the means of heat.

DILATATOIRES, in anatomy, a name given to several muscles in the human body.

DILATORY PLEAS, in law, are such as are put in merely for delay; and there may be a demurrer to a dilatory plea, or the defendant shall be ordered to plead better, &c. The truth of dilatory pleas is to be made out by affidavit of the fact, by stat. 4. and 5. Ann. See **PLEA**.

DILATRIS, a genus of the monogynia order, and triandria class of plants. No calyx; corolla six-petaled, shaggy; stigma simple. Three species natives of the Cape.

DILEMMA [*δῆλον*, Gr.] an argument equally conclusive by contrary suppositions. A young rhetorician applied to an old sophist to be taught the art of pleading, and bargained for a certain reward to be paid, when he should gain a cause. The master sued for his reward, and the scholar endeavoured to elude his claim by a dilemma: If I gain my cause, I shall withhold your pay, because the judge's award will be against you; if I lose it, I may withhold it, because I shall not yet have gained a cause. On the contrary, says the master, if you gain your cause, you must pay me, because you are to pay me when you gain a cause; if you lose it, you must pay me, because the judges will award it.

DILIGENCE, in Scots law, signifies, 1. that care and attention which parties are bound to give, in implementing certain contracts or trusts, and which varies according to the nature of the contract. 2. Certain forms of law, whereby the creditor endeavours to operate his payment, either by affecting the person or estate of the debtor.

DILL, in botany. See **ANETHUM**.

DILLA, or **MOUNT DILLA**, a remarkable promontory of Hindostan, on the coast of Malabar, 20 miles N. by W. of Tellichery.

DILLEMBURG, or **DILLENBURGH**, a country of Germany, in Weteravia.

DILLENBURGH, the capital of the county, 14 miles N. W. of Wetzlar.

DILLENGEN, a town of Germany, in the circle of Suabia, 18 miles N. E. of Ulm.

DILLENIA, a genus of the polygynia order and polyandria class of plants. Calyx pentaphyllous; petals five; capsule, polyspermous, coalited, full of pulp. There are seven species, very handsome trees natives of the East Indies.

DILOGY, [*διλογία*, Gr.] a rhetorical figure, when a doubtful word signifies two things.

DILUENT, that which has the power to thin and attenuate other matter.

DILUTE, to dilute a body is to render it liquid; or, if it were liquid before, to render it more so, by the addition of a thinner thereto. These things thus added, are called diluents, or dilutors.

DIMACHÆ, [from *δίς*, double, and *μαχη*, fight,] in antiquity, a kind of horsemen, first instituted by Alexander. Their armour was lighter than that of the infantry, and at the same time heavier than that used by horsemen, so that they could act as horse or foot as occasion required.

DIMENSION, in geometry, is either length, breadth, or thickness; hence, a line hath one dimension, viz. length; a superficies two, viz. length and breadth; and a body, or solid, has three, viz. length, breadth, and thickness.

DIMENSION is used with regard to the power of the roots of an equation, which are called the dimensions of that root. Thus in a simple equation $x = a + b$, the unknown quantity is only of one dimension: in a quadratic equation $x^2 = a^2 + b^2$, it is of two dimensions: in a cubic $x^3 = a^3 + b^3$ it is of three dimensions; and so on. See **ALGEBRA**.

DIMETÆ, the name given by the Romans to the ancient Britons, who inhabited the territories now called Caernarthenshire, Pembrokeshire, and Cardiganshire.

DIMINUTION, in architecture, a contraction of the upper part of a column, by which its diameter is made less than that of the lower part. See **ARCHITECTURE**.

DIMINUTION, in law, is where the plaintiff or defendant in a writ of error, alleges on an appeal to a superior court, that part of the record is omitted, and remains in the inferior court not certified; whereon he prays that it may be certified by certiorari. Co. Ent. 222, 242.

DIMINUTION, in music, is when there are several words which

are to make tones, and several quick motions in a cadence, several quavers, semiquavers, &c. corresponding to a crochet or minim, as when a semibreve is divided into two minims, four crotchets, &c.

DIMINUTION, in rhetoric, the exaggerating of what you have to say by an expression that seems to diminish it.

DIMINUTIVE, in grammar, a word formed from some other, to soften or diminish the force of it, or to signify a thing is little in its kind. Thus *cellule* is a diminutive of *cell*, *globule* of *globe*, *hillock* of *hill*.

DIMISSORY LETTERS, *LITERÆ DIMISSORIÆ*, in the canon law, a letter given by a bishop to a candidate for holy orders, having a title in his diocese, directed to some other bishop, and giving leave for the bearer to be ordained by him.

DIMERITE, [from *dim* and *erite*, to divide,] a name given to the Apollinarians, who at first held, that Christ only assumed a human body, without taking a reasonable soul; but being at length convinced by texts of scripture, they allowed, that he did assume a soul, but without understanding; the Word supplying that faculty. From this way of separating the understanding from the soul, they were denominated *Dimerites*, or *Separaters*.

DIMORCARPUS, in botany, a genus of the octandria monogynia class and order. Calyx five-cleft; corolla five-petaled; berries two, one-seeded, large. One species, found in China.

DIMORPHA, in botany, a genus of the diadelphia decandria class and order. Petals one large convolute, in place of the keel; standard and wings none. Three species, natives of the woods of Guiana.

DIMOTUC, a town of European Turkey, in Romania, 12 miles S. W. of Adrianople.

DINABURG, a town of Russia, in the government of Polotsk, on the Dwina; 80 miles N. W. of Polotsk.

DINAGEPOUR, a town of Hindostan, in the country of Bengal, 85 miles N. of Moorsbedabad.

DINAN, or **DINANT**, a strong town of France, in the department of the North Coast, 20 miles S. of St. Malo.

DINANT, a town of Germany, in Westphalia, five miles N. of Charlemont.

DINARCHY, [*Δυναρχία*, Gr.] a government by two. Such was the kingdom of Laconia, which had two royal families for several centuries, both descended from Hercules, each of which afforded a king to the state, both reigning at one time; a mode of government not paralleled in the history of any other country in the world.

DINASMAWDDWY, **DINASMONDY**, or **DINAMOUTHY**, a town of N. Wales, in Merionethshire, 18 miles S. of Bala. Lon. 3. 40. W. Lat. 52. 37. N.

DINKELSPIL, a town of Germany, in Suabia, 37 miles S. W. of Nuremberg.

DINDIGUL, a city of India, in the Mysore country, 51 miles S. W. of Trichinopoly.

DINGLE, a sea-port of Ireland, in Kerry, Munster, 21 miles W. S. W. of Tralee.

DINGWALL, an ancient and flourishing royal borough of Scotland, in the county of Ross, 18 miles W. of Cromarty.

DINKELBUHL, or **DUNKELSPUHL**, an imperial town of Germany, in Suabia, 16 miles S. W. of Aispach.

DINOCRATES, a celebrated architect of Macedonia, who rebuilt the temple of Ephesus, when burnt by Erostratus, with much more magnificence than before. Vitruvius informs us, that Dinocrates proposed to Alexander the Great, to convert mount Athos into the figure of a man, whose left hand should contain a walled city, and all the rivers of the mount flow into his right hand, and from thence into the sea! He also conceived a scheme for building the dome of the temple of Arsinoe at Alexandria, of loadstone; that should by its attraction uphold her iron image in the centre, suspended in the air! Projects which at least shewed a vast extent of imagination.

DIOCESE, [*diocesis*, and *diocesis*,] the circuit of every bishop's jurisdiction; for this realm has two divisions, one into shires or counties, in respect of temporal policy; another into dioceses, in respect of jurisdiction ecclesiastical.

DIOCESE is also used in ancient authors, for the province of a metropolitan. Diocesis was originally a civil government, composed of divers provinces. The first division of the empire into

dioceses is ordinarily ascribed to Constantine; who distributed the whole Roman state into four: viz. those of Italy, Illyria, the East, and Africa. And yet, long before Constantine, Strabo, who wrote under Tiberius, takes notice, (lib. xiii. p. 432,) that the Romans had divided Asia into dioceses; and complains of the confusion such a division occasioned in geography, Asia being no longer divided by people, but by dioceses, each whereof had a tribunal, or court, where justice was administered.

DIOCLEIA, [*Διοκλεία*,] in antiquity, a solemnity kept in the spring at Megara, in memory of the Athenian hero, who died in the defence of the youth he loved.

DIOCLESIANUS, **CAIUS VALERIUS JOVIUS**, a celebrated Roman emperor born of an obscure family in Dalmatia, in A.D. 245. He was first a common soldier, and by merit and success he gradually rose to the office of a general; and at the death of Numerian, in 284, he was invested with imperial power. In this high station he rewarded the fidelity of Maximian, who had shared with him all the subordinate offices in the army, by making him his colleague on the throne. He created two subordinate emperors Constantius and Galerius, by the title of Caesars, whilst he claimed for himself and his colleague the superior title of Augustus. Dioclesian has been celebrated for his military virtues; and though he was not polished by education, yet he was a patron of learning. He was bold, resolute, and active, and well acquainted with the arts, which made him respectable even in the eyes of his enemies. But his cruelty to the Christians has been deservedly branded with infamy. After he had reigned 22 years in the greatest prosperity, he publicly abdicated the crown at Nicomedia in 305, and retired to a private station at Salona. Maximian his colleague followed his example, but not from choice; and when he some time after endeavoured to rouse the ambition of Dioclesian, and persuade him to re-assume the imperial purple, he received for answer, that Dioclesian took now more delight in cultivating his little garden, than he formerly enjoyed in a palace, when his power was extended over all the earth. He lived nine years after his abdication in the greatest security and enjoyment at Salona, and died in 314, in the 68th year of his age. Dioclesian is the first on record, except Lysurgus and Sylla, who voluntarily resigned his power. His bloody persecution of the Christians forms a chronological era, called the era of Dioclesian, or of the Martyrs. It was long used in theological writings, and is still followed by the Copts and Abyssinians. It commenced August 29, A.D. 284.

DIOCESIS, [*Διοκίσις*, Gr.] See **DIOCESE**.

DIODIA, a genus of the monogynia order, and tetrandria class of plants; natural order, Stellata. Corolla monopetalous, funnel-shaped; capsule two-celled, two-seeded. Six species, chiefly natives of the West-Indies.

DIODON, a genus of fishes of the order cartilaginei. Jaws bony and undivided; aperture of the gills linear; body covered on all sides with long moveable spines; no ventral fins. There are three species.

D. HYSTRIX, or the **SEA PORCUPINE**, grows to nearly two feet in length, and inhabits the Indian and American seas. In some of the West India islands it is used for food, but, in general, is little valued. Its resemblance to the porcupine and hedge-hog, and likewise to the sea-urchins, is considerable, both in appearance and manners. It possesses the faculty of raising and depressing its spines at pleasure, and likewise of flattening its body, or extending it to a globular form, and is often fished for with a rod and line, merely for the sake of the curious spectacle it exhibits by these violent alternations. See **PLATE LV**.

D. OBLONGUS, the **OBLONG SUN-FISH**, grows to a great bulk; one examined by Sylvianus was above 100 pounds in weight; and Dr. Borlase mentions another taken at Plymouth in 1734, that weighed 500. In form it resembles a bream or some deep fish cut off in the middle. The mouth is very small, and contains in each jaw two broad teeth, with sharp edges. The eyes are little; before each is a small semilunar aperture; the pectoral fins are very small, and placed behind them. The colour of the back is dusky, and dappled; the belly silvery: between the eyes and the pectoral fins, are certain streaks pointing downwards. The skin is free from scales. When boiled, it has been observed to turn into a glutinous jelly, resembling boiled starch when cold, and served the purposes of glue on being tried on paper and leather. The meat

meat of this fish is uncommonly rank: it feeds on shell-fish. The sun-fish of the Irish. (See *SQUALUS*;) differs, in all respects from this.

DIODORUS, surnamed **SICULUS**, or **SICILIAN**, an ancient historian, born at Argyn in Sicily. He wrote a history of Egypt, Persia, Syria, Media, Greece, Rome, and Carthage; and it is said that he visited all the places which he has mentioned in his history. It was the labour of 30 years. He is, however, too credulous in some of his narrations; and often wanders far from the truth. He often dwells too long upon fabulous reports, and trifling incidents; while events of the greatest importance to history are treated with brevity, and sometimes passed over in silence. He lived in the age of Cæsar and Augustus; and spent much time at Rome to procure information, and authenticate his history. This important work, which he composed in Greek, contained 40 books, of which there are only 15 remaining. The style is clear, and very suitable to history. The best edition is that of Amsterdam, 1743, in 2 vols. folio.

DIOECIA, [*i. e.* two houses, from *dis*, twice, and *oia*, a house,] the 22d class in Linnæus's sexual system, consisting of plants, which have no hermaphrodite flowers, but produce male and female flowers on separate roots. These last only ripen the seeds; but require for that purpose the vicinity of a male plant; for the aspersion or sprinkling of the male dust. From the seeds of the female flowers thus impregnated, are raised, both male and female plants. See **BOTANY**.

DIODENES of Apollonia, in the island of Crete, held a considerable rank among the philosophers who taught in Ionia before Socrates appeared at Athens. He was the scholar and successor of Anaximenes, and in some measure rectified his master's opinion concerning air being the cause of all things. It is said, that he was the first who observed that air was capable of condensation and rarefaction. He passed for an excellent philosopher, and died about A. C. 450.

DIODENES, the **CYNIC**, a famous ancient philosopher, the son of a banker of Sinope. Being banished with his father for coining false money, he retired to Athens, where he studied philosophy under Antisthenes. He added new degrees of austerity to the sect of the Cynics, and never did any philosopher carry so far a contempt for the conveniences of life. He was one of those extraordinary men who run every thing to extremity, without excepting even reason itself; and who confirm the saying, that "there is no great genius without a tincture of madness." He lodged in a tub; and had no other moveables besides his staff, wallet, and wooden bowl, which last he threw away, on seeing a boy drink out of the hollow of his hand. He used to call himself a vagabond, who had neither house nor country; was obliged to beg, was ill clothed, and lived from hand to mouth: and yet, says Ælian, he took as much pride in these things, as Alexander could in the conquest of the world. He was not indeed a jot more humble, than those who are clothed in rich apparel, and fare sumptuously every day. He looked down on all the world with scorn; he magisterially censured all mankind, and thought himself unquestionably superior to all other philosophers. Alexander one day paid him a visit, and made him an offer of riches or any thing else: but all that the philosopher requested of him was, to stand from betwixt the sun and him; as if he had said, "Do not deprive me of the benefits of nature, and I leave to you those of fortune." The conqueror was so affected with the vigour and elevation of his soul, as to declare, that "if he was not Alexander, he would choose to be Diogenes." Diogenes had great presence of mind, as appears from his smart sayings and quick repartees; and Plato seems to have hit off his true character, when he called him a Socrates run mad. He spent a great part of his life at Corinth. As he was going over to the island of Ægina, he was taken by pirates, who carried him into Crete, and there exposed him to sale. He answered the crier, who asked him what he could do, that "he knew how to command men;" and perceiving Xenias, a Corinthian, going by, he said, "sell me to that gentleman, for he wants a master." Xenias struck with the singularity of Diogenes bought him, and carrying him to Corinth, appointed him tutor to his children, and soon entrusted him with the management of his house. Diogenes's friends being desirous of redeeming him, "You are fools (said he); the lions are not the slaves of those who feed them, but they are the servants of the lions." He therefore plainly told Xenias, that he ought to obey him, as

people obey their governors and physicians. He died at Corinth, when he was about 90 years old: but authors are not agreed either as to the time or manner of his death.

DIODENES, surnamed **LAERTIUS**, from Laerta in Cilicia, his birth-place, an ancient Greek author, who wrote ten books of the Lives of the Philosophers, still extant. In what age he flourished, is not determined. The oldest writers who mention him are Soter of Alexandria, who lived in the time of Constantine the Great, and Hesychius Milesius, who lived under Justinian. Diogenes often mentions Plutarch and Phavorinus, with approbation; and therefore, as Plutarch lived under Trajan, and Phavorinus under Adrian, it is certain that he could not flourish before the reigns of those emperors. Menage has fixed him to the time of Severus; that is, about A. D. 200. From certain expressions in his writings, some have fancied him to have been a Christian; but, as Menage observes, the immoderate praises he bestows upon Epicurus, incline us rather to suppose that he was an Epicurean. He divided his Lives into books, and inscribed them to a learned lady of the Platonic school, as he himself intimates in his life of Plato. Montaigne was so fond of this author, that instead of one Laertius, he wishes he had a dozen; and Vossius says, that his work is as precious as gold. Without doubt we are greatly obliged to him for what he has recorded of the ancient philosophers; but if he had been as exact in the writing, as he was judicious in the choice of his subject, we had been still more obliged to him. Bishop Burnet, in the preface to his Life of Sir Matthew Hale, speaks of him in the following proper manner: "There is no book the ancients have left us (says he), which might have informed us more than Diogenes Laertius's Lives of the Philosophers, if he had had the art of writing equal to that great subject which he undertook: for if he had given the world such an account of them as Gassendus has done of Pieresc, how great a stock of knowledge might we have had, which by his unskilfulness is in a great measure lost! since we must now depend only on him, because we have no other, and better author, who has written on that argument." There have been several editions of his Lives of the Philosophers; but the best is that printed in two volumes 4to, at Amsterdam, 1693. This contains the advantages of all the former, besides some peculiar to itself: the Greek text, and the Latin version, corrected and amended by Meibomius; the entire notes of Henry Stephens, both the Casaubons, and of Menage; 24 copper-plates, elegantly engraved: to which is added, The History of the Female Philosophers, written by Menage, and dedicated to Madam Dacier. Diogenes wrote also a book of Epigrams upon illustrious men, called Pammetrus, from its various kinds of metre: but this is lost.

DIOMEDES, in fabulous history, a tyrant of Thrace, who is said to have fed his horses with the flesh of men. Hercules killed him, and threw him to be eaten by his own carnivorous horses; Hyginus says there were four of them, and that the hero afterwards killed them, along with Abderus, their groom.

DIOMEDES, king of Ætolia, the son of Tydeus and Deiphyle, one of the bravest of the Grecian chiefs in the Trojan war. He often engaged Hector and Æneas, and obtained much military glory. He went with Ulysses to steal the Palladium from the temple of Minerva, in Troy; and assisted in murdering Rhesus, king of Thrace, and carrying off his horses. At his return from the siege of Troy, he lost his way in the darkness of the night, and landed in Attica, where his companions plundered the country, and lost the Trojan Palladium. During his long absence, his wife Ægiale had prostituted herself to Cometes, one of her servants. This was attributed to the resentment of Venus, whom Diomedes had wounded in a battle before Troy. He resolved to abandon his native country, which was the seat of his disgrace; and the attempts of his wife to take away his life, hastened his departure. He came to that part of Italy which has been called Magna Græcia, where he built a city, which he called Argyrippa, and married the daughter of Daunus the king of the country. He died there in extreme old age; or, according to a certain tradition, he perished by the hand of his father-in-law.

DIOMEDIA, in ornithology, a genus of the order anseres. Bill straight; superior mandible, crooked at the point; lower one truncated; nostrils oval, open, a little prominent, placed on the sides. There are four species.

D. DEMERSA, has no quill-feathers on the wings; and the feet have four toes, connected together by a membrane. It is the black

black penguin of Edwards, about the size of a goose, and is found at the Cape of Good Hope. It is an excellent swimmer and diver; but hops and flutters in a strange aukward manner on the land, and, if hurried, stumbles perpetually, and frequently runs for some distance like a quadruped, making use of its wings instead of legs, till it can recover its upright posture; crying out at the same time like a goose, but in a much hoarser voice.

D. EXULANS, has pennated wings, and three toes on each foot. It is the albatrosse of Edwards; and is about the size of a pelican. These birds are found in the ocean betwixt the tropics, and at the Cape of Good Hope. They are also often seen in vast flocks in Kamtschatka, and the adjacent islands, about the end of June, where they are called great gulls; but it is chiefly in the bay of Penschinensi, the whole inner sea of Kamtschatka, the Kurile isles, and that of Bering; for on the eastern coasts of the first they are scarce, a simple straggler only appearing now and then. Their chief motive for frequenting these places, seems to be plenty of food; and their arrival is a sure presage of shoals of fish following. At their first coming they are very lean, but soon grow immensely fat. See Plate LVIII.

DIONEÆ, in botany, a genus of the decandria-monogynia class and order. Natural order, Grinales. Calyx five-leaved; petals five; capsule one-celled, gibbous, containing many seeds. One species, viz. *D. mucipula*, Venus's fly-trap, a native of North Carolina, in swampy places. This is a newly discovered sensitive plant, in the construction of which, nature seems to have had some view towards its nourishment, in forming the upper joint of its leaf like a machine to catch food; and placing upon the middle of it the bait for the unhappy insect that becomes its prey. Many minute red glands that cover its inner surface, and which, perhaps, discharge some sweet liquor, tempt the poor insect to taste them; and the instant these tender parts are irritated by its feet, the two lobes rise up, grasp it fast, lock the two rows of spines together, and squeeze it to death. See Plate XXXV.

DIOPHANTINE PROBLEMS, in mathematics, certain questions relating to square and cube numbers, and right-angled triangles, &c. the nature of which was determined by Diophantus. In these questions it is endeavoured to find commensurable numbers to answer indeterminate problems, which bring out an infinite number of incommensurable quantities. See ALGEBRA.

DIOPHANTUS, a mathematician of Alexandria, who is believed to have lived about the third century. We have his works, which were published with notes at Paris, in 1621, by Bachet de Meziriac; and another edition in 1670, with observations on every question, by M. Fermat.

DIOPTRA, an instrument invented by Hipparchus, for leveling water-courses; taking the height of towers, and determining the distances of planets, &c.

DIOPSIS, a genus of the class vermes and order diptera. Head with two inarticulate filiform horns much longer than the head, at the tip of which are placed the eyes. It inhabits South America and Guinea, and resembles the ichneumon. There is but one species. See Plate XXXVII.

DIOPTRICS, the science of refractive vision; or that part of optics which considers the different refractions of light in its passing through different mediums, as air, water, glass, &c. and especially lenses. See OPTICS.

DIOSCOREA, in botany, a genus of the hexandria order, and diœcia class of plants; natural order samentaceæ. Male calyx sexpartite, no corolla; female sexpartite; no corolla; three styles; capsule trilocular, compressed; seeds two, membranaceous. There are fifteen species, of which the only remarkable one is the sativa or yam. This has slender stalks, which trail upon the ground and extend a great way; these frequently put out roots from their joints as they lie upon the ground, by which the plants are multiplied. The roots are eaten by the inhabitants of both the Indies; and are particularly serviceable in the West India islands, where they make the greatest part of the negro's food. The plant is supposed to have been brought from the East to the West Indies; for it has never been observed to grow wild in any part of America; but in the island of Ceylon, and the coast of Malabar, it grows in the woods, and there are in those places a great variety of sorts. It is propagated by cutting the root in pieces, observing to preserve an eye in each, as is practised in planting potatoes. One plant will produce three or four large roots. The inside is white, and of the consistence of red beet. It resembles the potatoe in its

mealiness, but is of a closer texture. When raw, the yams are viscous and clammy: when roasted or boiled, they afford very nourishing food; and are often preferred to bread by the inhabitants of the West Indies, on account of their lightness and facility of digestion.

DIOSMA, **AFRICAN SPIRÆA**, a genus of the monogynia order, and pentandria class of plants. Corolla pentapetalous, nectarium crown-shaped above the germen: capsules five, coalited. There are nineteen species.

DIOSPYROS, the **INDIAN DATE PLUM**, a genus of the diœcia order, and polygamia class of plants, natural order Bicornes. Calyx hermaphrodite, quadrifid; corolla urceolated, quadrifid; styles quadrifid; berry octospermous: male calyx, corolla, and stamina, as in the former. There are nine species.

D. LOTUS, is supposed to be a native of Africa, from whence it was transplanted into several parts of Italy, and also into the south of France. The fruit of this tree is supposed to be the lotus with which Ulysses and his companions were said to have been enchanted, and which made those who eat it forget their country and relations. In the warmer parts of Europe this tree grows to the height of thirty feet.

D. VIRGINIENSIS. See Plate XXXV.

DIPHYSA, a genus of the class and order diadelphica decandria. Calyx half five-cleft; legume with a bladder on each side; seeds hooked. There is one species, a small tree of New Spain.

DIPHTHONG, [*διφθωγγ*], a coalition of two vowels to form one sound. Diphthongs are divided into proper and improper.

DIPHTHONGS, IMPROPER, are those wherein only one of the vowels is sounded, the other being sunk; as *æ*, and *œ*, in the Latin, and *ea*, *ei*, *eo*, *ie*, *oa*, *ae*, *ue*, and *ui*, in the English language. The Latins pronounced the two vowels in their diphthongs *æ* or *œ*, *œ* or *æ*, much as we do; only that the one was heard much weaker than the other, though the division was made with all the delicacy imaginable.

DIPHTHONGS, PROPER, are such as include the original sound of both the component vowels, though still in one syllable; such as *au*, *eu*, and *ei*, in Latin; and *ai*, *au*, *ay*, *eu*, *ey*, *oi*, and *ou*, in English.

DIPLOE, the soft medullium, or medullary substance, which lies between the two laminae of the bones of the cranium.

DIPLOMA, [*διπλωμα*], a letter or writing conferring some privilege, so called, because they used formerly to be written on waxed tables, and folded together.

DIPLOMA is peculiarly used for an instrument or licence given by colleges, societies, &c. to clergymen or physicians, to exercise their respective professions, after passing examinations, and being admitted to a degree.

DIPLOMATICS, the science of diplomas, or of ancient literary monuments, public documents, &c. It does not, however, nor can it, absolutely extend its researches to antiquity; but is chiefly confined to the middle age, and the first century of modern times. For though the ancients were accustomed to reduce their contracts and treaties into writing; yet they grav'd them on tables, or covered them over with wax, or brass, copper, stone, or wood, &c. And all that in the first ages were not traced on brass or marble, has perished by the length of time, and the destructive events, that have taken place. The word diploma signifies, properly, a letter or epistle, folded in the middle, and not open. But, in more modern times, the title has been given to all ancient epistles, letters, literary monuments, and public documents, and to all those pieces of writing which the ancients called Syngrapha, Chirographa, Codicilli, &c. In the middle age, and in the diplomas themselves, these writings are called Litteræ, Præcepta, Placita, Chartæ indiculæ, Sagilla, and Bullæ; as also Panchartæ, Pantochartæ, Tractoriæ, Descriptiones, &c. The originals of these pieces are named Exemplaria, or Autographa, Chartæ authenticæ, Originalia, &c. and the copies, Apographa, Copiæ, Particulæ, &c. The collections that have been made of them, are called Chartaria, and Chartulia. The place where these papers and documents were kept, the ancients named Scrinia, Tabularium, or Ararium, words that were derived from the tables of brass, and, according to the Greek idiom, Archeum or Archivum. To understand the nature of these ancient papers, diplomas, and MSS. and to distinguish the authentic from the counterfeit, it is necessary to know that the paper of the ancients came from Egypt, and was formed of thin leaves or membranes, taken from the

the branches of a tree named *Papyrus*, or *Bibulum Ægyptiacum*, and which were pasted one over the other with the slime of the Nile, and were pressed and polished with a pumice-stone. This paper was very scarce; and it was of various qualities, forms, and prices, which they distinguished by the names of *charta hieratica*, *liria*, *augusta*, *amphitheatrica*, *satrica*, *tantrica*, *emporetica*, &c. They cut this paper into square leaves, which they pasted one to the other, in order to make rolls of them: from whence an entire book was called *volumen*, from *volendo*: and the leaves of which it consisted, *pagina*. Sometimes, also, they pasted the leaves all together by one of the extremities, as is now practised in binding: by this method they formed the back of a book, and these the learned call *codices*. They rolled the volume round a stick, which they named *umbilicus*: and the two ends that came out beyond the paper, *cornua*. The title, wrote on parchment, in purple characters, was joined to the last sheet, and served it as a cover. They made use of all sorts of strings or ribbands, and even sometimes of locks, to close the book; and sometimes also it was put into a case. But there is not now to be found, in any library or cabinet whatever, any one of these volumes. We have been assured, however by a traveller, that he had seen several of them in the ruins of *Herculaneum*; but so much damaged, the paper so stiff and brittle, by the length of time, that it was impossible to unroll them, and consequently to make any use of them; for on the first touch they fell into shatters. We know not the precise time when our modern paper was invented: and when they began to make use of pens in writing, instead of the stalks of reeds. The ink that the ancients used was not made of vitriol and galls, like the modern, but of soot. Sometimes also they wrote with red ink made of vermilion; or in letters of gold, on purple or violet parchment. It is easy for those who apply themselves to this study, to distinguish the parchment of the ancients from that of the moderns, as well as their ink and various exterior characters; but that which best distinguishes the original from the counterfeit is, the writing or character itself; which is so distinctly different from one century to another, that we may tell with certainty within about forty or fifty years, when any diploma was written. There are two works which furnish the clearest lights on this matter, and which may serve as sure guides in judging of what are called ancient diplomas. The one is the celebrated treatise on the *Diplomatic*, by F. Mabillon; and the other, the first volume of the *Chronicon Gotvicense*. We there find specimens of all the characters, the flourishes, and different methods of writing, of every age. For these matters, therefore, we must refer our readers to those works; and shall here only add, that all the diplomas are wrote in Latin, and consequently the letters and characters have a resemblance to each other: but there are certain strokes of the pen which distinguish not only the ages, but also the different nations; as the writings of the Lombards, French, Saxon, &c. The letters in the diplomas are also usually longer, and not so strong as those of MSS. There has also been introduced a kind of court hand, of a very disproportionate length, and the letters of which are called *Exiles litterariæ*, *crispæ*, *ac protractiores*. The first line of the diploma, the signature of the sovereign, that of the chancellor, notary, &c. are usually wrote in this character. The signature of a diploma consists either of the sign of the cross, or of a monogram or cipher, composed of the letter of the names of those who subscribed it. The initial letters of the name, and sometimes also the titles, were placed about this cross. By degrees the custom changed, and they invented other marks. They exhibited, added also the date and epoch of the signature, the feasts of the church, the days of the kalendar, &c. The successive corruption of the Latin language, the style and orthography of each age, as well as their different titles and forms; abbreviations, accentuation, and punctuation, and the various methods of writing the diphthongs; all these matters united, form so many characters and marks by which the authenticity of a diploma is to be known. The seal annexed to a diploma was anciently of white wax, and artfully imprinted on the parchment itself. It was afterward pendent from the paper, and inclosed in a box or place, which they called *bullæ*. There are some also that are stamped on metal, and even on pure gold. When a diploma bears all the characters that are requisite to the time and place where it is supposed to be written, its authenticity is not to be doubted: but, at the same time, we cannot examine them too scrupulously, seeing that the monks and priests of former ages have been very adroit in making counterfeits; and the more

so, as they enjoyed the confidence of princes and statesmen, and were even sometimes in possession of their rings or seals. As to MSS. that were wrote before the invention of printing, see *MANUSCRIPT*.

DIPPING, among miners, signifies the interruption or breaking off the veins of ore; an accident that gives them a great deal of trouble before they can discover the ore again. A great deal of the skill of the miners consists in the understanding of this dipping of the veins, and knowledge how to manage it. In Cornwall they have this general rule to guide them in this respect; most of their tin loads, which run from E. to W. constantly dip towards the north. Sometimes they underlie, that is, they slope down towards the N. three feet in height perpendicular.

DIPPING NEEDLE, or **INCLINATORY NEEDLE**, a magnetical needle, so hung, as that, instead of playing horizontally, and pointing out N. and S. one end dips, or inclines to the horizon, and the other points to a certain degree of elevation above it. It is used for observing the quantity of inclination towards the earth, assumed by the magnetic needle. The general method of constructing dipping needles is, to pass an axis quite through the needle itself, and to let the extremities of the axis rest upon two supports, like the beam of a pair of scales, that the needle may move vertically round; and hence, when placed in the magnetic meridian, it will naturally assume that position which is called the magnetic line, viz. the two ends nearly north and south, and one of them inclined considerably to the horizon. The degrees of this inclination are shewn upon a graduated circle; and when the instrument is made use of at land, it has a stand, but at sea a ring is necessary to suspend it. When furnished with a stand, it has also a spirit-level; and the stand has three screws, by which the whole is adjusted in such a manner as to let the centre of motion in the needle, and the mark of 90° on the lower part of the divided circle, be exactly in the same line perpendicular to the horizon. The greatest imperfections attending this instrument are the balancing of the needle itself, and the difficulty of knowing whether, after being made magnetic, it be properly balanced or not. The inaccuracy here indeed can be but very small, as arising only from dust or moisture. The method recommended by Mr. Cavallo, to obviate these inconveniences, is first to observe the dip of the needle; then to preserve its magnetism by the application of magnets, so that the end of it which before was elevated above the horizon, may now be below it; and, lastly, to observe its dip again; for a mean of the two observations will be pretty near the truth, though the needle may not be perfectly balanced. See *MAGNETISM*, and *MAGNETICAL NEEDLE*.

DIPSACUS, **TEAZEL**, a genus of the monogynia order, and tetrandia class of plants; natural order, *Aggregata*. Common calyx polyphyllous, proper above; receptacle paleaceous. There are four species; the most remarkable is the

D. CARDUS FULLONUM, which grows wild in many parts of England. It is of singular use in raising the knap upon woollen cloth. For this purpose, the heads are fixed round the circumference of a large broad wheel, which is made to turn round, and the cloth is held against them. In the west of England, great quantities of the plant are cultivated for this use. It is propagated by sowing the seeds in March, upon a well prepared soil. About one peck of seed is sufficient for an acre, as the plants must have room to grow; otherwise the heads will not be large enough, nor in great quantity.

DIPTERA, [from *δίς*, and *πτερον*, wing,] in entomology, an order of insects, which have only two wings, and under each wing a style or oblong body, terminated by a protuberance, and called a balancer.

DIPTYCH, or **DIPTYCHA**, in antiquity, was a public register, wherein were written the names of the consuls, and other magistrates, among the heathens; and of bishops, and living as well as dead brethren, among the Christians. The word is Greek, *διπτυχα*, the plural of *διπτυχον*, q. d. a book folded in two leaves; though there were some in three, and others in four, or five leaves.

DIPTERYX, in botany, a genus of the diadelphia decandria class and order; natural order, *Papilionaceæ*, or *Leguminosæ*. Calyx two, upper segments winged; legume ovate, compressed, one-seeded. There are two species, viz. *D. odorata*, *Coumarouna*, and *D. oppositifolia*, *Taralea*, both tall trees; about sixty feet high; very much branched at top; the leaves are large, alternate, and pinnate, natives of South America.

DIPUS,

DIPUS, the **JERBOA**, a genus of the class mammalia, order glires. Two front teeth in the upper, and in the under jaw; fore legs very short, hind legs very long; clavicles in the skeleton; tail long, and tufted at the tip. There are six species.

D. SAGITTA, or the Egyptian jerboa of Pennant, is about the size of a rat, and was known to the ancients by the name of the two-footed mouse. It is to be met with in various parts of Africa, and in the eastern provinces of Siberia. In its posture and movement it greatly resembles a bird. It stands on its hind feet, and rarely places its fore feet to the ground, employing them almost exclusively in applying food to its mouth, in the same manner as the kangaroo. See Plate LXVI.

D. TAMARICINUS, the **MARSH JERBOA**, or **TAMARISK MOUSE**, of Dr. Pallas, has five toes behind, and three before, with the rudiments of a fourth; the tail is obscurely annulated. The body and head measure about $5\frac{1}{2}$ inches in length; the tail is about the same length. This species inhabits the salt marshes near the Caspian sea; and is supposed to feed on the fruit of the tamarix and nitrium, which grow in these marshes. Under the roots of these trees it forms very deep burrows, which have two entrances. It is a very elegant little animal. See Plate LXVI.

DIRÆ, the general name of the three Furies in the Pagan mythology. They were so called, as being quasi Deorum ira, the ministers of divine vengeance in punishing guilty souls after death. They were the daughters of Acheron and Night. See **FURIES**.

DIRCA, a genus of the monogynia order, and octandria class of plants; natural order, Vepreculæ. No calyx; corolla tubular, with the limb indistinct; stamina longer than the tube; berry monospermous. There is one species, a small shrub of North America.

DIRECT, in astronomy. A planet is said to be direct when it appears to an observer on the earth to go forward in the zodiac, or according to the succession of the signs. See **ASTRONOMY**.

DIRECT, in matters of genealogy, is understood of the principal line, or the line of ascendants and descendants, in contradistinction to the collateral line. The heirs in the direct lines always precede those in the collateral lines.

DIRECT RAY, in optics, is a ray flowing from a point of a visible object directly to the eye, through one and the same medium.

DIRECT EAST and WEST DIALS, dials drawn upon planes that directly face the east and west points of the horizon, or are parallel to the meridian. See **DIALING**.

DIRECT SOUTH and NORTH DIALS, are those which face directly the north and south points of the horizon, or parallel to the prime vertical circle. See **DIALING**.

DIRECTION, in mechanics, signifies the line or path of a body's motion, along which it endeavours to proceed according to the force impressed upon it. See **MECHANICS**.

DIRECTION, ISLANDS OF, four small islands at the W. entrance of the straits of Magellan.

DIRECTOR, in commercial polity, a person who has the management of the affairs of a trading company: thus we say the directors of the India company, South-sea company, &c. See **COMPANY**.

DIRECTOR, in surgery, a grooved probe, to direct the edge of the knife or scissors in opening sinuses or fistulæ, that the adjacent vessel, nerves, and tendons, may not be hurt. See **SURGERY**.

DIRGE, in music, a solemn and mournful composition, performed at funeral processions. The dirge was in very general use with the ancients, and was numerously filled both by voices and instruments.

DIRGHAW, or **DIRCHAU**, a fortified town of Western Prussia, in the province of Pomorellis.

DIRIBITORES, among the Romans, officers appointed to distribute tablets to the people at the comitia.

DIRIGENT, or **DIRECTRIX**, a term in geometry, signifying the line of motion along which the describent line, or surface, is carried in the genesis of any plane, or solid figure: thus, if the line AB, Plate LIV. fig. 10, move along the line AC, so that the point A always keeps in the line AC, a parallelogram, as ABCD, will be formed, of which the side AB is the describent, and the line AC the dirigent; so also, if the surface ABCD be supposed to be carried along CE, in a position always parallel to itself in its first situation, the solid ADFH will be formed, where the surface AD is the describent, and the line CE the dirigent.

DIS, an inseparable particle used in composition, implying

commonly a privative or negative signification of the word to which it is joined; as to arm, to disarm; to join, to disjoin. It is borrowed from des, used by the French and Spaniards in that sense; as desmour to untie; desterar, to banish; from the Latin *de*; as struo, to build; destruo, to destroy.

Dis signifies also a separation, detachment, &c. as disposing, distributing.

Dis, in geography, a town of Norfolk, 19 miles S. of Norwich.

Dis, in mythology, a god of the Gauls, the same as Pluto, the god of hell. The ancient inhabitants of Gaul supposed themselves descended from that deity.

DISA, a genus of the gynandria diandria class and order. Spathe one-valved; petals three, the third less, two-parted, gibbous at the base. There are four species, herbaceous plants of the Cape, with beautiful blue flowers.

DISABILITY, in law, is when a man is disabled, or made incapable to inherit any lands, or take that benefit which otherwise he might have done. This may happen four ways; 1st, by the act of an ancestor; 2d, of the party; 3d, by the act of God; or, 4th, of the law. 1. Disability by the act of the ancestor, is where the ancestor is attainted of high treason, &c. which corrupts the blood of his children, so that they may not inherit his estate. 2. Disability by the act of the party, is where a man binds himself by obligation, that, upon surrender of a lease, he will grant a new estate to a lessee; and afterwards he grants over the reversion to another, which puts it out of his power to perform it. 3. Disability by the act of God, is where a man is non sanæ memoriæ, whereby he is incapable to make any grant, &c. So that, if he passes an estate out of him, it may after his death be made void; but it is a maxim in law, "That a man of full age shall never be received to disable his own person." 4. Disability by the act of the law, without any thing by him done, is rendered incapable of the benefit of the law; as an alien born, &c.

DISANDRA, a genus of the digynia order, and heptandria class of plants. Calyx seven-leaved; corolla seven-parted, flat; capsule two-celled. It has two species, natives of Africa and Madeira.

DISAPPOINTMENT BAY, a bay on the N.W. coast of North America. Lon. 129. 0. W. Lat. 52. 15. N.

DISAPPOINTMENT, ISLAND OF, a cluster of small islands, in the South Pacific Ocean. They were discovered by Commodore Byron in 1765. These islands abound with cocoa trees, and turtles are plentiful on the coasts. Lon. from 141. 5. to 141. 16. E. Lat. from 14. 5. to 14. 10. S.

DISARMING, in law, the prohibiting of people to wear arms. It is an offence by the common law of England for persons to go or ride armed with dangerous and uncommon weapons: though gentlemen may wear common armour, according to their quality. It is also ordained by statute, that no persons shall come before the king's justices with force of arms, on pain of imprisonment, &c.

DISC, [*discus*], in antiquity, a quoit made of stone, iron, or copper, five, or six fingers broad, and more than a foot long, inclining to an oval figure, which was hurled in the manner of a bowl, to a vast distance, by the help of a leathern thong tied round the person's hand who threw it, and put through a hole in the middle.

Disc, in astronomy, the face of the Sun or Moon, such as it appears to us on the earth; or the face of the earth, such as it appears to a spectator in the Moon. The disc in eclipses is supposed to be divided into twelve equal parts, called digits; in a total eclipse of the luminaries, the whole disc is obscured; in a partial eclipse, only a part of it. See **ASTRONOMY**.

Disc, in botany, is an aggregate of florets forming, as it were, a plane surface.

Disc, in optics, is the width of the aperture of telescopic glasses, whatever their form be, whether plane, convex, concave, &c.

DISCHARGE, is where a man confined by some legal process, performs that which the law requires, and is released from the matter for which he is confined. If an obligee discharge one obligor where several are jointly bound, it discharges the others. See **ARREST**, **BOND**, **PAYMENT**.

DISCIPLE, [*discipulus*, Latin], a scholar; one that professes to receive instructions from another.

DISCIPLES, in the Christian sense, were the followers of Jesus Christ,

Christ, in general; but in a more restrained sense, the title is given to those alone who were the immediate followers and attendants on his person, of whom there were 70 or 72. The names disciple and apostle are often synonymously used in the gospel history; but sometimes the apostles are distinguished from disciples, as persons selected out of the number of disciples, to be the principal ministers of his religion: of these there were only 12. The Latins kept the festival of the 70 or 72 disciples on July 15, and the Greeks on January 4.

DISCIPLINE, in a general sense, denotes instruction and government, as military discipline, ecclesiastical discipline, &c. Ecclesiastical discipline consists in putting those laws in execution by which the church is governed, and inflicting the penalties enjoined by them against the several sorts of offenders that profess the religion of Jesus: the primitive church never pretended to exercise discipline upon any but such as were within her pale, in the largest sense, by some act of their own profession; and even upon these she never pretended to exercise her discipline so far as to cancel or disannul their baptism: all that she pretended to, was to deprive men of the benefits of external communion, such as public prayer, receiving the eucharist, and other acts of divine worship. The church discipline was only confined to the admonition of the party, and to the less and greater excommunication.

DISCLAIMER, is a plea containing an express denial, renouncing or disclaiming; as if the tenant sues a replevin upon a distress taken by the lord, and the lord avows, saying that he holds of him as his lord, and that he distrained for rent not paid, or service not performed; then the tenant denying to hold of such lord, is said to disclaim; and the lord proving the tenant to hold of him, the tenant loses his land. Co. on Lit. 102.

DISCONTINUANCE OF POSSESSION. A man may not enter upon his own lands or tenements alienated (such alienation being discontinuance of possession,) whatsoever his right be to them, of his own self or by his own authority, but must bring his writ, and seek to recover possession by law. Co. Rep. lib. 3. 85.

DISCONTINUANCE OF PROCESS, is where the plaintiff leaves a chasm in the proceedings of a cause, whereby the opportunity of prosecution is lost for that time, in which case he must begin again, and usually pays costs to the defendant, or the plaintiff is dismissed the court, &c. Every suit, whether civil or criminal, and every process therein, ought to be properly continued from day to day, &c. from its commencement to its conclusion; and the suffering of any default or gap herein, is called a discontinuance. 2 Haw. 298.

DISCONTINUANCE OF PLEA: if where divers things should be pleaded to, when some are omitted, this is a discontinuance.

DISCORD, in music, every sound which, joined with another, forms an assemblage disagreeable to the ear; or rather, every interval whose extremes do not coalesce. Now, as there are no other concords or consonances, except those which form amongst themselves, and with their fundamental sound, perfect chords, it follows, that every other interval must be a real dissonance or discord: even the third and sixth were reckoned such among the ancients, who excluded them from the number of consonant chords. The term dissonance, which is synonymous with discord, both in a literal and metaphorical sense, signifies disagreement or disunion. In reality, that which renders dissonance grating, is, that the sounds which form them, far from uniting in the ear, seem to repel each other, and are heard each by itself as two distinct sounds though produced at the same time. This repulsion or violent oscillation of sounds is heard more or less frequently coincident. When two vocal strings are gradually tuned, till they approach a consonant interval, the pulsations become slower as the chord grows more just, till at last they are scarcely heard, if heard at all; from whence it appears certain, that the pleasure produced in us by harmony results from the more or less exact and frequent coincidence of vibrations; though the reason why this coincidence should give pleasure, more than any other modification or combination of sounds, appears to us inscrutable. The agreeable effects of dissonance in harmony, are no objection to this theory; since it is allowed, that the sensations excited by discord are not in themselves immediately and necessarily pleasing, but only please by auricular deception. The ear is surprised

with the shock it receives, without being able to imagine how it should have happened; and in proportion as it is harsh and grating, we feel the pleasure of returning harmony enhanced, and the disappointment of being artfully and insensibly extricated more agreeable. The name of dissonance, is given sometimes to the interval, and sometimes to each of the sounds which form it. But though two sounds equally form a dissonance between themselves, the name is most frequently given to that sound in particular which is most extraneous to the chord. The number of possible dissonances is indefinite; but as in music we exclude all intervals which are not found in the system received, the number of dissonances is reduced to a very few: besides, in practice, we can only select from those few, such as are agreeable to the species, and the mode in which we compose; and from this last number we must exclude such as cannot be used consistently with the rules prescribed. See MUSIC.

DISCOUNT, in commerce, a term used by traders, merchants, and bankers, especially by the two former when they purchase commodities on the usual time of credit, with a condition that the seller shall allow the buyer a certain discount at the rate of so much per cent. per annum, for the time for which the credit is generally given, upon condition that the buyer pays ready money for such commodities, instead of taking the time of credit. Traders and merchants are frequently taking promissory notes for monies due payable to them or order at a certain time, and sometimes having occasion for money before the time is elapsed, procure these notes to be discounted by bankers before the time of payment. Bills of exchange are also discounted by bankers; and in this consists one article of the profits of banking. See BANK. For finding the discount of any sum for any time, see ARITHMETIC AND INTEREST.

DISCOURSE, [*discursus*,] among logicians, signifies the progressive exercise of reason in the search of truth; as when from self-evident principles it discovers the truth of something it did not know before; by means of this, a second; by that second, a third; and so on. See LOGIC.

DISCOUS, [from *discus*, Lat.] broad, flat, wide. Used by botanists to denote the middle, plain, and flat part of some flowers, such as the flos solis, &c.

DISCRETE, or DISJUNCT PROPORTION, is when the ratio of two or more pairs of numbers or quantities is the same, but there is not the same proportion between all the four numbers. Thus, if the numbers 3:6::8:16 be considered, the ratio between 3:6, is the same as that between 8:16, and therefore the numbers are proportional; but it is only discretely or disjunctly, for 3 is not to 6 as 6 to 8; that is, the proportion is broken off between 8 and 3, and is not continued as in the following continual proportionals, 3:6::12:24. See PROPORTION.

DISCRETE QUANTITY, such as is not continuous and joined together. Such is a number whose parts being distinct units, cannot be united into one continuum; for in a continuum, there are no actual determinate parts before division, but they are potentially infinite.

DISCRETIONE, in music, intimates to play or sing with attention and care.

DISCRETIVE PROPOSITIONS, are those where various judgements are made and denoted by the particles *but*, *notwithstanding*, &c. either expressed or understood. Thus, fortune may deprive me of my wealth, but not of my virtue, is a discrete proposition.

DISCUS, in antiquity, an instrument used by the ancients in their public games. It is certain it was used in the gymnastic art for preserving health and strengthening the constitution; but as to its front, its dimensions, and various uses, authors disagree. See DISC. The same exercise was performed with an instrument called *Colos*, which some distinguish from the discus, because that was made of iron, and the discus of stone; while others distinguish them by the form, the *Colos* being spherical, and the discus broad.

DISCUS, in botany. See BOTANY. It generally consists of small florets, with a hollow regular petal. It is commonly surrounded by large, plain, or flat, tongue-shaped petals, in the circumference or margin; as in daisy, groundsel, and leopard's bane: sometimes the circumference is naked, as in cotton-weed and some species of colts-foot.

DISCUS FOLII, the surface of the leaf.

DISCUSSION, in matters of literature, signifies the clear treating or handling of any particular point, or problem, so as to shake off the difficulties with which it is embarrassed: thus we say, such a point was well discussed, when it was well treated of, and cleared up.

DISCUTIENTS, in surgery, are such external remedies as, by their subtilty, dissolve or disperse a stagnating or coagulated fluid in any part of the body.

DISDIAPASON, or BISDIAPASON, in music, a compound concord, described by F. Parran, in the quadruple ratio of 4:1, or 8:2.

DISDIAPASON DIAPENTE, a concord in a sextuple ratio of 1:6.

DISDIAPASON DITONE, a compound consonance in the proportion of 10:2.

DISDIAPASON SEMI-DIAPENTE, a compound concord in the proportion of 16:3.

DISDIAPASON SEMI-DITONE, a compound concord in the proportion of 24:5.

DISEASE, that condition of the body, in which it has declined from a state of health, so that its different functions are either greatly impeded, or performed with difficulty. Of all organized creatures, man is subject to the greatest diversity of diseases: some impairing only the use of the part immediately affected; for instance, the palsy, gout, rheumatism, &c.; others disordering the whole body, such as fever, apoplexy, &c.; again others disturbing the mind, as delirium, melancholy, and the like; and lastly, some attack both mind and body, such as phrenzy, accompanied with fever. Without perplexing the reader with conjectures on the origin and propagation of diseases, we may observe, that in proportion as men associate together in large and populous places, their manners and habits become more refined; while they gradually degenerate in bodily strength, and energy of mind, so that they are less capable of resisting the noxious agency of the elements, and other external powers. This progress towards refinement is always attended with an increase of luxury, the painful effects of which are sooner or later experienced by its votaries. Luxury, indeed, has also afforded the means of lessening the sudden influence of cold, heat, rain, moisture, and other external causes; for we can occasionally guard against their severity; but, on their next return, we are liable to be acted upon with additional vehemence. To this state of things we owe the introduction of many articles, both of food and dress, the consequences of which too frequently prove to be injurious to our bodily welfare. Thus it may be safely affirmed, that the number and variety of diseases, in a great measure depend upon the prevailing refinements in the extensive department of luxury. The passions are another fruitful source of disorders. Man is perhaps more violently attacked, and more obstinately governed, by them than any other creature. These emotions variously affect the human body: the most hurtful and oppressive of them, however, are terror and grief; the former in particular is often attended with the most fatal effects. The remedies to which we resort during the prevalence of passion, too frequently lay the foundation of lingering disorders both mental and corporeal, in which medicine can afford but precarious relief. The last source of diseases to which we shall allude, is a variety of specific contagions; the greater part of which is probably generated in the atmosphere. Such is particularly the case with respect to air that is vitiated by putrid, marshy, or noxious vapours, and by the unwholesome effluvia of various manufacturing processes, especially those of combustion, fermentation, and putrefaction. Lastly, there is another and very numerous class of contagious maladies, that perpetually migrate from one individual to another, such as the small-pox, measles, hooping-cough, influenza, putrid fevers, &c. Every disease weakens the digestive powers. The diet ought therefore in all cases to be light and easy of digestion. Paying due attention to this circumstance alone, without having recourse to those pernicious nostrums and pretended specifics, now in general circulation, will in a very great measure contribute to the recovery of the patient. Medicines are doubtless of considerable utility, when properly and opportunely administered; but an indiscriminate use of drugs (such as prevails among the ignorant and fanciful,) cannot fail to be productive of the worst consequences.

DISEASES OF HORSES. See FARRIERY.

DISEASES OF PLANTS. See HUSBANDRY.

DISEMBOGUE, in the sea-language, is said of a ship that passes out of a gulph or bay into the open sea; a river is also said to disembogue or discharge itself into the sea.

DISENTIS, one of the eight jurisdictions in the superior part of the Grison league; situated about the sources of the Rhine. It is mountainous and fertile.

DISENTS, the capital of the above territory, situated near the sources of the Rhine.

DISGUISE, in law. Persons doing unlawful acts in disguise are by our statutes subjected to great penalties, and even declared felons. Thus by an act, commonly called the black act, persons appearing disguised and armed in a forest or grounds inclosed, or hunting deer, or robbing a warren or a fish-pond, are declared felons.

DISH, in mining, is a trough made of wood, about 28 inches long, four inches deep, and six inches wide; by which all miners measure their ore. If any be taken selling their ore, not first measuring it by the bar-master's dish, and paying the king's duty, the seller forfeits his ore, and the buyer forfeits for every such offence 40 shillings to the lord of the field or farmer.

DISHERISON, a term used in old writers for disinheriting.

DISJUNCT PROPORTION, the same with that otherwise called discrete. See DISCRETE.

DISJUNCTIVE, something that separates or disjoins. Thus, *or, neither, &c.* which in connecting a discourse separate the parts of it, are called disjunctive conjunctions.

DISJUNCTIVE PROPOSITION, in logic, is that where, of several predicates, we affirm one necessarily to belong to the subject to the exclusion of all the rest, but leave that particular one undetermined. Such is the major of the following disjunctive syllogism:

The world is either self-existent, or the work of some finite, or of some infinite being.

But it is not self-existent, nor the work of a finite being.

Therefore it is the work of an infinite being.

DISK, or DISC. See DISC and DISCUS.

DISLOCATION, in surgery, the same with luxation. See SURGERY.

DISMISSION OF A BILL, in chancery. If the plaintiff does not attend on the day fixed for the hearing, his bill is dismissed with costs. It may be also dismissed for want of prosecution, which is in the nature of a non-suit at law, if he suffer three terms to elapse without moving forwards in the cause.

DISEMBEMBERED, in heraldry, is applied to birds that have neither feet nor legs, and also to lions and other animals whose members are separated.

DISMES, [*decimæ*, Lat.] a term formerly used for tithes. See TITHE.

DISMOUNTING, in the military art, the act of unhorsing. Thus to dismount the cavalry, dragoons, &c. is to make them alight.

DISMOUNTING CANNON, is the breaking of their carriages, wheels, axletrees, or any thing else, so as to render them unfit for service.

DISPARAGEMENT, in our law, is properly used for the matching an heir in marriage under his degree, or against decency.

DISPARATES, [*disparata*, Lat.] things so unlike that they cannot be compared with each other.

DISPART, in gunnery, is the mark set upon the muzzle ring of a piece of ordnance, so that a sight line taken upon the top of the base ring against the touch-hole, by the mark set on or near the muzzle, may be parallel to the axis of the concave cylinder. The common way of doing this, is to take the two diameters of the base ring, and of the place where the dispart is to stand, and divide the difference between them into two equal parts, one of which will be the length of the dispart, which is set on the gun with wax or pitch, or fastened there with a piece of twine or marline. By means of an instrument it may be done with all possible nicety.

DISPATCH, a letter on some affair of state, or other business of importance, sent with care and expedition, by a courier express. The business of dispatches lies on the secretaries of state and their clerks. The king gives directions to his ministers abroad by

by dispatches. The word is also used for the packet or mail containing such letters.

DISPENSARY, a kind of charitable institution, of late years very prevalent in Britain; particularly in London, Edinburgh, Newcastle, Dundee, Kelso, &c. They are distinguished by different titles, as the General Dispensary, the Royal Universal Dispensary, &c. They are supported by voluntary subscriptions, have each one or more physicians and surgeons, whose business is to attend at stated times, to prescribe for the poor; and, if necessary, to visit them at their own habitations. It is in this latter respect, that the patients of a dispensary differ from those called out-patients at an hospital. The poor are supplied gratis with medicines, and many of these institutions also afford gratuitous assistance to lying-in women. Formerly there were three dispensaries established in London, for selling medicines to the poor at prime cost, under the direction of the College of Physicians. In China, the medicines are not dispensed gratis, but money is given to the poor to purchase them. The Chinese have a stone, ten cubits high, erected in the public squares of their cities: on this stone are engraved the names of all sorts of medicines with the price of each; and when the poor stand in need of any relief from physic, they go to the treasury, where they receive the price each medicine is rated at.

DISPENSARY, or DISPENSATORY, denotes a book containing the method of preparing the various kinds of medicines used in pharmacy. Such are those of Bauderon, Quercetan, Zwelfer, Chara, Bates, Mesue, Salmon, Lemery, Quincy, &c. but the latest and most esteemed, besides the London and Edinburgh Pharmacopœias, is the Edinburgh New Dispensary, being an improvement upon that of Dr. Lewis.

DISPENSATION, in law, the granting of a licence of doing some certain action that otherwise is not permitted. The greatest dealer in dispensations is the Pope, who claims the office *jure divino*, and extends it to every thing. The more moderate of the Romanists themselves deny that he can give a dispensation for any thing contrary to the divine law, or the law of nature; and confine him to what is contrary to positive laws, or to things relating to fasts, marriages, holding several benefices, &c. and they limit him even in these things. The archbishop of Canterbury has a power, by statute, of dispensing in any cause wherein dispensations were formerly granted by the see of Rome; and as well to the king as his subjects; and during the vacancy of the archbishop's see, the guardian of the spiritualities may grant dispensations.

DISPERSION, in optics, the same with the divergency of the rays of light.

DISPERSION OF INFLAMMATION, in medicine and surgery is the removing of the inflammation, and restoring of the inflamed part to its natural state.

DISPERSION, POINT OF, in dioptrics, the point from which refracted rays begin to diverge, where their refraction renders them divergent.

DISPLAYED, in heraldry, is applied to the position of an eagle, or any other bird, when it is erect, with its wings expanded.

DISPONDEE, or DISPONDEUS, in the Greek and Latin poetry, a double spondee or foot, consisting of four long syllables; as *ἄνθρωπος*, *ἡλιόφωτος*.

DISPOSITION, in architecture, the just placing of the several parts of an edifice according to their nature and office.

DISPOSITION, in human nature. In every man there is something original, that serves to distinguish him from others, that tends to form a character, and to make him meek or fiery, candid or deceitful, resolute or timorous, cheerful or morose. This original bent, termed disposition, must be distinguished from a principle: the latter signifying a law of human nature, makes part of the common nature of man; the former makes part of the nature of this or that man. Propensity is a name common to both; for it signifies a principle as well as a disposition.

DISPOSITION, in oratory. See **ORATORY**.

DISPOSITION, in painting. See **PAINTING**.

DISPOSITION, in Scots law, a deed or writing which contains the grant of any subject: when applied to heritable subjects, it in some cases gets the name of charter, which differs from a disposition in nothing else than a few immaterial forms.

DISPROPORTION, a general term for any kind of irregularity, or want of proportion in the parts of a thing. See **PROPORTION**.

DISPROVING, in rhetoric and logic, the same with refutation. See **REFUTATION**.

DISPUTATION, in the schools, a contest, either by word or writing, on some point of learning for a degree, prize, or for an exercise. See **DEGREE** and **THESIS**.

DISQUISITION, a serious and exact examination into the circumstances of any affair, in order to discourse clearly about it. See **REASONING**, and **LOGIC**.

DISSECTION, in anatomy, the cutting up of a body, with a view of examining the structure and use of the parts. See **ANATOMY**.

DISSEISIN, in law, an unlawful dispossessing of a person of his lands or tenements. It is of two sorts, either single disseisin, which is committed without force of arms, or disseisin by force of arms, more properly termed deforcement. The disturbing of a person from entering on his land, or hindering of him from tilling it, are both disseisins of land; and denial of rent, when lawfully demanded, is a disseisin of the rent. If a disseisor, after he has expelled the right owner, gains peaceable possession of the lands five years, without claim, and continues in possession so as to die seised, and the land descends to his heirs, they will have a right to the possession till the owner recovers at law; and here the owner shall lose his estate for ever, if he do not prosecute his suit within the time limited by the statute of limitations.

DISSEISOR, a person who is guilty of disseisin.

DISSENTERS, separatists from the service and worship of the church of England. At the revolution a law was enacted, that the statutes of queen Elizabeth and king James I. concerning the discipline of the church, should not extend to the Protestant dissenters. Persons dissenting, however, are to subscribe the declaration of 30 Car. II. cap. 1. and take the oaths of fidelity, &c. Besides, they are not to hold their meetings till their place of worship is certified to the bishop, or to the justices of the quarter-sessions, and registered. Also they are not to keep the doors of their meeting-houses locked during the time of divine service. And to secure to them the free exercise of their religion, whoever disturbs or molests them in the performance of divine worship, on conviction at the sessions is to forfeit twenty pounds by the statute 1 William and Mary. Unless dissenters conform and receive the sacrament as administered by the church of England, they are excluded from holding any public places under the government. Dissenters chosen to any parochial or ward offices, and scrupling to take the oaths, may execute the office by deputy, who shall comply with the law in this behalf. But it seems they are not subject to fine, on refusing to serve corporation offices; for they may object to the validity of their election, on the ground of their own non-conformity.

DISSIMILAR, in general, an appellation given to things which are unlike: thus the seminal of first leaves of plants, are called dissimilar, as being generally of a different figure from those of the grown plants.

DISSIMILAR PARTS, in anatomy, those compounded of parts of various structure, such are all the limbs of the body.

DISSIMILITUDE, in general, denotes whatever constitutes the difference between two dissimilar things.

DISSIMILITUDE, in rhetoric, an argument wherein from dissimilar, or unlike things, other dissimilars are deduced, as in the following argument from Catullus.

Soles occidere & redire possunt.

Nobis cum semel occidit brevis lux,

Nox est perpetua una dormienda.

Voss. de institut. orator.

DISSIPATION, in physics, an insensible loss or consumption of the minute parts of the body; or that flux whereby they fly off, and are lost. See **EFFLUVIA**.

DISSIPATION, CIRCLE OF, in optics, is used for that circular space upon the retina, which is taken up by one of the extreme pencils or rays issuing from an object.

DISSOLVENT, in general, whatever dissolves or reduces a solid body into such minute parts as to be sustained in a fluid.

DISSOLUTION, in chemistry, the same with solution.

DISSOLUTION, in music, is when a sound in the enharmonic genus is lowered three dieses; for thereby that genus is dissolved, and the music, or that interval at least, is chromatic.

DISSONANCE, in music, the same with discord. See **DISCORD**.

DISSYLLABLE,

DISSYLLABLE, among grammarians, a word consisting only of two syllables; such are nature, science, &c.

DISTAFF, an instrument about which flax is tied in order to be spun.

DISTANCE, in general, an interval between two things, either with regard to time or place. See **METAPHYSICS**.

DISTANCES, **ACCESSIBLE**, in geometry, are such as may be measured by the chain, &c. See **CHAIN**, **THEODOLITE**.

DISTANCES, **INACCESSIBLE**, are such as cannot be measured by the chain, &c. by reason of some river, or the like, which obstructs our passing from one object to another. See **GEOMETRY** and **TRIGONOMETRY**.

DISTANCE, in navigation, the number of minutes or leagues a ship has sailed from any given place or point. See **NAVIGATION** and **MENSURATION**.

DISTANCE, in astronomy. The distance of the sun, planets, and comets, is only found from their parallax, as it cannot be found either by eclipses or their different phases: for from the theory of the motions of the earth and planets we know, at any time, the proportion of the distances of the sun and planets from us; and the horizontal parallaxes are in a reciprocal proportion to these distances. See **ASTRONOMY**.

DISTANCE, **CURTATE**, in astronomy, is the distance of the planet's place, reduced to the ecliptic, from the sun.

DISTANCE OF THE BASTIONS, in fortification, is the side of the exterior polygon.

DISTANCE OF THE EYE, in perspective, is a line drawn from the eye to the centre of the picture. See **PERSPECTIVE**.

DISTEMPER is frequently used in the same sense as disease, but is particularly applicable to cattle. This term implies a species of contagious fever, attended with an inflammation, which is succeeded by a gangrene in the lungs, liver, or intestines. It is always preceded by a shivering and trembling of the limbs, which are followed by various febrile symptoms, such as difficulty of breathing, a sinking in the flanks, and a dryness on the tongue, together with a loathing of the usual food and drink, great heaviness and debility. Animals affected with the distemper, frequently shed tears; their eyes appear sometimes sparkling and inflamed, but at intervals dull and languid. Their food remains crude in the stomach for several days after it has been eaten, from their inability to digest it. This contagion spread most rapidly in the early part, and about the middle of last century, over several provinces in France, whence it reached this country, and destroyed great numbers of cattle. Various causes of this malady have been assigned, but that most generally admitted, is the turning of cattle into rank grass, especially after heavy and frequent showers. Different remedies were then adopted, the best of which appears to be bleeding the infected animal in the earlier stages of the disorder; and the internal use of the Peruvian bark and red wine; or, if these should fail to procure relief, a mixture of that drug and of burdock, about half an ounce of each, pulverized, may be given twice nightly, for two or three succeeding nights, in warm water, which will seldom fail of effecting a cure.

DISTEMPER, in painting, a term used for the working up of colours with something besides water or oil. If the colours are prepared with water, that kind of painting is called limning; and if with oil, is called painting in oil, and simply painting. If the colours are mixed with size, whites of eggs, or any such proper glutinous or unctuous matter, and not with oil, then they say it is done in distemper.

DISTENSION, [*distensio*, Lat.] among ancient musicians, is used in a synonymous sense with interval. See **INTERVAL**.

DISTICH, [*distichon*,] a couplet of verses making a complete sense. Thus hexameter and pentameter verses are disposed in distichs.

DISTICHIASIS, in surgery, a disease of the eye-lids, when under the ordinary eye-lashes there grows another extraordinary row of hair, which frequently eradicates the former, and pricking the membrane of the eye, excites pain, and brings on a defluxion.

DISTILLATION, a chemical process employed to separate liquids from those parts of bodies which are more fixed, whether solid or liquid; the process by which the solid parts of bodies are separated is called sublimation. See **CHEMISTRY**. The apparatus employed for distillation are of several varieties, suited to the nature

of the volatile body. That employed for the distillation of water, alcohol, and essential oils, is called a still. It is chiefly made of copper, and ought to be so constructed, that as great an evaporable surface as possible may be exposed. The vapour which comes from the still, is condensed by causing it to pass through a spiral tube, fitted into the inside of a tub, which is filled with cold water, and so contrived, that the product of the distillation shall have no communication with the external water. This tub, which is called a worm tub, should be supplied with cold water at the bottom, while the warm water, caused by the condensation of the vapour, should be made to run off at the top. The apparatus employed for distilling bodies more easily condensable, consist of two parts, one called the retort, containing the substance to be distilled, and the other the receiver, because it receives the substance raised from the retort. In the distillation of bodies which afford permanent gasses as well as condensable matters, in addition to the receiver, a number of connected vessels are employed, constituting what, from its inventor is called a Woulfe's apparatus, in which, what is not condensed, or absorbed in the first bottle, passes forward to the second, and so on to the third and fourth, till at length the absolutely incondensable part is received into a vessel called a gasometer. Before the invention of this apparatus, this kind of distillation was attended with great danger, both to the apparatus and the operator; the receiver being very liable to burst, and the fumes being intolerably suffocating. Both these inconveniences are completely obviated by the invention of the Woulfe's apparatus. See **CHEMISTRY**. Sometimes an apparatus called an alembic is used for distillation; it is generally of glass, and is used for experiments in the small way; it consists of a bottle holding the substance to be distilled, having a dome-like head, furnished with a channel to convey the condensed vapour. There are various modes of applying heat in distillation, depending upon the nature of the apparatus employed, as well as upon the substance to be distilled. The common still, which is of metal, is immediately exposed to the naked fire, since from its tenacity, and its property of conducting heat with facility, it is not liable to crack, which is not the case with glass and earthen ware. If the vessel holding the substance to be distilled, be of the latter kind, it is essential to apply the heat very gradually and uniformly, and after the process, to suffer it to cool in a similar manner. This is effected in different ways; the most common of which is the sand-bath. In experiments in the small way, the lamp will answer every purpose of the sand-bath, as the sliding rest containing the retort, admits of its being placed at any given distance from the flame. In addition to this, the Argand lamp can be adjusted by the rack, to almost any degree of intensity below its maximum. Another method of defending the retort from the too rapid effect of the heat, consists in coating the outside with a mixture of horse-dung and clay, or loam. When a limited degree of heat is required in distillation, recourse is had to a bath of some liquid, whose boiling point will give the degree of heat required, such as water, oil, or mercury. If the different bodies subjected to distillation had no chemical affinity for each other, it is probable that each substance would put on its elastic form, only at that temperature at which it would, in a separate state, be converted into vapour. But we frequently find, that one volatile substance will carry along with it other bodies of considerable fixity. From the affinity which water has to air, we observe the evaporation of the former to take place at all temperatures below its boiling point; and though it has been thought that water might be freed from saline matter by distillation, it is found by experiment, that several salts are carried over along with the vapour of the water, which in their dry state would undergo decomposition before they would be induced to assume the elastic form. Hence water, by the common mode of distillation, cannot be rendered pure. From the circumstance, that the air is capable of raising water and other liquids at a low temperature, we are enabled to perform the distillation of such liquids, by making the slightest degree of difference of temperature between the retort and the receiver. Water and alcohol may be obtained perfectly pure, by placing the retort in the temperature of 100°, and the receiver in that of 50° of Fahrenheit's scale. The salts most liable to rise with water in distillation are carbonate ammonia, muriates of lime and magnesia, and nitrate of soda. Indeed this tendency appears to be directly, as the solubility of the salt, or rather as its deliquescent property, which is as its affinity for water.

The objects of distillation, considered as a trade distinct from the other branches of chemistry, are chiefly spirituous liquors, and those waters impregnated with the essential oil of plants, commonly called simple distilled waters. The distilling of compound spirits and waters is reckoned a different branch of business, and they who deal in that way are commonly called rectifiers. This difference, however, though it exists among commercial people, is not at all founded in the nature of the thing; compound spirits being made, and simple spirits being rectified, by the very same operations by which they are at first distilled, or at least with very trifling alterations. The great object with every distiller ought to be, to procure a spirit perfectly flavourless, or at least as well freed from any particular flavour as may be; and in this country the procuring of such a spirit is no easy matter. The only materials for distillation, that have been used in large quantity, are malt and molasses, or treacle. Both these, especially the first, abound with an oily matter, which, rising along with the spirit, communicates a disagreeable flavour to it, and from which it can scarce be freed afterwards by any means whatever. To dissipate this essential oil, it has been proposed to inspissate the wort into a thin extract like a syrup; afterwards to thin it with water, and ferment it in the usual manner. This certainly promises great success; there is no subject we know of, that is possessed of any kind of essential oil, but what will part with it by distillation, or by long boiling. The inspissating of the wort, however, does not seem to be either necessary, or safe to be attempted; for, in this case, there is great danger of its contracting an empyreuma, which never could be remedied. The quantity lost by evaporation, therefore, might be occasionally added, with an equal certainty of dissipating the obnoxious oil. Whether the yield of spirit would be as great in this case as in the other, is a question that can by no means be decided without further experiments. Previous to the operation of distilling, those of brewing and fermentation are necessary. See BREWING. The fermentation ought always to be carried on as slowly as possible, and performed in vessels closely stopped; only having at the bung a valve pressed down by a spring, which will yield with less force than is sufficient to burst the vessel. It should even be allowed to remain till it has become perfectly fine and transparent; as the spirit will thus not only be superior in quantity, but also in fragrance, pungency, and vinosity, to that commonly produced. As to the operation of distilling, only one general rule can be given, viz. to let the heat, in all cases, be as gentle as possible. Accidents will be effectually prevented by having the worm of a proper wideness, and by rectifying the spirits in a water bath; which, if sufficiently large, will perform the operation with all the dispatch requisite for the most extensive business. The vessel in which the rectification is performed, ought to be covered with water up to the neck, and to be loaded with lead at the bottom, so that it may sink in the water. Thus the operation will go on as quickly as if it was on an open fire, and without the least danger of a miscarriage; nor will it ever be necessary to make the water in the bath come to a boiling heat. As the end of rectification is to make the spirit clean as well as strong, or to deprive it of the essential oil as well as the aqueous part, it will be proper to have regard to this even in the first distillation. For this purpose, the spirit, as it first comes over, should be received into a quantity of cold water; as the connection betwixt it and the oily matter will thus be considerably lessened. After this, it should be again mixed with an equal quantity of water, and distilled a second time. Thus the spirit will be freed from most of the oily matter, even though it had been very much impregnated with it at first. But, as by using such a quantity of water, a considerable part of the water will be left in the residuum of each rectification, all these residuums, must be mixed together, and distilled on an open fire, with a brisk heat, that the remainder of the spirit may be got out. After the spirit has been distilled once or twice in this manner from water, it may be distilled in a water-bath without any addition; and this last rectification will free it from most of the water it contains. One very great desideratum among the distillers of this country is, a method of imitating the foreign spirits, brandy, rum, gin, &c. to a tolerable degree of perfection; and notwithstanding the many attempts that are daily made for this purpose, the success, in general, has been but very indifferent. On this subject, Mr. Cooper has the following observations, in his "Complete System of Distillation;" which, as they are applicable to all other spirits as well as brandy, we shall here quote: "The general me-

thod of distilling brandies in France need not be formally described, as it differs in nothing from that practised here in working from malt-wash or molasses; nor are they in the least more cleanly or exact in the operation. They only observe more particularly to throw in a little of the natural ley into the still along with the wine, as finding this gives their spirit the flavour, for which it is generally admired abroad. But, though brandy is extracted from wine, experience tells us that there is a great difference in the grapes from which the wine is made. Every soil, every climate, every kind of grapes, varies with regard to the quantity and quality of the spirits extracted from them. A large quantity of brandy is distilled in France during the time of the vintage; for all those poor grapes that prove unfit for wine, are usually first gathered, pressed, their juice fermented, and directly distilled. This rids their hands of their poor wines at once, and leaves their casks empty for the reception of better. It is a general rule with them not to distil wine that will fetch any price as wine; for, in this state, the profits upon them are vastly greater than when reduced to brandies. This large stock of small wines, with which they are almost over-run in France, sufficiently accounts for their making such vast quantities of brandy in that country, more than in other places which lie in warmer climates, and are much better adapted to the production of grapes. Nor is this the only fund of their brandies: for all the wine that turns eager, is also condemned to the still; and, in short, all that they can neither export nor consume at home, which amounts to a large quantity; since much of the wine laid in for their family provision is so poor as not to keep during the time of spending. Hence many of our English spirits, with proper management, are convertible into brandies hardly distinguishable from the foreign in many respects, provided the operation be neatly performed. The best, and indeed the only method of imitating French brandies to perfection, is by an essential oil of wine; this being the very thing that gives the French brandies their flavour. But to use even this ingredient to advantage, a pure tasteless spirit must first be procured; for it is ridiculous to expect that this essential oil should be able to give the agreeable flavour of French brandies to our fulsome malt spirit, already loaded with its own nauseous oil, or strongly impregnated with a livid taste from the alkaline salts used in rectification. The method of procuring this essential oil of wine, is this: Take some cakes of dry wine-lees, such as are used by our hatters; dissolve them in six or eight times their weight of water; distil the liquor with a slow fire, and separate the oil with a separating glass; reserving for the nicest uses only that which comes over first, the succeeding oil being coarser and more resinous. This fine oil of wine may be mixed into a quintessence with pure alcohol; by which means it may be preserved a long time fully possessed of all its flavour and virtues; but, without such management, it will soon grow resinous and rancid. When a fine essential oil of wine is thus procured, and also a pure and insipid spirit, French brandies may be imitated to perfection. The essential oil, however, must be drawn from the same kind of lees as the brandy to be imitated was procured from. In order to imitate Coniac brandy, it will be necessary to distil the essential oil from Coniac lees; and the same for any other kind of brandy. For, as different brandies have different flavours, and as these flavours are entirely owing to the essential oil of the grape, it would be preposterous to endeavour to imitate the flavour of Coniac brandy with an essential oil procured from the lees of Bourdeaux wine. When the flavour of the brandy is well imitated by a proper dose of the essential oil, and the whole reduced into one simple and homogeneous fluid, other difficulties are still behind: the flavour, though the essential part, is not, however, the only one; the colour, the proof, and the softness, must also be regarded, before a spirit that perfectly resembles brandy can be procured. With regard to the proof, it may be easily hit, by using a spirit rectified above proof; which, after being intimately mixed with the essential oil of wine, may be let down to a proper standard with fair water. And the softness may, in a great measure, be obtained by distilling and rectifying the spirit with a gentle fire; and what is wanting of this criterion in the liquor when first made, will be supplied by time: for it is time alone that gives this property to French brandies; they being at first acrid, foul, and fiery. But, with regard to the colour, a particular method is required to imitate it to perfection. A small quantity of the extract of oak, or the shavings of that wood, properly digested, will furnish us with a tincture capable of giving the spirit

spirit any degree of colour required. There are other methods in use for colouring brandies; but the best, besides the extract of oak, are treacle and burnt sugar. The treacle gives the spirit a fine colour, nearly resembling that of French brandy; but as its colour is dilute, a large quantity must be used: this is not, however, attended with any bad consequences; for notwithstanding the spirit is really weakened by this addition, yet the bubble proof, the general criterion of spirits, is greatly mended by the tenacity imparted to the liquor by the treacle. The spirit also acquires from the mixture a sweetish or luscious taste, and a fulness in the mouth; both which properties render it very agreeable to many people. A much smaller quantity of burnt sugar than of treacle will be sufficient for colouring the same quantity of spirits: the taste is also very different; for instead of the sweetness imparted by the treacle, the spirit acquires from the burnt sugar an agreeable bitterness, and by that means recommends itself to nicer palates, which are offended with a luscious spirit. The burnt sugar is prepared by dissolving a proper quantity of sugar in a little water, and scorching it over the fire till it acquires a black colour. Either treacle or burnt sugar will nearly imitate the genuine colour of old French brandy; but neither of them will succeed when put to the test of the vitriolic solution. The spirit distilled from molasses or treacle is very clean and pure. It is made from common treacle dissolved in water, and fermented in the same manner as the wash for the common malt spirit. But if some particular art be not used in distilling this spirit, it will not prove so vinous as malt spirit, but more flat and less pungent and acrid, though otherwise much cleaner tasted, as its essential oil is of a much less offensive flavour. Therefore, if good fresh wine lees, abounding in tartar, be added and duly fermented with the molasses, the spirit will acquire a much greater vinosity and briskness, and approach much nearer to the nature of foreign spirits. Where the molasses spirit is brought to the common proof-strength, if it be found not to have a sufficient vinosity, it will be very proper to add some good dulcified spirit of nitre; and if the spirit be clean worked, it may, by this addition only, be made to pass on ordinary judges for French brandy. Great quantities of this spirit are used in adulterating foreign brandy, rum, and arrack. Much of it is also used alone in making cherry brandy and other drams by infusion; in all which many, and perhaps with justice, prefer it to foreign brandies. Molasses, like all other spirits, are entirely colourless when first extracted; but distillers always give it as nearly as possible the colour of foreign spirits. If these principles hold good, the imitation of foreign spirits of all kinds must be an easy matter. It will only cost the procuring of some of those substances from which the spirit is drawn; and distilling this with water, the essential oil will always give the flavour desired. Thus, to imitate Jamaica rum, it will only be necessary to procure some of the tops, or other useless parts of the sugar-canes; from which an essential oil being drawn, and mixed with clean molasses spirit, it will give it the true flavour. The principal difficulty must lie in procuring a spirit totally, or nearly, free of all flavour of its own. The spirit drawn from the refuse of a sugar-house is by our author commended as superior to that drawn from molasses. The only method, therefore, of imitating foreign spirits is, by choosing such materials as will yield a spirit flavoured as much like them as possible. The materials most recommended by our author in this case, and probably the best that can be used, are raisins. Concerning these he gives the following directions: "To extract this spirit, the raisins must be infused in a proper quantity of water, and fermented in the manner already directed. When the fermentation is completed, the whole is to be thrown into the still, and the spirit extracted by a strong fire. The reason why we here direct a strong fire is, because by that means a greater quantity of the essential oil will come over the helm with the spirit, which will render it fitter for the distiller's purpose: for this spirit is commonly used to mix with the common malt goods: and it is surprising how far it will go in this respect; ten gallons of it being often sufficient to give a determining flavour and agreeable vinosity to a whole piece of malt spirits. It is therefore well worth the distiller's while to endeavour at improving the common method of extracting spirits from raisins; and perhaps the following hint may merit attention. When the fermentation is completed, and the still charged with fermented liquor as above directed, let the whole be drawn off with as brisk a fire as possible; but, instead of the cask

or can, generally used by distillers for a receiver, let a large glass, called by chemists a separating glass, be placed under the nose of the worm, and a common receiver applied to the spout of the separating glass: by this means the essential oil will swim upon the top of the spirit, or rather low wine, in the separating glass, and may be easily preserved at the end of the operation. The use of this limpid essential oil is well known to distillers; for in this resides the whole flavour, and consequently it may be used to the greatest advantage in giving that distinguishing taste and true vinosity to the common malt spirits. After the oil is separated from the low wine, the liquor may be rectified in *balneo marie* into a pure and almost tasteless spirit, and therefore well adapted to make the finest compound cordials, or to imitate or mix with the finest French brandies, arracks, &c. In the same manner a spirit may be obtained from cyder. But as its particular flavour is not so desirable as that obtained from raisins, it should be distilled in a more gentle manner, and carefully rectified according to the directions we have already given."

DISTILLATION OF COMPOUND SPIRITS. The following general rules are very easy to be learned and practised. 1. The artist must always be careful to use a well cleansed spirit, or one freed from its own essential oil. For, as a compound water is nothing more than a spirit impregnated with the essential oil of the ingredients, it is necessary that the spirit should have deposited its own. 2. Let the time of previous digestion be proportioned to the tenacity of the ingredients, or the ponderosity of their oil. 3. Let the strength of the fire also be proportioned to the ponderosity of the oil intended to be raised with the spirit. 4. Let only a due proportion of the finest parts of the essential oil be united with the spirit; the grosser and less fragrant parts of the oil not giving the spirit so agreeable a flavour, and at the same time rendering it unsightly. This may in a great measure be effected by leaving out the faints, and making up to proof with fine soft water in their stead. A careful observation of these rules will render this part of distillation much more perfect than it is at present. Nor will there be any occasion for the use of burnt alum, white of eggs, singlass, &c. to fine down cordial waters; for they will presently be fine, sweet, and pleasant tasted, without any further trouble. We subjoin a few receipts for making some of those compound waters, or spirits, that are in the most general estimation.

DISTILLATION OF ANISEED WATER. Take of aniseed bruised, two pounds; proof spirit, 12½ gallons; water, one gallon: draw off ten gallons with a moderate fire. This water should never be reduced below proof; because the large quantity of oil with which it is impregnated, will render the goods milky and foul when brought down below proof. But if there be a necessity for doing this, their transparency may be restored by filtration.

DISTILLATION OF CARDAMUM, or ALL-FOURS. Take of pimento, caraway, coriander seeds, and lemon peel, each 3lb.; of malt spirits, 11 gallons; water, 3 gallons. Draw off with a gentle fire, dulcify with common sugar, and make up the strength desired with clear water. This is a dram greatly used in some countries.

DISTILLATION OF CINNAMON WATER. Take 8lb. of fine cinnamon bruised, 17 gallons of clean rectified spirits, and two gallons of water. Put them into the still, and digest them twenty-four hours with a gentle heat; after which draw off 16 gallons with a pretty strong heat. Cinnamon water of this strength is called strong cinnamon water. A cheaper spirit but of an inferior quality, may be obtained by using cassia lignea instead of cinnamon. To dulcify cinnamon water, take double refined sugar, about two pounds to a gallon; and dissolve it in the spirit, after making it up proof with clean water. One general caution is here necessary, viz. near the end of the operation, carefully to watch the spirit as it runs into the receiver, to prevent the faints from mixing with the goods. This may be discovered by often catching some of it as it runs from the worm in a glass, and observing whether it is fine and transparent; for as soon as the faints begin to rise, the spirit will have a blueish cast. As soon as this colour is perceived, the receiver must immediately be changed; for if the faints are suffered to mix with the rest, the value will be greatly lessened. The distillers call such as are made up proof, double goods; and those below proof, single.

DISTILLATION OF CITRON WATER. Take of dry yellow rinds of citrons, three pounds; of orange-peel, 2lb. nutmegs, 9 bruised,

bruised, $\frac{2}{3}$ of a pound; clean proof spirit, $10\frac{1}{2}$ gallons; water, one gallon: digest in a gentle heat; then draw off ten gallons in balneo marie, and dulcify with fine sugar.

DISTILLATION OF HOLLANDS GIN. The ingredients used by the Dutch are the same with those above-mentioned, only, instead of malt spirits, they use French brandy. But from what has been already observed concerning the nature of these kinds of spirits, it is easy to see, that by the help of a well-rectified spirit, geneva may be made in this country at least nearly equal to the Dutch, provided it is kept to a proper age; for all spirituous liquors contract a mellowness by age, impossible to be imitated any other way. The following is the process of preparing Holland gin, according to the best Dutch distillers. Their grist is composed of ten quarters of malt, ground considerably finer than our malt-distillers' barley grist, and three quarters of rye-meal; or, more frequently, of ten quarters of rye and three quarters of malt-meal. The ten quarters are first mashed with the least quantity of cold water it is possible to blend it up with; when uniformly incorporated, as much boiling water is added as forms it into a thin batter; it is then put into one, two, or more casks, or gyle tuns, with a much less quantity of yeast than is usually employed by our distillers. Generally on the third day they add the malt or rye meal, previously made into a kind of lob, prepared in a similar manner, except in not being so diluted; but not before it comes to the temperature of the fermenting wash; at the same time adding full as much yeast as when at first setting the backs. The principal secret in the management of the mashing part of the business is, in first thoroughly mixing the malt with the cold water, and in subsequently adding the due proportion of boiling water, that it may still remain sufficiently diluted after the addition of the fine meal under the form of lob, and in well rousing all together in the back, that the wash may yet be dilute enough for distilling, without endangering its burning to the bottom of the still. Thus they commodiously reduce the business of brewing and fermenting to one operation. By using cold water to uniformly wet the malt, all danger of clogging the spending of the tap would be necessarily avoided; but here is no occasion to do any thing more, than sufficiently dilute the wash, consisting of the whole of the grain, thin enough to be fermented and distilled together, by which means the spirit of the bran and husky part, as well as of the flour of the grain, are completely extracted, yet their wash, compared with ours, is about three-eighths thinner. For these reasons they obtain more spirit from their grain than we do, and of a better quality, with not half the trouble taken by our distillers. Rectification into Holland gin. To every twenty gallons of spirit of the second extraction, about the strength of proof spirit, take three pounds of juniper berries, and two ounces of oil of juniper, and distil with a slow fire until the feints begin to rise, then change the receiving can; this produces the best Rotterdam gin. An inferior kind is made with a still less proportion of berries, sweet fennel seeds, and Strasburgh turpentine, without a drop of juniper-oil. In Plate LIV. fig. 11, is the representation of the common still. It is a large copper vessel, A, into which the materials are put. The still is built up in brick-work: the fire is applied underneath, and runs round it in a spiral manner. B is the head of the still, which is connected with the worm at x. The worm C is a spiral tube, immersed in a vessel of cold water, called the refrigeratory. The liquor being condensed in its passage through the worm, runs out at the cock D into the vessel Z, placed there to receive it.

DISTILLATION OF LEMON WATER. Take of dried lemon peel, 4lb. clean proof spirit, $10\frac{1}{2}$ gallons, and one gallon of water. Draw off 10 gallons by a gentle fire, and dulcify with fine sugar.

DISTILLATION OF ORANGE WATER. Take of the yellow part of fresh orange-peel, five pounds; clean proof spirit, $10\frac{1}{2}$ gallons; water, two gallons: draw off ten gallons with a gentle fire.

DISTILLER, he who makes distillations, and commonly a tradesman who makes spirits from malt, &c. By stat. 3 Geo. III. c. 5, s. 12, persons who sell liquors chargeable with duty, and distil spirits, are deemed common distillers, and are liable to surveys, penalties, &c. By the 2 Geo. III. c. 5, and 14 Geo. III. c. 73, no distillers, or those who distil spirits for sale, are allowed to have any still, or number of stills, which, either singly or together, contain less than 100 gallons, under the penalty of 100*l.*; and the wash-still is to hold at least 400 gallons, exclusive of the head, under a similar penalty. By the 8 and 9 William III. c. 19, and 24 Geo. III. c. 40, all distillers are to enter their warehouses, stills,

vessels, &c. at the next office of excise, on pain of 20*l.*; and all such persons as occupy the same, if not entered, shall forfeit 50*l.* and the vessels are to be marked by the gauger. Distillers who use private pipes, &c. for the conveying of distilled liquor, incur a forfeiture of 100*l.* by the 10 and 11 Will. III. c. 4. They are also enjoined by the 12 Geo. III. c. 46, and 14 Geo. III. c. 73, to make holes in the breast of the still, for taking gauges and samples; and also to provide locks on the still heads, the holes, and discharge-cocks, and furnace-doors, under a penalty of 50*l.* and of 200*l.* in case such lock or fastening be broken, or wilfully damaged, after it has been secured by the proper officer. Distillers are farther required, by the 24 Geo. II. c. 40, 12 Geo. III. c. 46, and the 14 Geo. III. c. 73, to give notice to the officer of excise, before they receive any wine, cyder, &c. or any kind of fermented wash, on pain of 50*l.* and also before they charge or open the still, expressing and describing the marks and numbers of the wash-batches used: and they are prohibited from charging the still with any other, under the penalty of 100*l.*

DISTINCT NOTION, or **IDEA**, is that wherein the mind perceives a difference from all other ideas. It will be useful, says Mr. Locke, to distinguish ideas as they are perceptions in our minds, from what they are in the bodies that cause such perceptions in us; for we are not to think the former exact images and resemblances of something inherent in the subject, most of those of sensation being in the mind no more the likeness of something existing without us, than the names that stand for them are the likeness of our ideas, which yet upon hearing they are apt to excite in us.

DISTINCT BASE, in optics, is that distance from the pole of a convex glass, in which objects beheld through it appear distinct and well described, so that it is the same with the focus. See **Focus** and **Optics**.

DISTINCTION, in logic, is an assemblage of two or more words, whereby disparate things, or their conceptions, are denoted. There are three kinds of distinctions taken from the three different modes of existence, real, modal, and rational. The first is that between two substances, or the modes of two substances. The second, or modal distinction, is that between several things, one whereof may exist without the other, but not vice versa, the other without that. The third, or rational distinction, is that between several things which are really one and the same, and whereof one cannot exist without the other; nor vice versa, the other without this: such is that between a thing and its essence, between the essences and properties, &c.

DISTINCTION, **METAPHYSICAL**, is the non-agreement of being, whereby this entity is not that, or one thing is not another.

DISTINCTION, [*distinctio*, or *distinguo*, Lat.] is also used in the schools as an expedient to evade an argument, or to clear up and unfold an ambiguous proposition, which may be true in one sense, and false in another: as we say, The respondent was hard pressed, but he disengaged himself by a *distinguo*.

DISTORSION, in medicine, a contraction of one side of the mouth, occasioned by a convulsion of the muscles of one side of the face: and it is likewise used to denote any part of an animal body, when it is ill placed or ill favoured. It is very justly observed, that this terrible malady to the human shape has often been the mere effect of carelessness and ill habits.

DISTRESS, in law the distraining any thing for rent in arrear, or other duty unperformed. The effect of this distress is to compel the party either to replevy the things distrained, and contest the taking, in an action of trespass against the distrainer; or rather to oblige him to compound and pay the debt or duty for which he was so distrained. There are likewise compulsory distresses in actions, to cause a person to appear in court; of which kind there is a distress personal of one's moveable goods, and the profits of his lands, for contempt in not appearing after summons: there is likewise distress real, of a person's immoveable goods. In these cases none shall be distrained to answer for any thing touching their freeholds, but by the king's writ. Distress may be either finite or infinite:

1. **DISTRESS, FINITE**, is that which is limited by law, in regard to the number of times it shall be made, in order to bring the party to a trial of the action.

2. **DISTRESS, INFINITE**, is that which is without any limitation being made till the person appears. It is farther applied to jurors that do not appear; as, upon a certificate of assise, the process is *venire*

venire facias, habeas corpora, and distress infinite. It is also divided into grand distress and ordinary distress; of these the former extends to all the goods and chattels that the party has within the county. A person, of common right, may distrain for rents and all manner of services; and where a rent is reserved on a gift in tail, lease for life, or years, &c. though there be no clause of distress in the grant or lease, so as that he has the reversion: but on a feoffment made in fee, a distress may not be taken, unless it be expressly reserved in the deed.

DISTRIBUTION OF INTESTATE'S EFFECTS, after payment of the debts of the deceased, is to be made according to the stat. 22 and 23 G. II. c. 10, in manner following: One-third shall go to the widow of the intestate, and the residue in equal proportions to his children; or if dead to their representatives, that is, their lineal descendants: if there are no children or legal representatives, then a moiety shall go to the widow, and a moiety to the next kindred in equal degree, or their representatives; if no widow, the whole shall go to the children; if neither widow nor child, the whole shall be distributed amongst the next kindred in equal degree, and their representatives: but no representatives are admitted among collaterals, farther than the children of the intestate's brothers and sisters. The father succeeds to the whole personal effects of his children, if they die intestate, and without issue; but if the father be dead, and the mother survive, she shall only come in for a share equally with each of the remaining children.

DISTRIBUTION, in architecture, the dividing and disposing of the several parts and pieces which compose a building, as the plan directs. See **ARCHITECTURE**.

DISTRIBUTION, in printing, the taking of a form asunder, separating the types, and disposing them in the cases again, each in its proper cell. See **PRINTING**.

DISTRIBUTION, in rhetoric, a kind of description, whereby an orderly division and enumeration is made of the principal qualities of the subject. Paul supplies us with an example of this kind, when, in the heat of his indignation against sinners, he gives a description of their iniquity. See **Rom. iii. 10—18**.

DISTRINGAS, in law, a writ commanding the sheriff or other officer, that he distrain a person for debt to the king, &c. or for his appearance at a certain day.

DISTRINGAS JURATORES, a writ directed to the sheriff, whereby he is commanded to distrain upon a jury to appear, and to return issues on their lands, &c. &c. for non-appearance. This writ issues for the sheriff to have their bodies in court, &c. at the return of the writ.

DITCH, a common fence in marshes, or other wet lands where there are no hedges. They allow these ditches six feet wide against high ways that are broad: and against commons, five feet. But the common ditches about inclosures, dug at the bottom of the bank on which the quick is raised, are three feet wide at the top, one at the bottom, and two feet deep. By this means each side has a slope, which is of great advantage; for where this is neglected, and the ditches dug perpendicular, the sides are always washing down; besides, in a narrow bottomed ditch, if cattle get down into it, they cannot stand to turn themselves to crop the quick: but where the ditch is four feet wide, it should be two and a half deep; and where it is five feet wide, it should be three deep; and so in proportion.

DITCH, FOSS. See **FORTIFICATION**.

DITHYRAMBIC, 1. A song in honour of Bacchus; in which anciently, and now among the Italians, the distraction of ebriety is imitated. 2. Any poem written with wildness and enthusiasm.

DITHYRAMBUS, in ancient poetry, a hymn in honour of Bacchus, full of transport and poetical rage. This poetry owes its birth to Greece, and to the transports of wine; and yet art is not quite exploded, but delicately applied to guide and restrain the dithyrambic impetuosity, which is indulged only in pleasing flights.

DITONE, in music, an interval comprehending two tones. The proportion of the sounds that form the ditone is 4:5; and that of the semiditone is 5:6.

DITRIGLYH. See **ARCHITECTURE**.

DITTANY, WHITE. See **DICTAMNUS**.

DITTO, in books of accounts, usually written D^o, signifies the aforementioned. The word is corrupted from the Italian *detto*,

"the said;" as in our law-phrase, "the said premises," meaning the same as were before mentioned.

DIVAL, in heraldry, the herb nightshade, used by such as blazon by flowers and herbs, instead of colours and metals, for sable or black.

DIVALIA, in Roman antiquity, a feast held in honour of the goddess Angerona; also called Angeronalia.

DIVAN, a court of justice among the eastern nations, particularly the Turks. The word signifies the same with sofa in the Turkish dialect. There are two sorts of divans; that of the grand signior, called the council of state, which consists of seven of the principal officers of the empire; and that of the grand vizir, composed of six other viziers or counsellors of state, the chancellor and secretaries of state, for the distribution of justice. The word is also used for a hall in the private houses of the orientals. The custom of China does not allow visits in the inner parts of the house, but only at the entry, in a divan contrived on purpose for ceremonies. Travellers relate wonders of the silence and expedition of the divans of the East.

DIVAN BEGHI, the superintendent of justice in Persia, whose place is last of the six ministers of the second rank, who are all under the athemadauler or first minister.

DIVANDUROW, the name of seven islands in the Indian ocean, three miles N. of the Maldives.

DIVER, in ornithology. See **COLYMBUS**.

DIVERGENT, or **DIVERGING**, LINES, in geometry, are those which constantly recede from each other. They are opposed to convergent or converging lines, whose distances continually approach nearer to each other, and become still less and less. Those lines which converge the one way, diverge the other.

DIVERGENT RAYS in optics, are those which going from a point of the visible object, are dispersed and continually depart one from another, in proportion as they are removed from the object: in which sense it is opposed to convergent. See **OPTICS**.

DIVERGING HYPERBOLA, is one whose legs turn their convexities towards one another, and run contrary ways.

DIVERSIFYING, in rhetoric, is an accomplishment essential to the character of an orator, and may be called the subject of all his tropes and figures. Vossius lays down six ways of diversifying a subject. 1. By enlarging on what was briefly mentioned before. 2. By a concise enumeration of what had been insisted on at length. 3. By adding something new to what is repeated. 4. By repeating only the principal heads of what had been said. 5. By transposing the words and periods. 6. By imitating them.

DIVERSION, in military affairs, is, when an enemy is attacked in one place where they are weak and unprovided, in order to draw off their forces from another place, where they have made, or intend to make, an irruption. Thus the Romans had no other way in their power of driving Hannibal out of Italy, but by making a diversion, in attacking Carthage.

DIVESTING, in law, is used for the act of surrendering or relinquishing one's effects. By a contract of donation or sale, the donor or seller is said to be disseised and divested of his property in such a commodity, and the donee or purchaser becomes invested therewith. See **INVESTITURE**.

DIVIDEND, in law proceedings, is taken for a dividing of fees and perquisites between officers of courts, arising from writs, &c.

DIVIDEND, in arithmetic, the number proposed to be divided into equal parts. See **ARITHMETIC**.

DIVIDEND OF STOCKS, is a share of the interest of stocks erected on public funds, as the south-sea, &c. divided among and paid to the adventurers half-yearly. The term is also applied to the annual interest paid by government on the public debts.

DIVIDEND, in the university, signifies that part or share which the fellows equally divide among themselves of their yearly stipend.

DIVINATION, in antiquity, was divided by Plato, Aristotle, Plutarch, Cicero, and others, into two species, viz. artificial and natural.

DIVINATION, ARTIFICIAL, was so called, because it was not obtained, or pretended to be obtained, by immediate inspiration, but proceeded upon certain superstitious experiments and observations.

rations arbitrarily instituted. Of this sort there were various kinds, as by sacrifices, entrails, flame, cakes; flour, wine, water, birds, lots, verses, omens, &c. Divination, which is generally the offspring of credulity, nursed by imposture, and strengthened by superstition, was necessarily an occult science, retained in the hands of the priests and priestesses, the magi, the soothsayers, the augurs, the visionaries, the priests of the oracles, the false prophets, and other like professors, till the time of the coming of Jesus Christ. The light of the gospel dissipated much of this darkness; but it is more difficult, than is commonly conceived, to eradicate from the human mind a deep-rooted superstition, even though the truth be set in the strongest light, especially when the art has been practised almost from the origin of the world: so we still find existing among us the remains of this pagan superstition, in the following chimeras, which enthusiastic and designing men have formed into arts and sciences; though it must be owned, to the honour of the 18th century, that the pure doctrines of Christianity, and the spirit of philosophy, which becomes every day more diffused, concur in banishing these visionary opinions. The vogue for these impious sciences and arts, is nearly past, at least in the enlightened parts of the world, though most of them are still esteemed and practised in those parts of the globe which are enveloped in the clouds and darkness of ignorance and superstition. By enumerating them here, therefore, we only mean to shew their impiety, and to mark those rocks upon which the human mind has foundered in almost all ages and countries. 1. Aeromancy, the art of divining by the air. 2. Astrology; divided into natural astrology and judicial. The former is a branch of the art of almanack-makers; but by merely confronting their predictions in the calendar, with the weather each day produces, every man of sense will see what regard is to be paid to our modern astrologers. The latter is still more illusive; and having been at first the wonderful art of visionaries, it afterwards became that of impostors; a very common fate with all these chimerical sciences. 3. Augury consisted in observing the flight, singing, &c. of birds. 4. Chiromancy, the art which pretends to discover, by inspecting the hand, not only the inclinations of a man, but his future destiny also. The fools or knaves, who practise this art, pretend, that the lines of the hand have a relation to the internal parts of the body, as some to the heart, others to the liver, spleen, &c. On this false supposition, and on many others equally extravagant, the principles of chiromancy are founded. 5. Geomancy was a divination made by observing cracks or clefts in the earth. It was also performed by points made on paper, or any other substance, at a venture; and they judged of future events from the figures that resulted from thence. This was certainly very ridiculous: but it is nothing less so to pretend to predict future events by the inspection of the grounds of a dish of tea or coffee, or by cards, and many other like matters. 6. Haruspicy consisted in the inspection of the bowels of animals, but principally of victims; and from thence predicting grand incidents relative to the republic, and the good or bad events of its enterprises. 7. Horoscopy is a branch of astrology, by which they draw a celestial scheme, containing the twelve houses, wherein they mark the disposition of the heavens at the moment, at which a man is born, in order to foretel his fortune, or the chief incidents of his life. But as there cannot be any probable or possible relation between the constellations and the human race, all the principles they lay down, and the prophecies they draw from them, are chimerical, false, absurd, and a criminal imposition on mankind. 8. Hydromancy is the art of divining by water. The Persians, according to Varro, invented it; Pythagoras and Numa Pompilius made use of it; and some still admire the like wonderful prognosticators. 9. Physiognomy, or Physiognomancy, is a science that professes to teach the nature, the temperament, the understanding, and the inclinations of men, by the inspection of their countenances, and is therefore thought by many, to be little less frivolous than chiromancy; though Aristotle, and a number of learned men after him, and in the present age, the celebrated Lavater, have written express treatises concerning it. But as it is an undeniable fact, that our passions, especially when frequently and violently agitated, make indelible impressions on our features, by their repeated action on particular muscles, insomuch that the tempers of many people may be known at first view from their looks; and as it is not improbable, that certain habits of vice make impressions equally uniform, and perhaps equally legible, if we were accustomed to study them, physiognomy appears to be

worthy of being rescued from the rubbish of superstition and of imposture; of being restored to its place among the useful sciences; and cultivated and reduced to fixed principles by those who have leisure for such investigations. See *PHYSIOGNOMY*. 10. Pyromancy is a divination made by the inspection of a flame, either by observing to which side it turns, or by throwing into it some combustible matter, or a bladder filled with wine, or any thing else from which they imagined they were able to predict. Thus designing men made use of all the four elements to impose upon the credulous.

DIVINATION, NATURAL, was so called, because not attained by any rules or precepts of art, but infused or inspired into the diviner, without his taking any further care about it, than to purify and prepare himself for the reception of the divine aflatus.

DIVING, the art or act of descending under water to considerable depths, and remaining there for some time. The uses of diving are very considerable, particularly in the fishing for pearls, corals, sponges, &c. See *PEARL-FISHING*, &c. Various methods have been proposed, and machines contrived, to render the business of diving more safe and easy. The great point is to furnish the diver with fresh air; without which, he must either make a short stay or perish. Those who dive for sponges in the Mediterranean, help themselves by carrying down sponges dipt in oil in their mouths. But considering the small quantity of air that can be contained in the pores of a sponge, and how much that little will be contracted by the pressure of the incumbent water, such a supply cannot long subsist the diver. For it is found by experiment, that a gallon of air included in a bladder, and by a pipe reciprocally inspired and expired by the lungs, becomes unfit for respiration in little more than one minute. For though its elasticity be but little altered in passing the lungs, yet it loses its vivifying spirit, and is rendered effete. A naked diver, Dr. Halley assures us, without a sponge, cannot remain above a couple of minutes inclosed in water, nor much longer with one, without suffocating; nor, without long practice, near so long; persons not accustomed to dive, beginning to stifle in about half a minute. Besides, if the depth be considerable, the pressure of the water in the vessels makes the eyes blood-shot, and frequently occasions a spitting of blood. Hence, where there has been occasion to continue long at the bottom, some have contrived double flexible pipes, to circulate air down into a cavity, inclosing the diver as with armour, both to furnish air and to bear off the pressure of the water, and give leave to his breast to dilate upon inspiration; the fresh air being forced down one of the pipes with bellows, and returning by the other. But this method is impracticable when the depth surpasses three fathoms; the water embracing the bare limbs so closely as to obstruct the circulation of the blood in them; and withal pressing so strongly on all the junctures where the armour is made tight with leather, that, if there be the least defect in any of them, the water rushes in, and instantly fills the whole engine, to the great danger of the diver's life.

DIVING-BELL, a machine contrived for the safe conveyance of a diver to any reasonable depth, and whereby he may stay a considerable time under water. It is most conveniently made in form of a truncated cone, the smaller base being closed, and the larger open. It is to be poised with lead: and so suspended, that the vessel may sink full of air, with its open basis downward, and as near as may be in a situation parallel to the horizon, so as to close with the surface of the water all at once. Under this coverlet the diver sitting, sinks down with the included air to the depth desired: and if the cavity of the vessel can contain a tun of air, a single man may remain a full hour, without much inconvenience, at five or six fathoms deep. But the lower he goes, the more the included air contracts itself, according to the weight of the water which compresses it: so that at 33 feet deep the bell becomes half full of water, the pressure of the incumbent water being then equal to that of the atmosphere; and at all other depths the space occupied by the compressed air in the upper part of the bell will be to the under part of its capacity filled with water, as 33 feet to the surface of the water in the bell below the common surface thereof. And this condensed air being taken in with the breath soon insinuates itself into all the cavities of the body, and has no ill effect, provided the bell be permitted to descend so slowly as to allow time for that purpose. One inconvenience that attends it is found in the ears, within which there are cavities which open only outwards, and that by pores so small as not to give admission even to the air itself,

unless they be dilated and distended by a considerable force. Hence, on the first descent of the bell, a pressure begins to be felt on the ear; which, by degrees, grows painful, till the force overcoming the obstacle, what constricts these pores yields to the pressure, and letting some condensed air slip in, presently ease ensues. The bell descending lower, the pain is renewed, and again eased in the same manner. But the greatest inconvenience of this engine is, that the water entering it, contracts the bulk of air into so small a compass, that it soon heats and becomes unfit for respiration, so that there is a necessity for its being drawn up to recruit it; besides the uncomfortable situation of the diver almost covered with water. To obviate these difficulties, Dr. Halley contrived some further apparatus, whereby not only to recruit and refresh the air from time to time, but also to keep the water wholly out of it at any depth. The bell he made use of was of wood, containing about 60 cubic feet in its concavity; and was of the form of a truncated cone, whose diameter at the top was three feet, and at the bottom five. This he coated with lead so heavy that it would sink empty; and he distributed the weight so about its bottom, that it would go down in a perpendicular direction, and no other. In the top was fixed a strong clear glass, as a window, to let in the light from above; and likewise a cock to let out the hot air that had been breathed: and below, about a yard under the bell, was placed a stage which hung by three ropes, each of which was charged with about 100 weight to keep it steady. This machine he suspended from the mast of a ship by a sprit, which was sufficiently secured by stays to the mast head, and was directed by braces to carry it overboard clear of the ship's side, and to bring it again within board as occasion required. To supply air when under water he caused a couple of barrels of about 36 gallons each to be cased with lead, so as to sink empty; each of them having a bung-hole in its lowest part to let in the water, as the air in them condensed on their descent; and to let it out again when they were drawn up full from below. To a hole in the uppermost part of these barrels, was fixed a leathern trunk or hose well liquored with bees wax and oil, and long enough to fall below the bung-hole, being kept down by a weight appended: so that the air in the upper part of the barrels could not escape, unless the lower ends of these hose were first lifted up. The air-barrels being thus prepared, he fitted them with tackle proper to make them rise and fall alternately, after the manner of two buckets in a well; which was done with so much ease, that two men, with less than half their strength, could perform all the labour required: and in their descent they were directed by lines fastened to the under edge of the bell, which passed through rings on both sides the leathern hose in each barrel; so that, sliding down by these lines, they came readily to the hand of a man who stood on the stage on purpose to receive them, and to take up the ends of the hose into the bell. Through these hose, as soon as their ends came above the surface of the water in the barrels, all the air that was included in the upper parts of them was blown with great force into the bell; whilst the water entered at the bung-holes below, and filled them: and as soon as the air of one barrel had been thus received, upon a signal given, that was drawn up, and at the sametime the other descended; and, by an alternate succession, furnished air so quick, and in so great plenty, that he and four others were together at the bottom in nine or ten fathom water, for above an hour and an half at a time, without any ill consequence: and might have continued there as long as they pleased, for any thing that appeared to the contrary. In descending they found it necessary to be let down gradually at first, as about 12 feet at a time; and then to stop and drive out the air that entered, by receiving three or four barrels of fresh air. But being arrived at the depth designed, as much of the hot air that had been breathed, as each barrel would replenish with cool, was let out by means of the cock at the top of the bell; through whose aperture, though very small, the air would rush with so much violence, as to make the surface of the sea boil, and to cover it with a white foam, notwithstanding the weight of the water above. And thus by the introduction of air a space at the bottom of the sea as wide as the circuit of the bell, could be made so far dry, as not to be overshoes thereon. And, by the glass window, so much light was transmitted, that when the sea was clear, and especially when the sun shone, they could see perfectly well to write or read; much more to fasten or lay hold on any thing that was to be taken up. By an additional contrivance, he found it not impracticable for a diver to go out of an engine to a

good distance from it, the air being conveyed to him with a continued stream, by small flexible pipes; which pipes may serve as a clue, to direct him back again when he would return to the bell. Plate LIX. fig. 1, shews Dr. Halley's diving-bell, with the divers at work. DBLK RIMP represents the body of the bell. D, the glass which serves as a window. B, the cock for letting out the air which has been breathed. LM, the seats. C, one of the air-barrels. P, H, two of the divers. F, another diver at a distance from the bell, and breathing through the flexible tube K. This diver is supposed to have a head-piece of lead, made to fit quite close about his shoulders: this head-piece was capable of containing as much air as would supply him for a minute or two. When he had occasion for more air, he turned a cock at F, by which means a communication was opened with the air in the bell, and thus he could receive a new supply at pleasure.

DIVING-BELL, MR. TRIEWALD'S. Mr. Triewald, F. R. S. and military architect to the late king of Sweden, has invented a diving-bell, (fig. 2,) which, for a single person, is thought to be more eligible than Dr. Halley's, and is constructed as follows: AB is the bell, which is sunk by lead weights DD hung to its bottom. This bell is of copper, tinned all over in the inside, which is illuminated by three strong convex lenses, G, G, G, with copper lids H, H, H, to defend them. The iron plate E, serves the diver to stand on when he is at work; and is suspended at such a distance from the bottom of the bell by the chains F, F, F, that when the diver stands upright, his head is just above the water in the bell, where the air is much better than higher up, because it is colder, and consequently more fit for respiration. But as the diver must always be within the bell, and his head of course in the upper part, the inventor has contrived, that even there, when he has breathed the hot air as long as he can, he may, by means of a spiral copper tube *bc*, placed close to the inside of the bell, draw the cooler and fresher air from the lowermost parts: for which purpose, a flexible leather tube, about two feet long, is fixed to the upper end of the copper tube at *b*; and to the other end of this tube is fixed an ivory mouth-piece, by which the diver draws in the air.

DIVING-BELL, SPALDING'S IMPROVED. The greatest improvement, which the diving-bell ever received, was from the late Mr. Spalding of Edinburgh. A section of his improved diving-bell is represented in fig. 3. This construction is designed to remedy some inconveniences of Dr. Halley's, which are very evident, and of very dangerous tendency. These are, 1. By Dr. Halley's construction, the sinking or raising of the bell depends entirely on the people who are at the surface of the water; and as the bell even when in the water has a very considerable weight, the raising it not only requires a great deal of labour, but there is a possibility of the rope breaking by which it is raised, and thus every person in the bell would inevitably perish. 2. As there are, in many places of the sea, rocks which lie at a considerable depth, the figure of which cannot possibly be perceived from above, there is danger that some of their ragged prominences may catch hold of one of the edges of the bell in its descent, and thus overset it before any signal can be given to those above, which would infallibly be attended with the destruction of the people in the bell: and as it must always be unknown, before trial, what kind of a bottom the sea has in any place, it is plain, that without some contrivance to obviate this last danger, the descent in Dr. Halley's diving-bell is not at all eligible. How these inconveniences are remedied by Mr. Spalding's new construction will be easily understood from the following description.—ABCD represents a section of the bell, which is made of wood; *e, e*, are iron hooks, by means of which it is suspended by ropes QBF *e*, and QAER *e*, and QS, as expressed in the figure: *c, c*, are iron hooks, to which are appended lead weights, that keep the mouth of the bell always parallel to the surface of the water, whether the machine taken altogether is lighter or heavier than an equal bulk of water. By these weights alone, however, the bell would not sink: another is therefore added, represented at L; and which can be raised or lowered at pleasure, by means of a rope passing over the pulley *a*, and fastened to one of the sides of the bell at M. As the bell descends, this weight, called by Mr. Spalding the balance-weight, hangs down a considerable way below the mouth of the bell. In case the edge of the bell is caught by any obstacle, the balance-weight is immediately lowered down so that it may rest upon the bottom. By this means the bell is lightened so that all danger of

oversetting is removed; for being lighter, without the balance-weight, than an equal bulk of water, it is evident that the bell will rise, as far as the length of the rope affixed to the balance-weight will allow it. This weight, therefore, will serve as a kind of anchor to keep the bell at any particular depth which the divers may think necessary; or by pulling it quite up, the descent may be continued to the very bottom. By another very ingenious contrivance, Mr. Spalding rendered it possible for the divers to raise the bell, with all the weights appended to it, even to the surface, or to stop at any particular depth, as they think proper; and thus they could still be safe, even though the rope designed for pulling up the bell was broke. For this purpose the bell is divided into two cavities, each of which is made as tight as possible. Just above the second bottom EF, are small slits in the sides of the bell; through which the water, entering as the bell descends, displaces the air originally contained in this cavity, which flies out at the upper orifice of the cock GH. When this is done, the divers turn the handle G, which stops the cock; so that if any more air was to get into the cavity AEFB, it could not longer be discharged through the orifice H as before. When this cavity is full of water, the bell sinks; but when a considerable quantity of air is admitted, it rises. If therefore the divers have a mind to raise themselves, they turn the small cock g, by which a communication is made between the upper and under cavities of the bell. The consequence of this is, that a quantity of air immediately enters the upper cavity, forces out a quantity of the water contained in it, and thus renders the bell lighter by the whole weight of the water which is displaced. Thus, if a certain quantity of air is admitted into the upper cavity, the bell will descend very slowly; if a greater quantity, it will neither ascend nor descend, but remain stationary; and if a larger quantity of air is still admitted, it will arise to the top. It is to be observed, however, that the air which is thus let out into the upper cavity must be immediately supplied from the air-barrel; from which the air is to be let out very slowly, or the bell will rise to the top with so great velocity, that the divers will be in danger of being shaken out of their seats. But, by following these directions, every possible accident may be prevented, and people may descend to great depths without the least apprehension of danger. The bell also becomes so easily manageable in the water, that it may be conducted from one place to another by a small boat with the greatest ease, and with perfect safety to those who are in it. Instead of wooden seats used by Dr. Halley, Mr. Spalding made use of ropes suspended by hooks *b b b*, and on these ropes the divers may sit without any inconvenience. I and K are two windows made of thick strong glass, for admitting light to the divers. N represents an air-cask with its tackle, and OCP the flexible pipe through which the air is admitted to the bell. In the ascent and descent of this cask, the pipe is kept down by a small weight appended, as in Dr. Halley's machine. R is a small cock by which the hot air is discharged as often as it becomes troublesome. Fig. 4, gives a perspective view of the whole diving apparatus. Two air-barrels are represented in this figure; but Mr. Spalding was of opinion, that one capable of containing thirty gallons is sufficient for an ordinary machine.

DIVING BLADDER, a machine invented by Borelli, and by him preferred, though without any good reason, to the diving-bell. It is a globular vessel of brass or copper, about two feet in diameter, which contains the diver's head. It is fixed to a goat's skin habit exactly fitted to his person. Within the vessel are pipes; by means of which a circulation of air is contrived; and the person carries an air-pump by his side, by which he can make himself heavier or lighter as fishes do, by contracting or dilating their air-bladder. By these means he thought all the objections to which other diving machines are liable were entirely obviated, and particularly that of want of air; the air which had been breathed, being as he imagined, deprived of its noxious qualities by circulating through the pipes. These advantages, however, it is evident, are only imaginary. The diver's limbs, being defended from the pressure of the water only by a goat's skin, would infallibly be crushed if he descended to any considerable depth; and from the discoveries now made by Dr. Priestley and others, it is abundantly evident, that air, which is once rendered foul by breathing, cannot in any degree be restored by circulation through pipes. Concerning the use of copper machines in general, Mr. Spalding has remarked, that when a person has breathed in them

a few minutes, he feels in his mouth a very disagreeable brassy taste, which continues all the time he remains in the vessel; so that, on this account, copper seems by no means an eligible material.

DIVING CASE, a large case of strong leather, perfectly waterproof, which may hold about half a hoghead of air; invented by a gentleman of Devonshire. It is so contrived, that, when he shuts himself up in this case, he can walk at the bottom of the sea, and go into any part of a wrecked vessel, and deliver out the goods. This method, we are told, he has practised for many years, and has thus acquired a large fortune. It would be a considerable improvement on this machine to condense the air in it as much as possible before the diver descended; as he would thus be furnished with an atmosphere endued with elasticity sufficient to resist the weight of the water, which otherwise would squeeze his case into much less room than it originally took up. The condensed air also would serve for respiration a much longer time than that which is in its ordinary state. A curious diving-machine called a submarine vessel, was invented by Mr. Bushnell of Connecticut; and of which a description is given in the Transactions of the American Philosophical Society. The external shape of the submarine vessel bore some resemblance to two upper tortoise-shells, of equal size, joined together; the place of entrance into the vessel being represented by the opening made by the swell of the shells, at the head of the animal. The inside was capable of containing the operator, and air sufficient to support him thirty minutes without receiving fresh air. At the bottom, opposite to the entrance, was fixed a quantity of lead for ballast. At one edge, which was directly before the operator, who sat upright, was an oar for rowing forward or backward. At the other edge was a rudder for steering. An aperture, at the bottom, with its valve, was designed to admit water, for the purpose of descending; and two brass forcing-pumps served to eject the water within, when necessary for ascending. At the top there was likewise an oar for ascending or descending, or continuing at any particular depth. A water-gauge, or barometer, determined the depth of descent, a compass directed the course, and a ventilator within supplied the vessel with fresh air, when on the surface. The entrance into the vessel was elliptical, and so small as barely to admit a person. This entrance was surrounded with a broad elliptical iron band, the lower edge of which was let into the wood of which the body of the vessel was made, in such a manner as to give its utmost support to the body of the vessel against the pressure of the water. Above the upper edge of this iron band there was a brass crown, or cover, resembling a hat with its crown and brim, which shut water-tight upon the iron band: the crown was hung to the iron band with hinges, so as to turn over sideways when opened. To make it perfectly secure when shut, it might be screwed down upon the band by the operator, or by a person without. There were in the brass crown three round doors, one directly in front, and one on each side, large enough to put the hand through. When open they admitted fresh air; their shutters were ground perfectly tight into their places with emery, hung with hinges, and secured in their places when shut. There were likewise several small glass windows in the crown for looking through, and for admitting light in the day-time, with covers to secure them. There were two air-pipes in the crown. A ventilator within drew fresh air through one of the air-pipes, and discharged it into the lower part of the vessel; the fresh air introduced by the ventilator expelled the impure light air through the other air-pipe. Both air-pipes were so constructed, that they shut themselves whenever the water rose near their tops, so that no water could enter through them, and opened themselves immediately after they rose above the water. The vessel was chiefly filled with lead fixed to its bottom; when this was sufficient, a quantity was placed within, more or less, according to the weight of the operator; its ballast made it so stiff, that there was no danger of oversetting. The vessel with all its appendages, and the operator, was sufficient to settle it very low in the water. About two hundred pounds of the lead, at the bottom for ballast, would be let down forty or fifty feet below the vessel; this enabled the operator to rise instantly to the surface of the water, in case of accident. When the operator would descend, he placed his foot on the top of a brass valve, depressing it, by which he opened a large aperture in the bottom of the vessel, through which the water entered at his pleasure; when he had admitted a sufficient quantity, he ascended very gradually:

dually: if he admitted too much, he ejected as much as was necessary to obtain an equilibrium by the two brass forcing-pumps placed at each hand. Whenever the vessel leaked, or he would ascend to the surface, he also made use of the forcing-pumps. When the skilful operator had obtained an equilibrium, he could row upward or downward, or continue at any particular depth, with an oar placed near the top of the vessel, formed upon the principle of the screw, the axis of the oar entering the vessel; by turning the oar one way he raised the vessel, by turning it the other way he depressed it. A glass tube eighteen inches long, and one inch in diameter, standing upright, its upper end closed, and its lower end which was open, screwed into a brass pipe, through which the external water had a passage into the glass tube, served as a water-gauge or barometer. There was a piece of cork, with phosphorus on it, put into the water-gauge. When the vessel descended the water rose in the water-gauge, condensing the air within, and bearing the cork, with its phosphorus, on its surface. By the light of the phosphorus the ascent of the water in the gauge was rendered visible, and the depth of the vessel under water ascertained by a graduated line. An oar, formed upon the principle of the screw, was fixed in the fore-part of the vessel; its axis entered the vessel, and being turned one way, rowed the vessel forward, but being turned the other way rowed it backward; it was made to be turned by the hand or foot. A rudder, hung to the hinder part of the vessel, commanded it with the greatest ease. The rudder was made very elastic, and might be used for rowing forward. Its tiller was within the vessel, at the operator's right-hand, fixed at a right angle, on an iron rod which passed through the side of the vessel; the rod had a crank on its outside end, which commanded the rudder, by means of a rod extending from the end of the crank to a kind of tiller, fixed upon the left hand of the rudder. Raising and depressing the first-mentioned tiller, turned the rudder as the case required. A compass marked with phosphorus directed the course, above and under the water: and a line and lead sounded the depth when necessary. Every opening was well secured. The pumps had two sets of valves. The aperture at the bottom, for admitting water, was covered with a plate, perforated full of holes to receive the water, and prevent any thing from choking the passage, or stopping the valve from shutting. The brass valve might likewise be forced into its place with a screw, if necessary. The air-pipes had a kind of hollow sphere, fixed round the top of each, to secure the air-pipe valves from injury: these hollow spheres were perforated full of holes for the passage of the air through the pipes: within the air-pipes were shutters to secure them, should any accident happen to the pipes or the valves on their tops. Wherever the external apparatus passed through the body of the vessel, the joints were round, and formed by brass pipes, which were driven into the wood of the vessel; the holes through the pipes were exactly made, and the iron rods, which passed through them, were turned into a lathe to fit them; the joints were also kept full of oil, to prevent rust and leaking. Particular attention was given to bring every part, necessary for performing the operations, both within and without the vessel, before the operator, and as conveniently as could be devised; so that every thing might be found in the dark, except the water-gauge and the compass, which were visible by the light of the phosphorus; and nothing required the operator to turn to the right hand, or to the left, to perform any thing necessary. The design of this submarine vessel was to convey a magazine, and its appendages, to the bottom of a ship to effect its destruction. In the fore-part of the brim of the crown of the submarine vessel were a socket, and an iron tube passing through the socket: the iron tube stood upright and could slide up and down in the socket six inches: at the top of the tube was a wood screw, fixed by means of a rod, which passed through the tube, and screwed the wood-screw fast upon the top of the tube: by pushing the wood-screw up against the bottom of a ship, and turning it at the same time, it would enter the planks; driving would also answer the same purpose: when the wood-screw was firmly fixed it could be cast off by unscrewing the rod, which fastened it upon the top of the tube. Behind the submarine vessel was a place, above the rudder, for carrying a large powder-magazine; this was made of two pieces of oak timber, large enough, when hollowed out, to contain 150 pounds of powder, with the apparatus used in firing it, and was secured in its place by a screw, turned by the operator. A strong piece

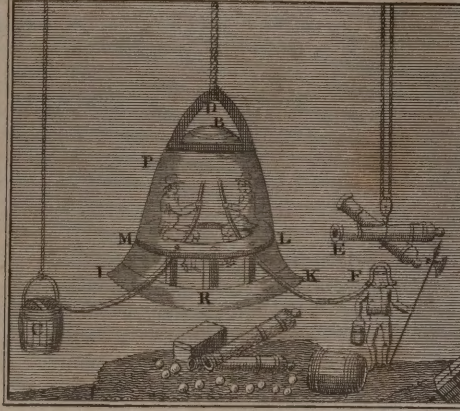
of rope extended from the magazine to the wood-screw above-mentioned, and was fastened to both. When the wood-screw was fixed, and to be cast off from its tube, the magazine was to be cast off likewise by unscrewing it, leaving it hanging to the wood-screw; it was lighter than the water, that it might rise up against the object to which the wood-screw and itself were fastened. Within the magazine was an apparatus, constructed to run any proposed length of time: it unpinioned a strong lock resembling a gun-lock, which gave fire to the powder. This apparatus was so pinioned that it could not possibly move till, by casting off the magazine from the vessel, it was set in motion. The skilful operator could swim so low on the surface of the water as to approach very near a ship in the night, without fear of being discovered; and might, if he chose, approach the stem or stern above water with very little danger. He could sink very quickly, and keep at any depth he pleased, and row a great distance in any direction he desired, without coming to the surface; and when he rose to the surface, he could soon obtain a fresh supply of air, when, if necessary, he might descend again, and pursue his course. The following experiments were made to prove the use of this vessel. The first experiment was made with about two ounces of gun-powder, which were exploded four feet under water, to prove to some of the first personages in Connecticut, that powder would take fire under water. The second experiment was made with two pounds of powder, inclosed in a wooden bottle, and fixed under a hoghead, with a two-inch oak plank between the hoghead and the powder; the hoghead was loaded with stones as deep as it could swim; a wooden pipe descending through the lower head of the hoghead, and through the plank, into the powder contained in the bottle, was primed with powder. A match put to the priming, exploded the powder; which produced a very great effect, rending the plank into pieces, demolishing the hoghead, and casting the stones and the ruins of the hoghead, with a body of water, many feet into the air, to the astonishment of the spectators. There were afterwards made many experiments of a similar nature, some of them with large quantities of powder; they all produced very violent explosions, much more than sufficient for the purpose proposed. After various attempts to find an operator to his wish, Mr. Bushnell sent one, who appeared more expert than the rest, from New York to a fifty-gun ship, lying not far from Governor's Island. He went under the ship, and attempted to fix the wood-screw into her bottom; but struck, as he supposes, a bar of iron, which passes from the rudder-hinge, and is spiked under the ship's quarter. Had he moved a few inches, which he might have done without rowing, he would probably have found wood where he might have fixed the screw; or, if the ship were sheathed with copper, he might easily have pierced it; but not being well skilled in the management of the vessel, in attempting to move to another place, he lost the ship; after seeking her in vain, for some time, he rowed some distance, and rose to the surface of the water, but found day-light had advanced so far, that he durst not renew the attempt. The adventurer said that he could easily have fastened the magazine under the stem of the ship, above water, as he rowed up to the stern, and touched it before he descended. Had he fastened it there, the explosion of 150 pounds of powder (the quantity contained in the magazine), must have been fatal to the ship. In his return from the ship to New York he passed near Governor's Island, and thought he was discovered by the enemy on the island; being in haste to avoid the danger he feared, he cast off the magazine, as he imagined it retarded him in the swell, which was very considerable. After the magazine had been cast off one hour, the time the internal apparatus was set to run, it blew up with great violence. Several other machines have been constructed for the purpose of diving; all of them depending on the same principles.

DIVINITY. See THEOLOGY.

DIVIO, DIBIO, or DIVIONENSE CASTRUM, in ancient geography, a town of the Lingones, in Gallia Belgica, now called Dijon.

DIVISIBILITY, in physics, is that property by which the particles of matter in all bodies are capable of a separation or disunion from each other. The Peripatetics and Cartesians hold divisibility to be an affection of all matter. The Epicureans, again, allow it to agree to every physical continuum; but they deny that this affection agrees to all bodies, for the primary corpuscles or atoms they maintain to be perfectly insecable and indivisible.

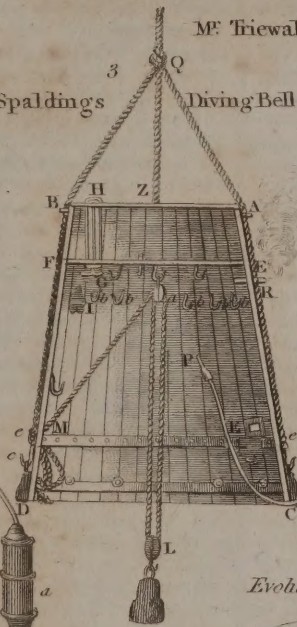
D^r Halley's Diving Bell 1



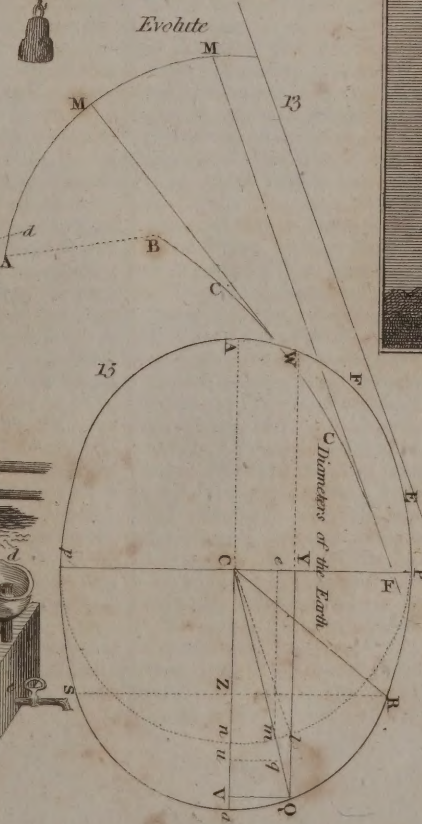
M^r Tricewalds Diving Bell



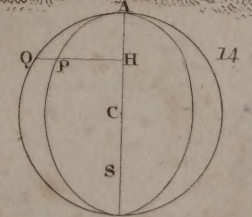
M^r Spaldings Diving Bell



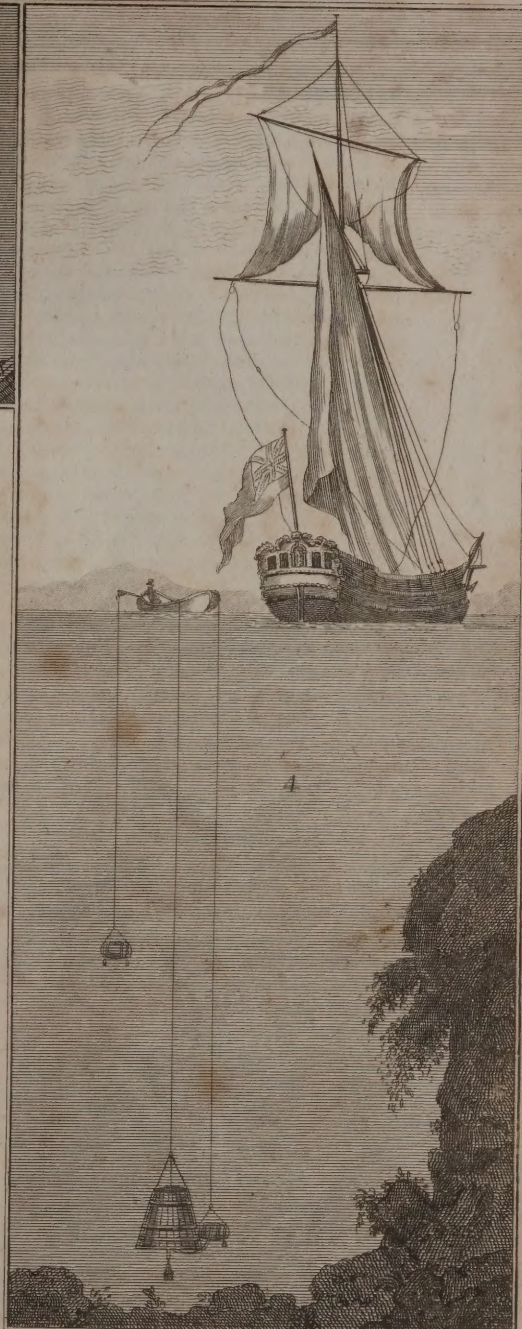
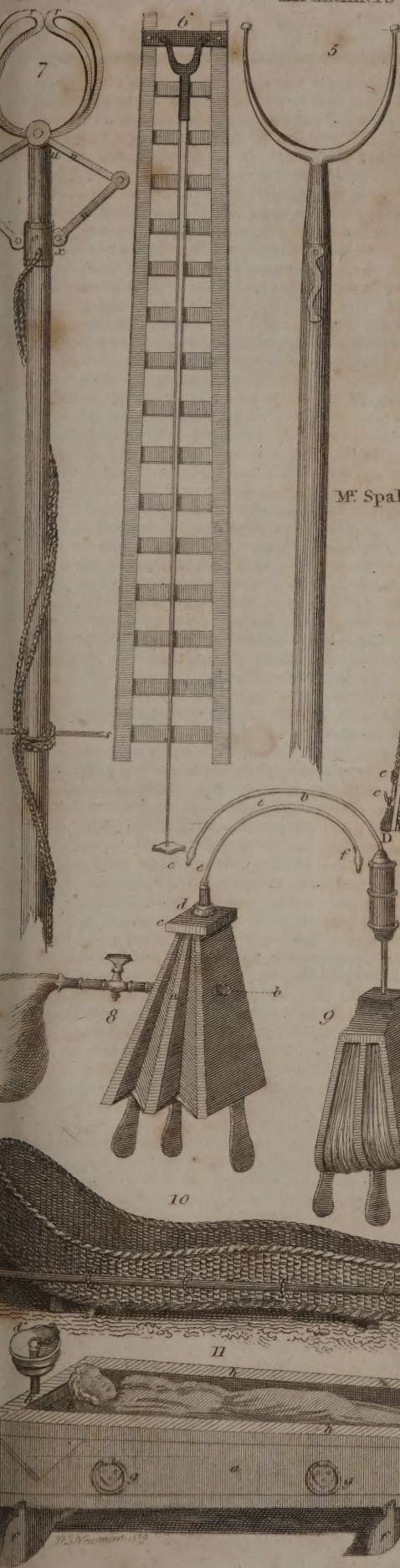
Evolute



A Dun or Burgh



Excentric Circle



Handwritten signature or initials

visible. Absolutely to determine whether the divisibility of matter may proceed without limits, or that there are ultimate primary corpuscles not admitting of further division, does not appear as yet to be within the reach of philosophy. That all bodies contain an infinity of parts is exceedingly obvious, thus any body which can be proposed has for instance ten parts, each of the ten parts has also ten parts, and again each of these has ten parts, and so on without limit. The same would appear by supposing any other number of parts as well as ten, and it would be absurd to suppose that the smallest particle has fewer halves, quarters, tenths parts, &c. than the largest mountain. That any given extension is divisible ad infinitum in a mathematical point of view may be thus demonstrated. See Plate LIV. fig. 13. Suppose the line AC perpendicular to BF; and another, as GH, at a small distance from it, also perpendicular to the same line. With the centres CCC, &c. describe circles cutting the line GH in the points e e e, &c. Now the greater the radius AC is, the less is the part eG. But the radius may be augmented in infinitum; so long, therefore, the part eG may be divided into still less portions; consequently it may be divided in infinitum. Or thus, suppose the line AB, (fig. 12,) be required to be divided, through its extreme points A and B draw EF and CD parallel to each other; in one of these lines take a point as L, and from L draw lines LD to the line CD, cutting AB in e: it is evident that the further D is taken from B, the part Ae will be the less, and since BD may be continued without limits, the part Ae may be lessened without limits, or it is divisible ad infinitum. Thus far we have shewn that extension, and consequently that an extended body, contains an unlimited number of parts; but with respect to the limits of the divisibility of matter itself, we are perfectly in the dark. We can indeed divide certain bodies into surprisingly fine and numerous particles, and the works of nature offer many fluids and solids of wonderful tenuity; but both our efforts, and those naturally small objects, advance a very short way towards infinity. Ignorant of the intimate nature of matter, we cannot assert whether it may be capable of infinite division, or whether it ultimately consists of particles of a certain size, and of perfect hardness. However, the uniformity and constancy of the qualities of the same bodies would lead us to conclude that there are ultimate invariable, indivisible particles which are their true constituents, and which do not admit of a separation of their parts by any power less than that of Him who formed them. But even these are amazingly small, as will appear from the following instances of the wonderful tenuity of certain bodies, which have been produced either by art, or discovered by means of microscopical observations amongst the stupendous works of nature. The spinning of wool, silk, cotton, and such-like substances, afford no bad specimens; since the thread which has been produced by this means, has often been so very fine as almost to exceed the bounds of credibility, had it not been sufficiently well authenticated. Mr. Boyle mentions that two grains and a half of silk was spun into a thread 300 yards long. A few years ago, a lady of Lincolnshire spun a single pound of woollen yarn into a thread of 168,000 yards long, which is equal to 95 English miles. Also a single pound weight of fine cotton-yarn was lately spun, in the neighbourhood of Manchester, into a thread 134,400 yards long. The ductility of gold likewise furnishes a striking example of the great tenuity of matter amongst the productions of human ingenuity. A single grain weight of gold has been often extended into a surface equal to 50 square inches. If every square inch of it is divided into square particles of the hundredth part of an inch, which will be plainly visible to the naked eye, the number of those particles in one inch square, will be 10,000; and multiplying this number by the 50 inches, the product is 500,000; that is, the grain of gold may be actually divided into at least half a million of particles, each of which is perfectly apparent to the naked eye. Yet, if those particles are viewed in a good microscope, they will appear like a large surface, the ten thousandth part of which might by this means be easily discerned. An ingenious artist in London has been able to draw parallel lines upon a glass plate, as also upon silver, so near one another, that 10,000 of them occupy the space of one inch. Those lines can be seen only by the assistance of a very good microscope. Another workman has drawn a silver wire, the diameter of which does not exceed the 750th part of an inch. But those prodigies of human ingenuity will appear extremely gross and rude, if they are com-

pared with the immense subtilty of matter which may every where be observed amongst the works of nature. The animal, the vegetable, and even the mineral kingdom, furnish numerous examples of this sort. What must be the tenuity of the odoriferous parts of musk, when we find that a piece of it will scent a whole room in a short time, and yet it will hardly lose any sensible part of its weight! But supposing it to have lost one-hundredth part of a grain weight, when this small quantity is divided and dispersed through the whole room, it must so expand itself as not to leave an inch square of space where the sense of smell may not be affected by some of its particles! The human eye, unassisted by glasses, can frequently perceive insects so small as to be barely discernible. The least reflection must shew, that the limbs, the vessels, and other parts of such animals, must infinitely exceed in fineness every endeavour of human art. But the microscope has discovered wonders that are vastly superior, and such indeed as were utterly unknown to our fore-fathers, before the invention of that noble instrument. Insects have been discovered so small as not to exceed the 10,000th part of an inch: so that 1,000,000,000,000, of them might be contained within the space of one cubic inch; yet each animalcule must consist of parts connected with each other; with vessels, with fluids, and with organs necessary for its motions, for its increase, for its propagation, &c. How inconceivably small must those organs be! and yet they are unquestionably composed of other parts still smaller, and still farther removed from the perception of our senses.

DIVISION, among logicians, is the explication of a complex idea, by enumerating the simple ideas whereof it is composed; in which sense it is nearly allied to definition, only that this last regards names and things, whereas division is employed wholly about ideas. When the parts of an idea are divided, in order to a clearer explication of the whole, this is called a subdivision: thus, a year is divided into twelve months, a month is subdivided into weeks, weeks into days, days into hours, and so on. The rules for a good division are these, that the members entirely exhaust the whole; that they be opposite; that subdivisions be not too numerous; that the whole be first divided into its larger parts, and these into the more remote and minute parts.

DIVISION, in mathematics. See ALGEBRA and ARITHMETIC.

DIVISION, in sea affairs, a select number of ships in a fleet or squadron of men of war, distinguished by a particular flag or pendant, and usually commanded by a general officer. A squadron is commonly ranged into three divisions, the commanding officer of which is always stationed in the centre. When a fleet consists of 60 sail of the line, that is, of ships having at least 60 cannon each, the admiral divides it into three squadrons, each of which has its divisions and commanding officers. Each squadron has its proper colours, according to the rank of the admiral, and every division its proper mast. Thus in Britain, the first admiral, or the admiral of the fleet, displays the union flag at the main-top-mast head; next follows the white flag with St. George's cross; and afterwards the blue. The private ships carry pendants of the same colour with their respective squadrons at the mast of their particular divisions; so that the last ship in the division of the blue squadron carries a blue pendant at her mizen-top-mast head.

DIVISION, MECHANICAL, signifies that separation which is occasioned in the parts of a body by help of mechanical instruments. The mechanical division of bodies does indeed separate them into smaller, homogeneous, similar parts; but this separation cannot extend to the primary integrant molecules of any body; and consequently is incapable of breaking what is properly called their aggregation. No union is formed betwixt the dividend and dividing bodies, in which respect division essentially differs from dissolution. Division is not properly a chemical operation. It is only employed preparatorily to facilitate other operations, and particularly solution. For this purpose it is very useful, as it increases the quantity of surface, and consequently the points of contact of any body. Different methods are used to divide bodies according to their nature, as that of cutting, rasping, filing, pounding, bruising, grinding, &c.

DIVISION, in music, the dividing of the interval of an octave into a number of less intervals. The fourth and fifth divide the octave perfectly, though differently: when the fifth is below, and serves as a bass to the fourth, the division is called harmonical;

but when the fourth is below, it is called arithmetical. To run a division, is to play, or sing, after the manner above-mentioned; that is, to divide the intervals of an octave, fifth, fourth, &c. into as many parts, and as agreeably as possible, which depends entirely upon taste and fancy.

DIVISION, in rhetoric, the arrangement of a discourse under several heads, each of which is to be separately spoken to.

DIVISIONS OF PROPORTION. If four quantities be proportional, as $a : b :: c : d$; then the assumption of the difference between the antecedents $a - b$, or $b - a$, to either the antecedent a , or consequent b , of the first ratio a to b ; and the difference between the antecedent $c - d$ or $d - c$ to either the antecedent c , or consequent d of the second ratio c to d ; is called division of proportion.

DIVISION OF AN ARMY, in the military art, the several brigades and squadrons into which it is cantoned.

DIVISIONS OF A BATTALION are the several platoons into which it is divided in marching or firing, each of which is commanded by an officer.

DIVISOR, [*divisor*, Lat.] the number which sheweth how many parts the dividend is to be divided into. See **ARITHMETIC**.

DIUM, in ancient geography, the name of several places: viz. 1. A town of Chalcidice in Macedonia, near Mount Athos: 2. A promontory of Crete, on the north side of the island: 3. A promontory of Eubœa; or a town of that name in Eubœa, near the promontory Cœnæum, on the N. W. side of the island, called also Dia: 4. A town of Macedonia, in Persia, on the W. side of the Sinus Thermaicus: 5. A town near Pella in the Piræa, beyond Jordan.

DIVORCE, [*divorce*, Fr. from *divortium*, Lat.] the legal separation of husband and wife. Divorce is a spiritual judgement and is therefore passed in the ecclesiastical court. It is of two kinds: viz.

1. **DIVORCE A MENSA ET THORO**, *i. e.* from bed and board. In this case the wife has a suitable separate maintenance allowed her, out of her husband's effects.

2. **DIVORCE A VINCULO MATRIMONII**, *i. e.* from the bonds of matrimony, is strictly and properly divorce. This happens either in consequence of criminality, as in the case of adultery, or through some essential impediment, as consanguinity or affinity within the degrees forbidden, pre-contract, impotency, &c. of which impediments the canon law allows no less than 14. In these cases the woman receives again only what she brought with her. Sentences which release the parties a vinculo matrimonii, on account of impuberty, frigidity, consanguinity, within the prohibited degrees, prior marriage, or want of the requisite consent of parents or guardians, are not properly dissolutions of the marriage contract, but judicial declarations that there never was any marriage; such impediment subsisting at the time as rendered the celebration of the marriage rite a mere nullity. And the rite itself contains an exception of these impediments. "The law of Moses, says Mr. Paley, for reasons of local expediency, permitted the Jewish husband to put away his wife; but whether for every cause, or for what cause, appears to have been controverted amongst the interpreters of those times. Christ, the precepts of whose religion were calculated for more general use and observation, revokes this permission, as given to the Jews "for their hardness of heart," and promulges a law which was thenceforward to confine divorces to the single cause of adultery in the wife. (Mat. xix. 9.) Inferior causes may justify the separation of husband and wife, although they will not authorize such a dissolution of the marriage-contract as would leave either at liberty to marry again: for it is that liberty in which the danger and mischief of divorces principally consist. The law of this country, in conformity to our Saviour's injunction, confines the dissolution of the marriage-contract to the single case of adultery in the wife; and a divorce, even in that case, can only be brought about by the operation of an act of parliament, founded upon a previous sentence in the spiritual court, and a verdict against the adulterer at common law: which proceedings taken together compose as complete an investigation of the complaint as a cause can receive. It has lately been proposed to the legislature to annex a clause to these acts, restraining the offending party from marrying with the companion of her crime, who, by the course of proceeding, is always known and convicted: for

there is reason to fear, that adulterous connections are often formed with the prospect of bringing them to this conclusion; at least, when the seducer has once captivated the affection of a married woman, he may avail himself of this tempting argument to subdue her scruples, and complete his victory; and the legislature, as the business is managed at present, assists by its interposition the criminal design of the offenders, and confers a privilege where it ought to inflict a punishment. The proposal deserved an experiment; but something more penal, it is apprehended, would be found necessary to check the progress of this alarming depravity. Whether a law might not be framed, directing the fortune of the adulteress to descend as in case of her natural death; reserving, however, a certain proportion of the produce of it, by way of annuity, for her subsistence (such annuity in no case to exceed a certain sum); and also so far suspending the estate in the hands of the heir, as to preserve the inheritance to any children she might bear to a second marriage, in case there was none to succeed in the place of their mother by the first: whether such a law would not render female virtue in higher life less vincibile, as well as the seducers of that virtue less urgent in their suit, I would recommend to the deliberation of those who are willing to attempt the reformation of this important, but most incorrigible, class of the community. A passion for splendor, for expensive amusements and distinctions, is commonly found in that description of women who would become the subjects of such a law, not less inordinate than their other appetites. A severity of the kind proposed applies immediately to that passion. And there is no room for any complaint of injustice, since the provisions above-stated, with others which might be contrived, confine the punishment, so far as it is possible, to the person of the offender; suffering the estate to remain to the heir, or within the family of the ancestor from whom it came, or to attend the appointments of his will." Moral and Political Philosophy, p. 273.

DIURETICS, [*diuretica*, Gr.] a term applied to those medicines which increase the secretion of urine in the kidneys. Their operation consists in promoting the circulation of the blood towards the renal arteries, rendering that vital fluid more serous, and at the same time stimulating the secretory organs.

DIURIS, in botany, a genus of the gynandria diandria class and order. Nectary dependent; petals nine; the five outer ones very large; of two shapes; column of the fructification reversed, with a lid at top. One species only is known.

DIURNAL, in astronomy, something relating to the day, in opposition to nocturnal, which regards the night.

DIURNAL ARCH, the arch or number of degrees that the sun, moon, or stars, describe from their rising to their setting.

DIURNAL MOTION OF A PLANET, is so many degrees and minutes as any planet moves in twenty-four hours. Hence the motion of the earth about its axis, is called its diurnal motion. See **ASTRONOMY**.

DIVUS, and **DIVA**, in antiquity, appellations given to men and women who had been deified, or ranked among the gods.

DIVY POINT, a cape of Hindostan, in the bay of Bengal. Lon. 81. 20. E. Lat. 15. 55. N.

DIXAN, the first town of Abyssinia, on the side of Taranta. Lon. 40. 7. E. Lat. 14. 57. N.

DIXMUDE, or **DYMUDE**, a town of France, in the department of Lys, 11 miles S. of Ostend.

DIZIER, Sr. a town of France, in the department of Upper Marne. Lon. 4. 54. E. Lat. 48. 35. N.

DMITRIEU SUOPA, a town of Russia, in the government of Kursk, 20 miles N. N. W. of Kursk. Lon. 53. 30. E. Lat. 52. 5. N.

DNIEPER, **DNEPER**, or **NIEPER**, the ancient Boristhenes, a large river of Europe, rising in Smolenskow, running a long course in a S. direction, and falling into the Black Sea, between Cherson and Oczakow.

DNIESTER, or **NIESTER**, a fine river of Europe, which rises in Galicia, in Austrian Poland, and falls into the Black Sea, between the mouths of the Dnieper and the Danube.

DO, in music, a note of the Italian scale, corresponding to ut of the common gamut. See **MUSIC**.

DOAB, or **DOOAB**, a territory of Hindostan Proper, between the Ganges and the Jumna.

DOBBS, a district of N. Carolina.

DOBELIN,

DOBELIN, or **DOBLEN**, a town in the duchy of Courland; 20 miles S. W. of Mittau.

DOBEZIN, or **DOBEZYN**, a town of Great Poland, in Cujavia, 68 miles N. of Warsaw.

DOBOY, a small American island, in the Atlantic, near the coast of Georgia. Lon. 81. 31. W. Lat. 31. 28. N.

DOBRAKOTZ, a town of Hungary, 19 miles S. of Symontornya.

DOBRATA, a town of European Turkey, in the province of Moldavia, 40 miles W. of Jassy.

DOBRENIZ, a town of Bohemia, in the circle of Konigin-gratz: 8 miles S. W. of Konigingratz.

DOBUNI, or **BODUNI**, an ancient people of Britain, who possessed the territory which now forms the counties of Oxford and Gloucester. Both the names of this British nation seem to have been derived from the low situation of a great part of the country which they inhabited: for both *duon* and *bodun* signify "profound" or "low," in the ancient language of Gaul and Britain. The Dobuni are not mentioned among the British nations who resisted the Romans under Julius Cæsar, which was probably owing to the distance of their country from the scene of action; and before the next invasion under Claudius, they had been so much oppressed by their ambitious neighbours the Cattivellauni, that they submitted with pleasure to the Romans, to be delivered from that oppression.

DOCE, or **FRESH WATER RIVER**, a river of South America, in Brasil, which runs into the Atlantic.

DOCETÆ, [from *δοkein*, to appear,] in ecclesiastical history, the followers of Julius Cassianus, one of the Valentinian sect, towards the close of the second century, who revived a notion that had been adopted by a branch of the Gnostics, against whom St. John, Ignatius, and Polycarp, had asserted the truth of the incarnation. They believed and taught, as their name imports, that the actions and sufferings of Jesus Christ were not in reality, but only in appearance.

DOCIMASIA, in Greek antiquity, a probation of the magistrates and persons employed in public business at Athens.

DOCIMASTIC ART, a name given to the art of assaying by operations in small, the nature and quantity of metallic or other matters which may be obtained from mineral, or other compound bodies. See **METALLURGY**.

DOCIMASTIC HUNDRED, or **CENTNER**, in metallurgy and assaying, is a weight divisible, first into 100, and thence into smaller parts; but though the word is the same both with the assayers and metallurgists, yet it is to be understood as expressing a very different quantity in their different acceptance of it. The weights of the metallurgists are easily understood, being of the common proportion, but those of the assayers are a thousand times smaller than these, as the portions of metals or ores examined by the assayers are usually very small. The metallurgists, who extract metals out of their ores, use a weight divided into 100 equal parts, each part a pound; the whole they call a centner, or hundred weight; the pound is divided into 32 parts, or half ounces; and the half-ounce into two quarters of ounces, and these each into two drams. These divisions and denominations of the metallurgists are easily understood; but the same words used by assayers express very different quantities; for as the centner of the metallurgists contains 100lb. the centners of the assayers is really no more than one dram, to which the other parts are proportioned.

DOCIMENOS, in ancient geography, a city of Phrygia, afterwards called Synaia.

DOCIMENUM MARMOR, a name given by the ancients to a species of marble of a bright and clear white, much used in large and sumptuous buildings, such as temples and the like.

DOCK, in botany. See **RUMEX**.

DOCK. 1. The stump of the tail, which remains after docking.
2. The solid part of the tail.

Dock, in the manege, is used for a large case of leather, as long as the dock of a horse's tail, which serves it for a cover. The French call the dock trousseneue. It is made fast by straps to the crupper, and has leathern thongs that pass between his thighs, and along his flanks to the saddle straps, in order to keep the tail tight, and to hinder it from whisking about.

Dock, [as some imagine of *δοκιν*,] in maritime affairs, a broad and deep trench, formed on the side of a harbour, or on the bank of a river, and commodiously fitted either to build ships in, or

receive them to be repaired. These docks have generally strong flood-gates, to prevent the flux of the tide from entering the dock while the ship is under repair.

Dock, Wet, is a dock, where a ship can only be cleaned during the recess of the tide, or in the interval between the time when the tide leaves her a-ground, and the period when it again reaches her by the return of the flood. The largest and most commodious docks in this country, or perhaps in the world, are those constructed of late years at Liverpool.

Dock YARDS, magazines containing all sorts of naval stores and timber for ship-building. In England, the royal dock-yards are at Chatham, Portsmouth, Plymouth, Deptford, Woolwich, and Sheerness. The ships and vessels of war which belong to the nation, are generally moored at these ports, during the time of peace; and such as want repairing are taken into the docks, examined, and refitted for service. The principal dock-yards are governed by a commissioner resident at the port; who superintends all the musters of the officers, artificers, and labourers, employed in the dock-yard. He also controuls the payments therein; examines the accounts; contracts, and draws bills on the navy-office to supply the deficiency of stores; and regulates whatever belongs to the dock-yard, maintaining due order in the respective offices. These yards are generally supplied from the northern states with hemp, pitch, tar, rosin, canvas, oak-plank, and several other articles. Masts, particularly those of the largest size, are usually imported from New England. Of late years plans have been brought forward and executed for improving the London docks; making wet-docks for the West India shipping only; and others for the East India shipping only, these have proved very advantageous to the commerce of the port of London, and to the companies who raised the money for accomplishing them.

Dock COMPANY, LONDON. This company was established by an act of 39 and 40 Geo. III. passed the 20th of June, 1800, by which they were empowered to raise a capital stock of 1,200,000*l*. This has since been increased; so that the total capital stock which the company are authorized to raise, if necessary, is 2,200,000*l*. The company is under the management of twenty-four directors, who are elected annually. Two general courts of proprietors are held every year, at which all persons are entitled to vote who possess 500*l*. stock or upwards. The dividends on their stock are restricted to 10 per cent. per annum, and are paid on the 1st of January, and the 1st of July. The present dividend is 5½ per cent, and the company pay the property tax thereon. The dividends are paid, and transfers made on any day except holidays. The company was required to complete the docks within seven years, and so early as the close of January, 1805, the dock was opened for public use.

Dock COMPANY, WEST INDIA. This company was established by an act of 39 Geo. III. passed the 12th of July, 1799, and was empowered to raise a joint stock of 500,000*l*. with liberty to increase the same to 600,000*l*. which has since been increased to 1,200,000*l*. The company is under the management of twenty-one directors, eight of whom must be members of the corporation of London. They are elected annually, five going out every year for three years, and six the fourth year. Two general meetings of proprietors are to be held every year, in January and July, at which all persons are entitled to vote who hold 500*l*. stock, or upwards. Votes may be given by power of attorney. The present dividend is 10 per cent. per annum, and becomes due the 1st of January, and the 1st of July. The dividends are payable every day, and the company pay the property tax thereon. The dock was opened in August, 1802.

Dock COMPANY, EAST INDIA. This company was established by an act of 43 Geo. III. passed the 27th of July, 1803, and was authorized to raise a capital of 200,000*l*. divided into shares of 100*l*. each. They have since been empowered to increase their capital to 400,000*l*. nearly the whole of which has been raised. They were to pay five per cent. interest on the money advanced; and after the docks should be completed to make dividends not exceeding 10 per cent. per annum. The company is under the management of thirteen directors, who must be holders of at least twenty shares of the company's stock, and four of them must be directors of the East India company. They are elected annually in July, and three go out every year. Two general meetings are held yearly, in January and July, at which proprietors of five shares and upwards are entitled to vote. They must also be di-

rectors of the East India company, or have been so within two years, or be an agent, husband, consignee, or owner, to the value of 500*l.* or upwards, of East India shipping. The present dividend is at the rate of five per cent. per annum, and is payable at Lady-day and Michaelmas, every day except Fridays, between the hours of eleven and two o'clock. The dock was opened in August, 1806.

DOCKET, a little bill tied to wares or goods, directed to the person or place they are to be sent to.

DOCKET, or **DOGGET**, in law, signifies a brief in writing, made on a small piece of paper, or parchment, containing the purport and effect of a large writing. The rolls of judgement, when brought into the court of common pleas, are entered on the docket of that term: and attorneys keep docket-books, wherein they enter judgements.

DOCKUM, a river and town of Batavia, in the department of Eems, 10 miles N. E. of Lewarden.

DOCTOR, [*διδασκαλος*], in the Greek church, is a particular officer appointed to interpret part of the scriptures: He who interprets the Gospels, is called doctor of the Gospels; he who interprets St. Paul's Epistles, doctor of the Apostle; he who interprets the Psalms, doctor of the Psalter.

DOCTOR is also an appellation adjoined to several specific epithets, expressing the merit of the schoolmen: thus, Alexander Hales is called the irrefragable doctor; Thomas Aquinas, the angelic doctor; St. Bonaventure, the seraphic doctor; John Duns Scotus, the subtle doctor; Raimond Lully, the illuminated doctor; Roger Bacon, the admirable doctor, &c.

DOCTOR OF THE CHURCH, a title given to certain fathers whose doctrines and opinions have been the most generally followed and authorized.

DOCTOR OF THE LAW, a title of honour among the Jews. The investiture of this order was performed by putting a key and table book in their hands; which is what some authors imagine our Saviour alluded to, when, speaking of the doctors of the law, (Luke xi. 52,) he says, "Wo unto you doctors of the law, for ye have taken away the key of knowledge: ye enter not in yourselves, and them that were entering ye hindered."

DOCTOR, ORIGIN OF THE DEGREE OF. The establishment of the doctorate, such as now in use among us, is ordinarily attributed to Ireneus, who himself drew up the formulary. The first ceremony of this kind was performed at Bologna, in the person of Bulgarius, who began to profess the Roman law, and on that occasion was solemnly promoted to the doctorate, *i. e.* installed *juris utriusque* doctor. But the custom was soon transferred from the faculty of law to that of theology; the first instance whereof was given in the university of Paris, where Peter Lombard, and Gilbert de la Portree, the two chief divines of those days, were created doctors in theology, *sacrae theologiae doctores*. Spelman takes the title of doctor not to have commenced till after the publication of Lombard's sentences, about 1140; and affirms, that such as explained that work to their scholars were the first that had the appellation of doctors. Others go much higher, and hold Bede to have been the first doctor at Cambridge, and John de Beverly at Oxford, which last died A. D. 721. But Spelman will not allow doctor to have been the name of any title or degree in England, till the reign of king John, about 1207. By stat. 37 Henry VIII. c. 17. sect. 4. a doctor of the civil law may exercise ecclesiastical jurisdiction, though a layman.

DOCTOR, PRE-REQUISITES FOR PASSING IN ENGLAND. To pass D. D. at Oxford, it is necessary the candidate have been four years bachelor of divinity. For LL. D. he must have been seven years in the university to commence LL. B. five years after which he may be admitted doctor. Otherwise, in three years after taking the degree of M. A. he may take the degree of LL. B. and in four years more that of LL. D. which method and time are likewise required to obtain the degree of M. D. At Cambridge, to take the degree of D. D. it is requisite that the candidate have been seven years B. D. though in several of the colleges the taking of the bachelor's degree is dispensed with, and they may go out per saltum. To commence LL. D. the candidate must have been five years LL. B. or seven M. A. To pass M. D. he must have been five years B. D. or seven years M. A.

DOCTORS COMMONS. See **COLLEGE**.

DOCUMENT, in law, some written monument produced in proof of any thing asserted.

DODARTIA, a genus of the angiospermia order, and didynamia class of plants; natural order, Personatae. Calyx quinque-dentated; under lip of the corolla twice as long as the upper; capsule bilocular, globose. Two species, natives of India.

DODBROOK, a town in Devonshire, 15½ miles S. W. of Dartmouth, and 219 W. S. W. of London.

DODD, DR. WILLIAM, an unfortunate English divine, eldest son of the rev. W. Dodd, vicar of Bourne, in Lincolnshire, was born May 29, 1729. He was sent to Cambridge, in 1745. In 1749-50 he took the degree of B. A. with great honour, being upon that occasion in the list of wranglers. Leaving the university, he married Miss Mary Perkins in 1751; was ordained a deacon the same year; priest in 1753, and soon became a celebrated and popular preacher. By the patronage of bishop Squire, he, in 1763, obtained a prebend of Brecon, and by the interest of some city friends, was appointed one of the king's chaplains; soon after which he had the care of the education of the earl of Chesterfield. In 1766 he took the degree of LL. D. At this period, the estimation in which he was held by the world was sufficient to give him expectations of preferment, and hopes of riches and honours; and these he might probably have acquired, had he possessed a common portion of prudence. But, impatient of his situation, and eager for advancement, he rashly fell upon means which in the end were the occasion of his ruin. When the living of St. George, Hanover-square, became vacant, he wrote an anonymous letter to the chancellor's lady, offering 3000 guineas if by her assistance he was promoted to it. This being traced to him, complaint was immediately made to the king, and Dr. Dodd was dismissed with disgrace from his office of chaplain. From this period he lived neglected, if not despised; and his extravagance and difficulties increasing, he forged lord Chesterfield's name to a bond for 4200*l.* in hopes of being able to take it up before it was due, but the fraud was discovered, and he was tried and condemned, February 24, 1777. Great exertions were made to save his life, but in vain, and he was executed at Tyburn, June 27th following. He expressed deep contrition for his crimes, and for the scandal which he had brought on his profession. He published a translation of the poems of Callimachus; four volumes of sermons on the Miracles and Parables; a collection of Poems; Reflections on Death, 12mo. Comfort for the Afflicted, 8vo, and after his death appeared his Thoughts in Prison, with his life prefixed.

DODECAHEDRON, [from *δώδεκα*, twelve, and *ῥῆμα*, base,] is one of the Platonic bodies, or five regular solids, and is contained under twelve equal and regular pentagons. The solidity of a dodecahedron is found by multiplying the area of one of the pentagonal faces of it by twelve; and then this latter product by one-third of the distance of that face from the centre of the dodecahedron, which is the same as the centre of the circumscribing sphere.

DODDRIDGE, PHILIP, D. D. an eminent Presbyterian minister, the son of Daniel Doddridge, an oilman in London, where he was born on the 26th of June, 1702. Having completed the study of the classics, he was, in 1719, placed under the tuition of the rev. John Jennings, who kept an academy at Kilworth in Leicestershire. He was first settled as a minister at Kilworth, where he preached to a small congregation in an obscure village; but, on Mr. Jennings's death, succeeded to the care of his academy; and soon after was chosen minister by a large congregation of Dissenters at Northampton, to which he removed his academy, and where the number of his pupils increased. He instructed them with the freedom and tenderness of a father; and never desired that they should blindly follow his sentiments, but encouraged them to judge for themselves. He checked any appearance of bigotry and uncharitableness, and endeavoured to cure them by shewing what might be said in defence of those principles they disliked. Yet while he was thus liberal as to the opinions of others, he was so steady to his own principles that he refused a very genteel offer of patronage made him by the Duchess of Bedford, on condition of his turning over to the church of England. A pulmonary complaint brought on a consumption, for which he was advised to try the Bristol waters, and these proving ineffectual, he went to Lisbon, where he died in 1751. Though tender in his constitution, he published a number of excellent works, the principal of which are, his Family Expositor on the New Testament, 6 vols. 4to.; the Rise and Progress of Religion in the Soul, of which numerous editions have been printed; the Life of Colonel Gardiner; and

and Sermons on the Evidences of Christianity. His single sermons and tracts were collected in 8 vols. 12mo. after his death: also his Hymns; Lectures on Pneumatology, Ethics, and Divinity; and a volume of his Letters, by Mr. Stedman of Shrewsbury.

DODECAGYNIA, [from *dodeka*, twelve, and *gyni*, a woman,] the fifth order in the class dodecandria; consisting of plants, which, along with the general characteristics of the class, have twelve female organs. See **BOTANY**.

DODECANDRIA, [from *dodeka*, twelve, and *andri*, a man,] the eleventh class in Linnaeus's sexual system, consisting of plants with hermaphrodite flowers, that have twelve male organs. It is not, however, limited to this number. Many genera have sixteen, eighteen, and even nineteen stamina. The essential character is, that the stamina, however numerous, are inserted into the receptacle. See **BOTANY**.

DODECAS, a genus of the trigynia order, and dodecandria class of plants. Calyx half-quadrifid having the corolla above; corolla quinquefid, capsule unilocular, conjoined with the calyx. One species only is known.

DODECATEMORION, [*dodekateimonion*,] the twelfth part.

DODECATHEON, **MEDIA**, a genus of the monogynia order, and pentandria class of plants: natural order *Preciæ*. Corolla verticillated, reflexed; stamina placed in the tube; capsule unilocular, oblong. It has one species.

DODO, in ornithology. See **DIPODUS**.

DODONA, a town of Thesprotia in Epirus, or, as some say, in Thessaly. There was in its neighbourhood a celebrated oracle of Jupiter. The oracles of Dodona were generally delivered by women.

DODONÆA, a genus of the monogynia order, and octandria class of plants. Calyx tetraphyllous; no corolla; capsule trilobular, inflated; seeds two-fold. It has two species.

DODONÆUS, or **DODONIAN**, in antiquity, an epithet given to Jupiter, because he was worshipped in a temple built in the forest of Dodona.

DODONIES, the priestesses who gave oracles in the temple of Jupiter, in Dodona. According to some traditions the temple was originally inhabited by the seven daughters of Atlas, who nursed Bacchus. Their names were Ambrosia, Eudora, Pasithoe, Pytho, Plexaure, Coronis, and Tyche.

DODRANS, in antiquity, three-fourths of the as, or nine uncia.

DOE, in zoology. See **CERVUS**.

DOEG, [דג, Heb. *i. e.* careful,] the Edomite, a bloody villain, who acted in the quadruple character of chief herdsman, informer, accuser, and executioner, to king Saul. His monstrous barbarity in murdering the whole people of Nob, men, women, and children, at the mandate of the enraged monarch, when even his own footmen refused to obey his iniquitous order (1 Sam. xxii. 17), affords one of the numberless instances, with which both sacred and profane history abound, of the dreadful effects of despotic power.

DOESBURG, a town of Holland, in the department of Yssel, 10 miles S. S. W. of Zutphen.

DOFREFIELD, or **DOFRINE**, the highest peak of the mountains, which divide Norway from Sweden.

DOG, in zoology, an animal remarkable for its natural docility, fidelity, and affection, for its master; qualities which mankind are careful to improve for their own advantage. See **CANIS**. In several parts of Africa and China, dogs are eaten, as well as by the West Indian negroes, and accounted excellent food; and we have the testimony of Mr. Forster, that dogs flesh, in taste, exactly resembles mutton. They were also used as food by the Romans, and long before them by the Greeks, as we learn from several treatises of Hippocrates. Dogs bred in Britain are justly reckoned superior to the dogs bred in any other country. The swiftness of the greyhound is amazing: as are also the steadiness and perseverance of other hounds and beagles; the boldness of terriers in unearthing foxes, &c.; the sagacity of pointers and setting dogs, who are taught a language by signs as intelligible to sportsmen as speech; and the invincible spirit of a bull-dog, which can be conquered only by death. All the nations in Europe not only do justice to the superior qualities of the British dogs, but adopt our terms and names, and thankfully receive the creatures as presents. It is remarkable, however, that almost every kind of British dogs degene-

rate in foreign countries; nor is it possible to prevent this degeneracy by any art whatever.

DOGADO, [Ital. *i. e.* duchy,] a province of Italy, in Venice, comprehending that part of the state in which the city of Venice lies.

DOGATE, [Ital. *dogado*, from *ducatus*, Lat. a duchy,] the late office of doge, in the late aristocracies of Genoa and Venice.

DOG-BANE, in botany. See **APOCYNUM**.

DOG-DAYS, the days in which the dog-star rises and sets with the sun, vulgarly reputed unwholesome.

DOG-DAYS. See **CANICULA**.

DOGE properly signifies duke, being formed from the Latin *dux*. The dogate, or office and dignity of doge, was elective; at Venice, he was elected for life; at Genoa, only for two years; he was addressed under the title of Serenity, which was esteemed superior to that of Highness.

DOG-FISH. See **SQUALUS**.

DOGGER, a Dutch fishing-vessel navigated in the German Ocean. It is generally employed in the herring fishery.

DOGGERS, in the English alum works, a name given by the workmen to a sort of stone found in the same mines with the true alum-rock, and containing some alum, though not near so much as the right kind.

DOGMATISTS, a sect of the ancient physicians, of which Hippocrates was the founder. They are also called *logici*, logicians, from their using the rules of logic in medical subjects. They laid down definitions and divisions; reducing diseases to certain genera, and those genera to species, and furnishing remedies for them all; supposing principles, drawing conclusions, and applying those principles and conclusions to particular diseases under consideration: in which sense the dogmatists stand contradistinguished from empirics and methodists. They reject all medicinal virtues that they think not reducible to manifest qualities; but Galen has long ago observed, that they must either deny plain facts, or assign but very poor reasons and causes of many effects they pretend to explain. See **MEDICINE**.

DOG-RIBBED INDIANS, a nation of North Americans, who inhabit round lake Edlande, in the N. W. part of North America. They are often at war with the Arathapescow Indians. Both these tribes are among the most savage of the human race. They trade with the Hudson bay company's settlements.

DOG'S HEAD, a cape on the W. coast of Ireland, in Galway. Lon. 10. 8. W. Lat. 53. 54. N.

DOG'S ISLAND, one of the smaller Virgin islands, W. of Virginia Gorda, and E. of Tortula. Lon. 62. 55. W. Lat. 18. 20. N.

DOG'S STONES, in botany. See **ORCHIS**.

DOG-STAR. See **CANICULA**, and **SIRIUS**.

DOIAGOI, an island of Russia, in the Frozen Sea, at the entrance of the straits of Vagaskoi.

DOIT, the ancient Scots penny piece, of which twelve were equal to a penny sterling. It was a small copper coin, as thin as a silver penny, and not much larger.

DOL, a town of France, in the department of Ille and Vilaine, and late province of Bretagne, 27 miles W. of Paris.

DOLCE AQUA, a town of Piedmont, in the county of Nice, 16 miles E. N. E. of Nice.

DOLCINGO, a strong town of European Turkey, in Albania, 10 miles S. E. of Antivari.

DOLE, a town of France, in the department of Jura, and late province of Franche Comté, 23 miles W. S. W. of Besançon. Lon. 5. 38. E. Lat. 47. 6. N.

DOLE, in Scots law, signifies a malevolent intention.

DOLEGELLY, **DOLGELLY**, or **DOLGETH**, a town of North Wales, in Merionethshire, 46 miles S. of Caernarvon.

DOLICHOS, a genus of the decandria order, and diadelphica class of plants; natural order Papilionaceæ. Basis of the vexillum has two callous knobs, oblong, parallel, and compressing the ala below. There are thirty-eight species, chiefly herbaceous annuals, and natives of the Indies.

DOLIOCARPUS, in botany, a genus of the polyandria monogynia class and order. Calyx five-leaved; corolla three-petaled, plaited; stigma subtrifid; berry globular, crowned with the style, one-celled, two-seeded. Three species, shrubs of Guiana.

DOLLAR, in this country, is chiefly applied to the Spanish silver coin, otherwise called a piece of eight. Dollars are also

coined in different parts of Germany and Holland; and have their subdivisions, into semi-dollars, quarter-dollars, &c. See MONEY. They are of various fineness and weight. In the Levant the Dutch dollars are called *astani*, from the impression of a lion on them.

DOLLENDORF, a town of Germany, in Westphalia.

DOLLEREN, a river of France, in the department of the Upper Rhine.

DOLPHIN, in ichthyology. See DELPHINUS.

DOLPHIN OF THE MAST, in sea language, a peculiar kind of wreath, formed of plaited cordage, to be fastened occasionally round the masts, as a support to the puddening, whose use is to sustain the weight of the fore and main yards in case the rigging or chains by which those yards are suspended should be shot away in the time of battle; a circumstance which might render their sails useless at a season when their assistance is extremely necessary.

DOLPHIN'S ISLAND, an island in the straits of Magellan. Lon. 71. 41. W. Lat. 53. 59. S.

DOM, or **DON**, [an abridgement of *domnus*, from *dominus*,] a title of honour, invented and chiefly used by the Spaniards, signifying sir or lord. See DON.

DOM AND SOM, in old charters, signifies full property and jurisdiction.

DOMAIN. See DEMESNE.

DOMAT, JOHN, a celebrated French lawyer, born in 1625, who, observing the confused state of the laws, digested them in 4 vols. 4to. under the title of *The Civil Laws in their Natural Order*: for which Louis XIV. settled on him a pension of 2000 livres. Donat was intimate with the famous Pascal, who left him his private papers at his death: he died in 1696.

DOMAZLIZE, a town of Bohemia, in the circle of Pilsen, 17 miles S. of Pilsen.

DOMBACA, a small island near the coast of Ava, in the bay of Bengal. Lon. 94. 35. E. Lat. 17. 32. N.

DOMBES, a late principality of France, about 24 miles long, and 21 broad, lying on the W. bank of the Soane. Trevoux was the capital. It now forms part of the department of Ain.

DOMBEYA, in botany, a genus of the class and order diœcia monadelphia. Male, calyx of the ament; scales terminated by a leaflet; corolla none; anthers ten or twelve, without filaments. Female, calyx ament, with many germs; corolla none; stigma bivalve, unequal; seeds many, in a roundish strobile. There is one species, a tree of Chili.

DOME, [*domus*, Lat. *house*,] in architecture, is a roof of a hemispherical form, raised over the middle of a building, as a church, hall, pavilion, vestibule, stair-case, &c. by way of crowning. Domes are the same with what the Italians call *cupolas*; or, according to Vitruvius, *tholi*. They are usually made round; though we have instances of square ones; as those of the Louvre; and others that are polygons, as that of the ci-devant Jesuits church in the Rue St. Antoine at Paris. They have usually columns ranged around their outsides, both by way of ornament, and to support the vault. See a plan and elevation of a circular dome constructed without entering: Plate LIV. fig. 4. The first course consists of the stones marked 1, 1, of different sizes (the large ones exactly twice the height of the small ones,) placed alternately, and forming intervals to receive the stones marked 2, which rise half their height above the large ones of the first course, and leave alternate intervals as before for those marked 3: the other courses are continued in the same manner, according to the order of the figures, to the top. It is evident from the converging or wedge-like form of the intervals, that the stones they receive can only be inserted from the outside, and cannot fall through; therefore the whole dome may be built without centering or temporary support. To break the upright joints, the stones may be cut of the form as at A, and those marked 16, 17, &c. near the key-stone, may be enlarged, as at B.

Dome, in chemistry, the upper part of furnaces, particularly portable ones. It has the figure of a hollow hemisphere, or small dome. Its use is to form a space in the upper part of the furnace, the air of which is continually expelled by the fire: hence the current of air is considerably increased, which is obliged to enter by the ash-hole, and to pass through the fire, to supply the place of the air driven from the dome. The form of this piece renders it proper to reflect or reverberate a part of the flame upon matters

which are in the furnace, which has occasioned this kind of furnace to be called a reverberatory one. See CHEMISTRY.

DOME, or **DOOM**, signifies judgement, sentence, or decree. The homagers oath in the black book of Hereford ends thus: "So help me God at his holy dome, and by my trowthe."

DOMESDAY, or **DOOMSDAY BOOK**, a most ancient record, made in the time of William I. and containing a survey of all the lands of England. It consists of two volumes. The first is a large folio, written on 382 double pages of vellum, in a small but plain character; each page having a double column. Some of the capital letters and principal passages are touched with red ink; and some have strokes of red ink run across them; as if scratched out. This volume contains the description of 31 counties. The other volume is in 4to, written upon 450 double pages of vellum, but in a single column, and in a large but very fair character. It contains the counties of Essex, Norfolk, Suffolk, part of the county of Rutland included in that of Northampton, and part of Lancashire in the counties of York and Chester. This work, according to the red book in the exchequer, was begun by order of William the Conqueror, with the advice of his parliament, in the year of our Lord 1080, and completed in the year 1086. The reason given for taking this survey, as assigned by several ancient records and historians, was, that every man should be satisfied with his own right, and not usurp with impunity what belonged to another. But, besides this, it is said by others, that now all those who possessed landed estates became vassals to the king, and paid him so much money by way of homage, in proportion to the lands they held. This appears very probable, as there was at that time extant, a general survey of the whole kingdom, made by order of king Alfred. For the execution of the survey recorded in domesday book, commissioners were sent into every county and shire; and juries summoned in each hundred, out of all orders of freemen, from barons down to the lowest farmers. These commissioners were to be informed by the inhabitants, upon oath, of the name of each manor, and that of its owner; also by whom it was held in the time of Edward the Confessor; the number of hides; the quantity of wood, of pasture, and of meadow land; how many ploughs were in the demesne, and how many in the tenanted part of it; how many mills, how many fish-ponds, or fisheries belonged to it; with the value of the whole together in the time of king Edward, as well as when granted by king William, and at the time of this survey; also whether it was capable of improvement, or of being advanced in its value: they were likewise directed to return the tenants of every degree, the quantity of lands then and formerly held by each of them, what was the number of villains or slaves, and also the number and kinds of their cattle and live stock. These inquiries being first methodized in the country, were afterwards sent up to the king's exchequer. This survey, at the time it was made, gave great offence to the people; and occasioned a jealousy that it was intended for some new imposition. But notwithstanding all the precaution taken by the conqueror, to have this survey faithfully and impartially executed, it appears from indisputable authority, that a false return was given in by some of the commissioners; and that, as it is said, out of a pious motive. However, the authority of domesday book was never permitted to be called in question; and always, when it has been necessary to distinguish whether lands were held in ancient demesne, or in any other manner, recourse was had to that only, to determine the doubt. From this definitive authority, from which, as from the sentence pronounced at domesday, or the day of judgement, there could be no appeal, the name of the book is said to have been derived. But Stowe assigns another reason for this appellation; namely, that domesday book is a corruption of *domus Dei* book; a title given it because heretofore deposited in the king's treasury, in a place of the church of Westminster, or Winchester, called *domus Dei*. From the great care formerly taken for the preservation of this survey, we may learn the estimation in which its importance was held. The dialogue de Scaccaris says, "*Liber ille (Domesday) sigilli regis comes est individuis in thesauro.*" Until lately it has been kept under three different locks and keys; one in the custody of the treasurer, and the others in that of the two chamberlains of the exchequer. It is now deposited in the chapter-house at Westminster, where it may be consulted on paying to the proper officers a fee of 6s. 8d. for a search, and 4d. per line for a transcript. Besides the two volumes

James above-mentioned, there is also a third made by order of the same king; and which differs from the others in form more than matter. There is also a fourth called domesday, which is kept in the exchequer; which, though a very large volume, is only an abridgement of the others. In the remembrancer's office in the exchequer is kept a fifth book, likewise called domesday, which is the same with the fourth book already mentioned.

DOMESTIC, in antiquity, was a particular officer in the court of Constantinople. According to some this officer was one entrusted to manage affairs of importance; others say the Greek domestici were the same with the Roman comites; and that they began first to be used when count became a dignity: domestics therefore were such as served the prince in the administration of affairs, as well those of the family as the affairs of justice and the church.

DOMESTIC HAPPINESS, the pleasures enjoyed in one's family, in distinction from those found in the bustle of public life, or delusively sought in the haunts of dissipation. See **PLEASURE**.

DOMFRONT, a town of France, in the department of Orne, 35 miles N. W. of Alencon. Lon. 0. 43. W. Lat. 48. 38. N.

DOMIFYING, in astrology, the dividing or distributing of the heavens into 12 houses, to erect a theme, by means of six great circles, called circles of position. Regiomontanus makes the circles of position pass through the intersections of the meridian and the horizon: others make them pass through the poles of the zodiac.

DOMINANT, among musicians, is used either as an adjective or substantive.

1. **DOMINANT**. The dominant or sensible chord is that which is practised upon the dominant of the tone, and which introduces a perfect cadence. Every perfect major chord becomes a dominant chord, as soon as the seventh minor is added to it.

2. **DOMINANT**, of the three notes essential to the tone, is that which is a fifth from the tonic. The tonic and the dominant fix the tone; in it they are each of them the fundamental sound of a particular chord; whereas the mediant, which constitutes the mode, has no chord peculiar to itself, and only makes a part of the chord of the tonic.

A **DOMINANT**, in that species of church music which is called plain chant, is that note which is most frequently repeated or beaten, in whatever degree it may be from the tonic. In this species of music there are dominants and tonics, but no mediant.

DOMINGO, Sr, or **HISPANIOLA**, an island in the Atlantic Ocean. See **HISPANIOLA**.

DOMINGO, Sr, the capital of the above island. Lon. 70. 10. W. Lat. 18°. 19' 30". N.

DOMINIC, **DE GUZMAN**, the founder of the Dominican order. See **DOMINICANS**.

DOMINICA, the last of the leeward or Caribbee islands, taking them from N. W. to S. E. so named by Christopher Columbus, from his having discovered it on Sunday, 3rd. November 1493. It is situated about half-way betwixt Guadaloupe on the N. W. and Martinico on the S. E. 15 leagues from each, between 15° 20' and 15° 44' 30" lat. N. and between 61° 17' and 61° 30' lon. W. It is about 29 miles long; and nearly 16 broad.

DOMINICA, a town in the island of Cuba, 45 miles W. of Havannah.

DOMINICA, or **HEEVAROA**, the largest of the Marquesas islands, extending E. and W. 18 miles. Lon. 139. 13. W. Lat. 9. 44. N.

DOMINICAL LETTER, in chronology, is that letter of the alphabet which points out in the calendar the Sundays throughout the year, thence also called Sunday-letter. See **CHRONOLOGY**. The Dominical Letter for any year may be found by the following rule. Add together the year, its fourth part, and the figures which remain from the fourth part after rejecting the units and tens; also reject the units and tens of the given year and add one to the remaining figures; subtract this from the foregoing sum, and divide the remainder by seven, and subtract what remains from seven, and the last remainder is the index of the letter required. N. B. If the given year exactly divides by 4, it is leap-year; and the Dominical Letter for January and February will be the one which immediately succeeds, in the order of the alphabet, that found by the above rule. Thus to find the Dominical Letter for 1809.

1809

452

4

2265

19

7)2246

320

6

1

Therefore the Dominical Letter was A.

Example 2. To find the Dominical Letter for the ensuing year of Christ 1811.

1811 The year of Christ.

452 Its fourth part, omitting fractions.

4 The remaining figure of 452, after omitting the units and tens.

2267 Sum of the three numbers.

19 The number of centuries in the given year + 1

7)2248 Difference of the two preceding quantities.

321 Quotient of 2267 — 19 after its division by 7, and 1 over, which taken from 7, according to the rule, leaves 6, the index of the Dominical Letter; consequently F, the sixth letter in the order of the alphabet, will be the Sunday-letter required.

Example 3. To find the Dominical Letters for the year of Christ 2000, it being leap-year.

2000

500

5

2505

21

7)2484

354

6

1

Therefore BA will be the Dominical Letters; See the article Chronology in this work, pages 713, 781, and 782.

If the day of the month in any particular year on which any Sunday falls be given, the Sunday-letter may be found thus: divide the number of days from the first of January to the given Sunday inclusive by seven, and the remainder subtracted from 7 is the index of the letter: if nothing remains 7 is the index.

Example. The liberation of Sir Francis Burdett from the Tower and of Gale Jones from Newgate took place on the prorogation of the late session of parliament, which was on Thursday, June 21, of the present year; quære the Dominical Letter.

First, if the 21st of June, 1810, happened on a Thursday, the preceding Sunday must have taken place on June 17. Therefore, according to the rule, 31, the number of days in January, + 28, ditto in February, + 31, ditto in March, + 30, ditto in April, + 31, ditto in May, + 17, the given Sunday in June, = 168. And 168 divided by 7 = 24 and nothing over, consequently G is the Sunday-letter for this year, for 7 — 0 = 7, the index of the letter.

DOMINICANS, an order of religious, so named from their founder Dominic De Guzman, who preached with great zeal against the Albigenes in Languedoc, where he laid the first foundation of this order. It was approved of in 1215, by Innocent III, and confirmed in 1216, by a bull of Honorius III, under the title of St. Augustin; to which Dominic added several austere precepts and observances, obliging the brethren to take a vow of absolute poverty; to abandon entirely all their revenues and possessions; and to take the title of Preaching Friars, because the public instruction was the main end of their institution.

DOMINION, in the civil law, the power to use or dispose of things as we please.

DOMINION,

DOMINION, in theology, the fourth order of angels, in the hierarchy, reckoning from the seraphim. See **ANGEL**.

DOMINIS, **MARK ANTHONY DE**, archbishop of Spalatro in Dalmatia at the close of the 15th and beginning of the 16th centuries, was a man whose fickleness in religion proved his ruin. His preferment, instead of attaching him to the church of Rome, rendered him disaffected to it. Becoming acquainted with bishop Bedell, while chaplain to Sir Henry Wotton ambassador from James I. at Venice, he communicated his books "*De Republica Ecclesiastica*" to him; which were afterwards published at London, with Bedell's corrections. He came to England with Bedell; where he was received with great respect, and preached and wrote against the Romish religion. He is said to have had a principal hand in publishing father Paul's "*History of the Council of Trent*," at London, which was inscribed to King James, in 1619. But on the promotion of Pope Gregory XIV. who had been his school-fellow and old acquaintance, he was deluded by Gondomar the Spanish ambassador into the hopes of procuring a cardinal's hat, by which he fancied he should prove an instrument of great reformation in the church. Accordingly he returned to Rome in 1622, recanted his errors, and was at first well received; but he afterwards wrote letters to England, repenting his recantation; which being intercepted, he was imprisoned by Pope Urban VIII, and died in 1625. He was the author of the first philosophical explanation of the rainbow, which before his time was accounted a prodigy.

DOMINIUM, in civil law. See **DOMINION**.

DOMINIUM DIRECTUM, in Scots law, the right which a superior retains in his lands, notwithstanding the feudal grant to his vassal.

DOMINIUM EMINENS, in Scots law, that power which the state or sovereign has over private property, by which the proprietor may be compelled to sell it for an adequate price where public utility requires.

DOMINIUM UTILE, in Scots law, the right which the vassal acquires in the lands by the feudal grant from his superior.

DOMINUS, [Lat. *i. e.* a lord or master,] a title anciently prefixed to a name, usually to denote the person either a knight or a clergyman. The title was sometimes also given to a gentleman not dubbed; especially if he were lord of a manor.

DOMITZ, a town and fortress of Germany; in Lower Saxony. Lon. 11. 41. E. Lat. 53. 15. N.

DOMMART, a town of France, in the department of Somme, 12 miles N. W. of Amiens.

DOMMEL, a river of France which rises about the borders of the bishopric of Liege, and, passing by Bois-le-duc, joins the Meuse, and forms with that river and the Waal, the island of Bommel.

DOMMEL AND SCHELDT, one of the eight departments into which the Batavian republic was divided, in March 1798. Herzogenbusch is the chief city.

DOMO-D'OSCELA, **DOMO-D'OSCELLO**, or **DOMO-D'OSSOLA**, a town of the late Cisalpine republic, in the late duchy of Milan, S. W. of Lake Maggiore. Lon. 8. 25. E. Lat. 46. 2. N.

DOMPAIRE, an ancient town of France, in the department of Vosges, 9 miles W. N. W. of Epinal.

DOMREMY, a town of France, in the department of the Meuse, 10½ miles E. of Bar-le-duc.

DOMUS CONSERVORUM, the ancient name of the house where the rolls are kept in Chancery-Lane.

DON, [*dominus*, Lat.] the Spanish title for a gentleman; as, Don Quixote. See **DOM**. This title was first given to Pelayo, in the beginning of the eighth century. In Portugal no person can assume the title of Don without the permission of the sovereign, as it is reckoned a mark of honour and nobility. In France it was formerly used among the religious.

DON, a river of Russia, anciently called Tanais, which takes its rise from the small lake of St. John, near Tula, in the government of Moscow, and falls into the sea of Azof.

DON, a river of Scotland, in Aberdeenshire, which rises about four miles N. of the Castle of Brae-Mar.

DONAGHADEE, a sea-port town of Ireland, in the county of Down, Ulster; 21 miles W. of Port Patrick in Scotland. Lon. 5. 40. W. Lat. 54. 45. N.

DONARIA, among the ancients, in its primary signification,

was taken for the places where the oblations offered to the gods were kept; but afterwards was used to denote the offerings themselves; and sometimes, improperly, the temples.

DONATIA, a genus of the trigynia order, and triandria class of plants. Calyx three-leaved; corolla has from 8 to 10 petals of an oblong linear shape, twice as long as the calyx; anthers roundish, didymous, and two-lobed at the base. One species.

DONATION, in law, to be valid and complete, supposes a capacity both in the donor and the donee; and requires consent, acceptance, and delivery.

DONATION MORTIS CAUSA, in law, a disposition of property made by a person in his last sickness, who apprehending his dissolution near, delivers, or causes to be delivered to another, the possession of any personal goods, to keep in case of his decease. If the donor dies, this gift needs not the consent of his executor; but it shall not prevail against creditors; and it is accompanied with this implied trust, that, if the donor lives, the property shall revert to himself, being only given in prospect of death, or mortis causa. This method of donation seems to have been conveyed to us from the civil lawyers, who borrowed it from the Greeks.

DONATISTS, ancient schismatics in Africa, so denominated from their leader Donatus. They had their origin, A. D. 311, when, in the room of Mensurius, who died in that year on his return to Rome, Cæcilian was elected bishop of Carthage, and consecrated without the concurrence of the Numidian bishops, by those of Africa alone; whom the people refused to acknowledge, and to whom they opposed Majorinus; who, accordingly, was ordained by Donatus bishop of Casa Nigra. They were repeatedly condemned, in different councils held at Rome and Arles; and particularly in one at Milan, in 316, before Constantine the Great, who deprived them of their churches, banished their bishops, and punished some of them with death. Their cause was espoused by another Donatus, called the Great, the principal bishop of that sect, who, with numbers of his followers, was exiled by Constans. They are now nearly extinct. They were distinguished by other appellations; as Montenses, Campites, Rupites, &c. They held three councils, one at Cirta in Numidia, and two at Carthage. The errors of the Donatists were, 1. That baptism conferred out of the church, that is, out of their sect, was null; and accordingly they rebaptized those who joined their party from other churches, and reordained their ministers. 2. That their's was the only true, pure, and holy church; (an error common to bigots of all denominations;) all the rest of the churches they held as prostitute and fallen. Donatus seems likewise to have given into the doctrine of the Arians, with whom he was closely allied; and, accordingly, St. Epiphanius, Theodoret, and some others, accused the Donatists of Arianism; and it is probable that the charge was well founded, because they were patronized by the Vandals, who were of these sentiments. But St. Augustine (Ep. 185, to count Boniface, & Har. 69.) affirms, that the Donatists, in this point, kept clear of the errors of their leader.

DONATIVE, in the canon-law, is a benefice given by the patron to a priest, without presentation to the ordinary, and without institution or induction. If chapels founded by laymen be not approved by the diocesan, and, as it is called, spiritualized, they are not accounted proper benefices, neither can they be conferred by the bishop, but remain to the pious disposition of the founder, and their heirs, who may give such chapels without the bishop. Gwin observes, that the king might anciently found a free chapel, and exempt it from the jurisdiction of the diocesan; so may he, by letters patent, give liberty to a common person to found such a chapel, and make it donative, not presentable; and the chaplain or beneficiary, is deprivable by the founder or his heir, and not by the bishop. Donatives are within the statute against simony; and if they have cure of souls, within that against pluralities. If the patron of a donative does not nominate a clerk, there can be no lapse thereof, unless it be specially provided for in the foundation; but the bishop may compel him to do it by spiritual censures. But if it be augmented by queen Anne's bounty, it will lapse like other presentative livings, 1 Geo. I. stat. 2. cap. 10. The ordinary cannot visit a donative, and therefore it is free from procurator, and the incumbent is exempted from attendance at visitations. All bishoprics anciently were donative by the king. Where a bishop has the gift of a benefice, it is properly called a donative, because he cannot present to himself.

DONATIVE, or **DONATIVUM**, in antiquity, was properly a gift

gift made to the soldiers, as *congiarium* was to the people. The Romans made large donatives to their soldiers. Julia Pia, wife of the emperor Severus, is called on certain medals *mater castorum*, because of the care she took of the soldiery, by interposing for the augmentation of their donatives, &c.

DONATORY, in Scots law, that person to whom the king bestows his right to any forfeiture that has fallen to the crown.

DONAWERT, a town of Germany, in Bavaria on the frontiers of Suabia. 18 miles N. of Augsburg. Lon. 11. 5. E. Lat. 48. 52. N.

DONAX, a genus of insects of the class and order *vermes testacei*. Animal a tethys; shell bivalve, generally with a crenulate margin, the frontal margin very obtuse; hinge with two teeth, and a single marginal one placed a little behind, rarely double, triple, or none. There are nineteen species. *D. scortum* is a triangular heart-shaped shell, with a flat frontal margin. It inhabits the Indian ocean. *D. scripta* inhabits the coast of Malabar, it is elegantly painted with angular reddish, blue, or brown lines. *D. rugosa* is represented in Plate XXXVII.

DONCASTER, an ancient town, in the W. Riding of Yorkshire, 37 miles S. of York. Lon. 1. 12. W. Lat. 53. 33. N.

DONCHERRY, or **DONCHERY**, a fortified town of France, in the department of Ardennes, three miles from Sedan. Lon. 5. 2. E. Lat. 49. 42. N.

DONEGAL, a county of Ireland, in the province of Ulster, bounded on the E. by Londonderry; on the S. by Fermanagh; and on the W. and N. by the ocean. It is generally reckoned 68 miles long, and 44 broad. The surface is generally rugged and mountainous; in some places marshy, interspersed with several rich valleys. The principal towns are Donegal, Ballyshannon, Killbegs, Lifford, and St. Johnstown, which send two members each to parliament, besides two from the county.

DONEGAL, the capital of the county, 10 miles N. of Ballyshannon. Lon. 8. 30. W. Lat. 54. 42. N.

DONEGAL BAY, a large bay of the Atlantic, on the W. coast of Ireland.

DONERAIL, a borough of Ireland, in Cork, 19 miles N. E. of Cork.

DONETZK, a town of Russia, in the government of Ekaterinoslaw.

DONGALA, **DANGALA**, **DANCALA**, or **DANGOLA**, a town of Africa, in Nubia. Lon. 30. 35. E. Lat. 21. 0. N.

DONJON, a town of France, in the department of Allier, 24 miles S. E. of Moulins.

Donjon, in Fortification, commonly signifies a large tower, or redoubt of a fortress; whence the garrison may retreat in case of necessity, and capitulate with good advantage.

DONNE, **JOHN**, D. D. a poet and divine of the 17th century. His parents were of the Romish religion, and used their utmost efforts to keep him firm to it; but his early examination of the controversy between the church of Rome and the Protestants, at last determined him to choose the latter. He travelled into Italy and Spain; where he made many useful observations, and learned their languages to perfection. Soon after his return to England, Sir Thomas Egerton, keeper of the great seal, appointed him his secretary; in which post he continued five years. Marrying privately Anne, the daughter of Sir George Moore, then chancellor of the garter, he was dismissed from his place, and thrown into prison. But he was reconciled to Sir George by the good offices of Sir Francis Woolley. In 1612, he accompanied Sir Robert Drury to Paris. During this time, many of the nobility solicited the king for some secular employment for him. But king James who took pleasure in his conversation, had engaged him in writing his *Pseudo-Martyr*, printed at London in 1610; and was so highly pleased with that work, that, in 1614, he prevailed with him to enter into holy orders; appointed him one of his chaplains, and procured him the degree of D. D. from the university of Oxford. In 1619, he attended the earl of Doncaster in his embassy into Germany. In 1621, he was made dean of St. Paul's: and vicar of St. Dunstan, in London; the advowson of it having been given to him long before by Richard earl of Dorset. By these and other preferments, he was enabled to be charitable to the poor, kind to his friends, and to make good provision for his children. He wrote, besides the above, 1. Devotions upon emergent Occasions. 2. The Ancient History of the Septuagint, translated from the Greek of Aristeus, in 4to. 3. Three volumes of sermons,

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folio. 4. A considerable number of poems: and other works. He died in 1631; and was interred in St. Paul's cathedral, where a monument was erected to his memory. His writings shew him to have been a man of wit and learning, and he was, however, highly celebrated by all the great men of that age.

DONNINGTON, or **DUNNINGTON**, a town in Lincolnshire, 11 miles W. S. W. of Boston.

DONNOE, a small island in the North sea, near the coast of Norway.

DONOR, in law, the person who gives lands or tenements to another in tail, &c. as he to whom such lands, &c. are given, is the Donee.

DONZY, a town of France, in the department of Nievre, 22 miles N. of Nevers.

DOOMSDAY BOOK. See **DOMESDAY BOOK**.

DOOR, in architecture, an aperture in a wall, to give entrance and exit into and out of a building, or any apartment thereof. See **ARCHITECTURE**.

DOR, the common black beetle. See **SCARABÆUS**.

DORADO, in ichthyology. See **CORYPHENA**.

DORADO, in astronomy, a southern constellation, not visible in our latitude; it is also called *xiphias*. The stars of this constellation, in Sharp's catalogue, are six.

DORENA, a genus of the monogynia order, and pentandria class of plants. Corolla five-cleft; stigma emarginate: capsule one-celled. One species, viz. *D. japonica*, a native of Japan.

DORAN, a town of Arabia, in the country of Yemen, 28 miles S. of Sana. Lon. 44. 4. E. Lat. 14. 55. N.

DORAT, a town of France in the department of Upper Vienne, 24 miles N. of Limoges.

DORCAS. See **CAPRA**.

DORCHESTER, the capital of Dorsetshire, seated on the river Frome, on a Roman road, 35 miles E. of Exeter. Lon. 2. 45. W. Lat. 50. 42. N.

DORCHESTER, a town in Oxfordshire, 10 miles S. E. of Oxford. Lon. 1. 0. W. Lat. 51. 39. N.

DORCHESTER, a county of Maryland, in North America.

DORCHESTER NECK, a peninsula of Massachusetts, in Norfolk county.

DORDOGNE, a department of France, comprehending part of the late province of Perigord, bounded on the N. E. by that of the Upper Vienne, on the E. by those of the Lot and Correze, on the S. by that of the Lot and Garonne, on the W. by those of the Gironde and the Lower Charente, and on the N. W. by that of the Charente. Perigueux is the capital.

DORDOGNE, a river of France, which rises about 7 miles N. W. of Besse, and joins the Garonne, near Bourdeaux.

DORDRECHT, or **DORT**. See **DORT**.

DORE, a river of France, which rises in the department of the Puy-de-dome, and joins the Allier.

DORIC DIALECT, one of the five dialects, or manners of speaking, which obtained among the Greeks. It was first used by the Lacedemonians, and particularly those of Argos; thence it passed into Epirus, Libya, Sicily, the islands of Rhodes and Crete. In this dialect, Archimedes and Theocritus wrote, who were both of Syracuse; as well as Pindar. The Doric dialect is properly the manner of speaking peculiar to the Dorians, after their recess near Parnassus and Asopus; and which afterwards came to obtain among the Lacedemonians, &c. Most of the medals of the cities of Græcia Magna, and Sicily, favour of the Doric dialect in their inscription: e. g. *ΑΜΒΡΑΚΙΝΤΑΝ, ΑΙΟΛΑΩΝΙΑΤΑΝ, ΑΧΕΡΟΝΤΑΝ, ΑΧΥΡΙΑΝ, ΗΡΑΚΛΕΩΝΤΑΝ, ΤΡΑΧΙΝΙΩΝ, ΘΕΡΜΙΤΑΝ, ΚΑΤΑΟΝΙΑΤΑΝ, ΚΟΗΙΑΤΑΝ, ΤΑΤΜΟΝΙΑΤΑΝ, &c.* Which shews the countries wherein the Doric dialect was used. According to the Doric dialect, the vowels *η, ε, ι, ω*, are changed in *α*; the diphthong *ηι* into *α* or *αι*; and the consonants *β* into *γ*; *ζ* into *σδ*; *κ* and *ς* into *τ*; *τ* and *ς* into *κ*; *λ* with a *τ* or *ς* following it, into *ν*. Thus for *σητης, τρεχων, κλειδας, βασιλευς, &c.* they say *φατης, τρεχω, κλειδας, γλυφαρας, &c.* They likewise change *υ* into *ω*, as *λογω* for *λογυ*; also *εις* into *εις*, as *βασιλευς* for *βασιλεις*; *οι*, *αι*, and *οι* into *η*, as *κρης* for *κρας*, *εγεις* for *εγαιεις*, and *γεις* for *γταιεις*; with other transmutations of the like nature.

DORIC MODE, in music, the first of the authentic modes of the ancients. Its character is to be severe, tempered with gravity and joy; and is proper upon religious occasions, as also to be used

n war. It begins D, lá, sol, re. Plato admires the music of the Doric mode, and judges it proper to preserve good manners as being masculine; and on this account allows it in his commonwealth. The ancients had likewise their subdoric or hypodoric mode, which was one of the plagal modes. Its character was to be very grave and solemn: it began with re, a fourth lower than the Doric.

DORIC ORDER, the second of the five orders of architecture. It is usually placed upon the Attic base, though originally it had none. See **ARCHITECTURE**. At its first invention it was more simple than at present; and when in aftertimes they came to adorn and enrich it more, the appellation Doric was restrained to this richer manner, and the primitive simple manner they called by a new name, the Tuscan order, which was chiefly used in temples; as the former, being more light and delicate, was for porticoes and theatres.

DORIS, in ancient geography, a country of Greece, between Phocis, Thessaly, and Acarnania. It received its name from Dorus the son of Deucalion, who made a settlement there. It was called Tetrapolis, from its four cities, viz. Pindus or Dryopis, Erineum, Cytinium, and Borium. To these four some add Lilæum and Carphía, and therefore call it Hexapolis. The name of Doris has been common to many parts of Greece.

DORIS, in entomology, a genus of the class and order vermes testacea. Body oblong, flat beneath, creeping; mouth placed below; vent behind surrounded with a fringe; feelers two, retractile. There are twenty-four species.

D. ARGO, the **LEMON DORIS**, has an oval body, convex, marked with numerous punctures, of a lemon colour; the vent beset with elegant ramifications. It inhabits different parts of our seas, and is called about Brighthelmstone the sea lemon.

DORIS, in the mythology, the daughter of Oceanus and Tethys, wife of Nereus and mother of the Nereides.

DORMANT, in heraldry, is used for the posture of a lion, or any other beast, lying along in a sleeping attitude with the head on the fore paws; by which it is distinguished from the couchant, where though the beast is lying, yet he holds up his head.

DORMER, in architecture, signifies a window made in the roof of a house, or above the entablature, being raised upon the rafters.

DORMITORY, a gallery in convents or religious houses, divided into several cells, in which the religious sleep or lodge.

DORMITORY is sometimes used for a burying-place.

DORMOUSE. See **MYOXUS**.

DORNBERG, a town of Germany, in the Upper Rhine, and principality of Hesse, eight miles N. N. W. of Darmstadt.

DORNBURG, a town of Germany, in Upper Saxony, and principality of Weimar, 14 miles E. of Weimar.

DORNOCH, the county town of Sutherland, on the Frith of Dornoch in Scotland.

DORBERNIA, the Roman name of Canterbury.

DOROBOL, or **DOROHOL**, a town of European Turkey, in Moldavia, 68 miles N. W. of Jassi, and 142 N. W. of Bender.

DORONICUM, **LEOPARD'S BANE**: a genus of the polygamia superflua order, and syngenesia class of plants; natural order, **Compositæ**. Receptacle naked; pappus simple; scales of the calyx in a double row, longer than the disc; seeds of the radius naked without any pappus. It has three species natives of Spain, France, and Germany.

DORPT, a town of Russia, in Liyonia, 60 miles S. of Narva. Lon. 27. 52. E. Lat. 58. 18. N.

DORSETSHIRE, a county of England, bounded on the N. by Somersetshire and Wiltshire, on the E. by Hampshire, on the S. by the English channel, and on the W. by Devonshire. It is for the most part hilly: the soil is in general shallow, over a chalky bottom, but in some of the valleys very rich; the whole is estimated at 775,000 acres. The number of sheep kept in this country is averaged at upwards of 800,000. The chief towns are Dorchester, Lyme, Shaftesbury, Pool, Bridport, Wareham, Corf Castle, Weymouth, Melcomb Regis, Sherborn, Blandford, Cranborn, Bemister, Abbotsbury, Bere, Evershot, Milton Abbey, Frampton, Stalbridge, Sturminster, Cerne, and Winburn; of which the first nine are borough towns, and send each two members to parliament. The principal rivers are the Stour, the Frome, and the Piddle. The climate is mild and healthy.

DORSTEN, a town of Germany, in the circle of the Lower Rhine, 31 miles S. W. of Munster.

DORSTENIA, **CONTRAYERVA**, a genus of the monogynia order, and tetrandria class of plants; natural order, **Scabridæ**. Receptacle common, monophyllous, fleshy; seeds lying singly in the fleshy substance. There are eight species, low herbaceous plants; growing in the warm countries of America. See **PLATE XXXV.**

DORSUM, the **BACK**, in anatomy, comprehends all the posterior parts of the body from the neck to the buttocks. See **ANATOMY**.

DORT, or **DORDRECHT**, a city of Holland, in the department of Delft, and late province of Holland, ten miles S. E. of Rotterdam. Lon. 4. 48. E. Lat. 51. 50. N.

DORT, **SYNOD OF**, a national synod, summoned by authority of the States General, the provinces of Holland, Utrecht, and Overysel excepted, and held at Dort in 1618. The most eminent divines of the United Provinces, and deputies from the churches of England, Scotland, Switzerland, Bremen, Hussia, and the Palatinate, assembled on this occasion, in order to decide the controversy between the Gomarists or Calvinists, and Arminians: the latter were declared corrupters of the true religion. But the authority of this synod was far from being universally acknowledged either in Holland or in England. The provinces of Friesland, Zealand, Utrecht, Guelderland, and Groningen, could not be persuaded to adopt their decisions: and they were opposed by king James I. and archbishop Laud in England. The liberty of private judgement with respect to the doctrines of predestination and grace, which the spirit that prevailed among the divines of Dort seemed so much adapted to discourage and suppress, acquired new vigour in consequence of the arbitrary proceedings of this assembly.

DORTMUND, a city of Germany, in Westphalia, 35 miles N. E. of Cologne. Lon. 7. 35. E. Lat. 51. 26. N.

DORYPHORI, [from *dory*, a spear, and *phor*, to bear,] an appellation given to the life-guard men of the Roman emperors.

DOSE, [*δοσις*,] so much of any medicine as is taken at one time.

DOSITHEANS, or **DOSITHEI**, an ancient sect among the Samaritans in the first century. They were named after their leader, Dositheus, mentioned by Origen, Epiphanius, Jerom, and other Greek and Latin fathers: But the learned are not at all agreed as to the time wherein he lived. St. Jerom, in his Dialogue against the Luciferians, places him before our Saviour; wherein he is followed by Drusius, who in his answer to Serrarius places him about the time of Sennacherib king of Assyria. But Scaliger will have him posterior to our Saviour's time: And Origen intimates him to have been contemporary with the apostles; where he observes, that he endeavoured to persuade the Samaritans that he was the Messiah foretold by Moses. He had many followers; and his sect was still subsisting at Alexandria in the time of the Patriarch Eulogius, as appears from a decree of that patriarch published by Phocius. In that decree Eulogius accuses Dositheus of injuriously treating the ancient patriarchs and prophets, and attributing to himself the spirit of prophecy. He makes him contemporary with Simon Magus; and accuses him of corrupting the Pentateuch in divers places, and of composing several books directly contrary to the law of God. Archbishop Ussher takes Dositheus to have been the author of all the changes made in the Samaritan Pentateuch, which he argues from the authority of Eulogius. But all we can justly gather from the testimony of Eulogius is, that Dositheus corrupted the Samaritan copies since used by that sect; but that corruption did not pass into all the copies of the Samaritan Pentateuch now in use among us, many of which vary but little from the Jewish Pentateuch.

DOTHAN, in ancient geography, a city twelve miles N. of Samaria, 44 of Jerusalem, and six W. of Tiberias; where Joseph was sold to the Ishmaelites, and where Elisha struck the Syrians blind.

DOTTEREL, a bird. See **CHARADRIUS**.

DOUARNENEZ, a sea-port town of France, in the department of Finisterre, 10½ miles N. W. of Quimper.

DOUAY, a considerable town of France, in the department of the North, and late French Flanders, 15 miles N. W. of Cambray. Lon. 3. 10. E. Lat. 50. 22. N.

DOUBLE CAST, in husbandry, a term used by the farmers for that method of sowing that does not dispense the necessary quantity

tity of seed for a piece of land at one bout, but requires going over every place twice.

DOUBLE FICHE', or **DOUBLE FICHY,** in heraldry, the denomination of a cross, when the extremity has two points; in contradistinction to *fiché*, where the extremity is shaped away to one point.

DOUBLE LETTER, in grammar, a letter which has the force and effect of two. The Greeks have three of these, viz. α , β , γ ; the Latins have two X and Z ; and most of the modern languages have the same.

DOUBLE POINT, in geometry, is one point considered as two infinitely near ones, belonging to geometrical curve lines.

DOUBLE OCTAVE, in music, an interval composed of 15 notes in diatonic progression, and which, for that reason, is called a fifteenth. "It is (says Rousseau) an interval composed of two octaves, called by the Greeks *disdiapason*." It deserves, however, to be remarked, that in intervals less distant and compounded, as in the third, the fifth, the simple octave, &c. the lowest and highest extremes are included in the number from whence the interval takes its name. But, in the double octave, when termed a fifteenth, the simple number of which it is composed gives the name. This is by no means analogical, and may occasion some confusion. We should rather choose, therefore, to run any hazard which might occur from uniformly including all the terms of which the component intervals consist, and call the double octave a sixteenth, according to the general analogy.

DOUBLE EMPLOYMENT, in music, a name given by M. Rameau to the two different manners in which the chord of the subdominant may be regarded and treated, viz. as the fundamental chord of the sixth superadded, or as the chord of the great sixth, inverted from a fundamental chord of the seventh. In reality, the chords carry exactly the same notes, are figured in the same manner, are employed upon the same chord of the tone, in such a manner, that frequently we cannot discern which of the two chords the author employs, but by the assistance of the subsequent chord, which resolves it, and which is different in these different cases. To make this distinction, we must consider the diatonic progress of the two notes which form the fifth and the sixth, and which, constituting between them the interval of a second, must one or the other constitute the dissonance of the chord. Now, this progress is determined by the motion of the bass. Of these two notes, then, if the superior be the dissonance, it will rise by one gradation into the subsequent chord, the lower note will keep its place, and the higher note will be a superadded sixth. If the lower be the dissonance, it will descend into the subsequent chord, the higher will remain in its place, and the chord will be that of the great sixth.

DOUBLE PLEA, [*duplex placitum*, Lat.] is that in which the defendant alleges for himself two several matters, in bar of the action, whereof either is sufficient to effect his desire in debarring the plaintiff.

DOUBLE-QUARREL, is a complaint made by any clerk or other to the archbishop of the province, against an inferior ordinary, for delaying justice in some cause ecclesiastical. The effect is, that the archbishop directs his letters, under the authentical seal, to all clerks of his province, commanding them to admonish the said ordinary within nine days to do the justice required, or otherwise to cite him to appear before him or his official: and lastly to intimate to the said ordinary, that if he neither performs the thing enjoined, nor appears at the day assigned, he himself will proceed to perform the justice required. And this seems to be termed a double-quarrel, because it is most commonly made against both the judge, and him at whose petition justice is delayed.

DOUBLET, among lapidaries, implies a counterfeit stone composed of two pieces of crystal, and sometimes glass softened, together with proper colours between them: so that they make the same appearance to the eye as if the whole substance of the crystal had been tinged with these colours. See **GLASS**, **COLOURING OF**.

DOUBLETS, a game on dice within tables.

DOUBLING, among hunters, is applied to a hare, which is said to double, when she keeps in plain fields, and winds about to deceive the hounds.

DOUBLING, in the manege, a term used of a horse, who is said to double his reins, when he leaps several times together, to throw his rider.

DOUBLING, in the military art, is the putting two ranks or files of soldiers into one. Thus, when the word of command is, *double* your ranks, the second, fourth, and sixth ranks march into the first, third, and fifth, so that the six ranks are reduced to three, and the intervals between the ranks become double what they were before.

DOUBLING UPON, in naval tactics, the act of inclosing any part of a hostile fleet between two fires, or of cannonading it on both sides. It is usually performed by the van or rear of that fleet which is superior in number, taking the advantage of the wind, or other circumstances, and tacking or veering round the van or rear of the enemy, who will thereby be exposed to great danger, and can scarcely avoid being thrown into general confusion.

DOUBLING A CAPE OR POINT, in navigation, signifies the coming up with it, passing by it, and leaving it behind the ship.

DOUBLINGS, in heraldry, the linings of robes and mantles of state, or of the mantlings in achievements.

DOUBE, a department of France, bounded on the E. by the Helvetic republic. It comprehends part of the late province of Franche Comté. Besançon is the capital.

DOUBS, or **DOUX,** a river of France, which rises at the foot of Mount Jura, and runs into the Saone, near Verdun.

DOUBTING, the act of with-holding our assent from any proposition, on suspicion that we are not able peremptorily to decide between the reasons for and against it. Doubting is distinguished by the schoolmen into two kinds, *dubitatio sterilis*, and *dubitatio efficax*. The former is that where no determination ensues: in this manner the Sceptics and Academics doubt, who with-hold their assent from every thing. See **SCEPTICS**, &c. The latter is followed by judgement, which distinguishes truth from falsehood: such is the doubting of the Peripatetics and Cartesians. The last in particular perpetually inculcate the deceitfulness of our senses, and tell us that we are to doubt of every one of their reports, till they have been examined and confirmed by reason. On the other hand, the Epicureans teach, that our senses always tell truth; and that, if we go ever so little from them, we come within the province of doubting.

DOUBTING, in rhetoric, a figure whereon the orator appears some time fluctuating, and undetermined what to do or say. Tacitus furnishes us with an instance of doubting, almost to a degree of distraction, in those words of Tiberius written to the senate: *Quid scribam, P. S. aut quomodo scribam, aut quid omnino non scribam hoc tempore, dii me deique pejus perdant quam perire quotidie sentio, si scio.*

DOUCINE, in architecture, a moulding concave above and convex below, serving commonly as a cymatium to a delicate cornice. It is likewise called *gula* and *cymatium*.

DOUE, a town of France, in the department of Maine and Loire, 20 miles S. of Angers.

DOVE, a river in Derbyshire, which falls into the Trent, 4 miles N. of Burton.

DOVE, in ornithology. See **COLUMBA**.

DOVER, a borough and sea-port town of England, in Kent. The cliffs, which are very high, afford a fine prospect of the French coast. Dover lies 15 miles S. of Canterbury, 21 miles N. of Calais, and 72 S. E. of London. Lon. 1. 23. E. Lat. 51. 8. N.

DOVER, a town and township of the United States, in Stafford county, New Hampshire.

DOVER, the metropolis of Delaware state, in Kent county, on the S. W. side of Jones creek, 76 miles S. S. W. of Philadelphia.

DOVER, STRAITS OF, the narrow channel between Dover and Calais, which separates Great Britain from the French coast. Britain is supposed by many to have been once peninsulated, the present straits occupying the site of the isthmus which joined it to Gaul. "No certain cause (says Mr. Pennant, in his *Arct. Zool.* vol. i. *Introd.* p. ii.) can be given for the mighty convulsion which tore us from this continent; whether it was rent by an earthquake, or whether it was worn through by the continual dashing of the waters." "The correspondency of strata, (he adds) on part of the opposite shores of Britain and France, leaves no room to doubt but that they were once united. The chalky cliffs of Blancnez between Calais and Boulogne, and those to the westward of Dover, exactly tally; the last are vast and continued; the former short, and

and the termination of the immense bed. Between Boulogne and Folkstone (about six miles from the latter) is another memorial of the junction of the two countries; a narrow submarine hill, called the Rip-raps, about a quarter of a mile broad, and ten miles long, extending eastwards towards the Goodwin Sands. Its materials are boulder stones, adventitious to many strata. The depth of water on it, in very low spring tides, is only 14 feet. The fishermen from Folkstone have often touched it with a 15 feet oar; so that it is justly the dread of navigators. Many a tall ship has perished on it, and sunk instantly into twenty-one fathoms of water. In July 1782, the *Belleisle* of 64 guns struck, and lay on it during three hours; but, by starting her beer and water, got clear off." These celebrated straits are only 21 miles wide in the narrowest part. From the pier at Dover to that of Calais 24. It is said that their breadth is diminishing, and that they are two miles narrower than they were in ancient times.

DOVE-TAILING, in carpentry, is the manner of fastening boards together by fitting one piece into another, in the form of the tail of a dove. The dove-tail is the strongest of the assemblages or jointings, because the tenon, or piece of wood which is put into the other, goes widening to the extreme, so that it cannot be drawn out again because the extreme or tip is bigger than the hole.

DOUGLAS, the capital of the Isle of Man, seated on the eastern side. Lon. 4. 25. W. Lat. 54. 7. N.

DOUGLASSIA, in botany, a genus of the polyadelphia polyandria class and order. Calyx half six-cleft, corolla none; nectary six; filaments none; germ superior; stigma six-cleft; berry ovate, one-celled; seed one, with a brittle shell. It has but one species, viz. *D. guianensis*, *guiana douglassia*.

DOULEIA, [*δουλειά*], in antiquity, a punishment among the Athenians, by which the criminal was reduced to the condition of a slave. It was never inflicted upon any but the *ατιμοι*, sojourners and freed servants.

DOULENS, or **DOURLENS**, a town of France, in the department of Somme, and late province of Picardy, 15 miles N. of Amiens. Lon. 2. 23. E. Lat. 50. 10. N.

DOURAK, a town of Persia, near the confluence of the Euphrates and Tigris; remarkable for the reeds of which the Persians make their pens. Lon. 56. 57. E. Lat. 32. 15. N.

DOURDAN, a town of France, in the department of Seine and Oise, and late province of the Isle of France, 25 miles S. W. of Paris.

DOURLACH, a town of Germany, in Suabia, 12 miles S. of Philipsburgh. Lon. 9. 28. E. Lat. 49. 2. N.

DOURO, or **DOUERO**, a river of Spain, which rises in Old Castile, in the Sierra of Urbion, and after crossing Portugal, falls into the Atlantic near Oporto.

DOUSE, in sea language, is to lower suddenly, or slacken; and it is applied to a sail in a squall of wind, an extended hawser, &c.

DOUW, **GERHARD**, a celebrated painter, born at Leyden in 1613. He received his first instructions from Bartholomew Doendo, an engraver, and Peter Kouwohoorn a painter on glass; but at the age of 15 he became a disciple of Rembrandt. His pictures are usually of a small size, with figures so exquisitely touched, so transparent, so wonderfully delicate, as to excite astonishment as well as pleasure. He designed every object after nature, and with an exactness so singular, that each figure appears as perfect as nature itself, in respect to colour, freshness, and force. It is incredible what vast sums have been and still are given for his paintings. He was exceedingly curious in finishing them, and patiently assiduous beyond example. Of that patience Sandrart gives a strong instance. Having once, in company with Bamboccio, visited Douw, they could not forbear admiring the prodigious neatness of a picture which he was then painting, in which they took particular notice of a broom; and expressing their surprise at the excessive neatness of the finishing that minute object, Douw told them he should spend three days more on that broom before he should account it complete. In a family picture of Mrs. Spiering, the same author says, that the lady had sat five days for the finishing one of her hands that leaned on an armed-chair. Few, therefore, would sit to him for their portraits; so he indulged himself mostly in works of fancy, in which he could introduce objects of still life, and employ as much time on them as suited his incli-

nation. Houbraken testifies, that his great patron Mr. Spiering allowed him 1000 guilders a year, and Sandrart assures us, that this pension was paid him on no other consideration, than that he should give his benefactor the option of every picture he painted, for which he was immediately to receive the utmost of his demand. Douw died in 1674, aged 61. He is doubtless the most wonderful in his finishing of all the Flemish masters. His colouring has exactly the true and lovely tints of nature; and whatever pains he may have taken, there is no look of labour or stiffness. His pictures are also remarkable, not only for retaining their original lustre, but for having the same beautiful effect at any distance.

DOWAGER, is a title applied chiefly, if not solely, to the widows of princes, dukes, earls, and persons of high rank. See **QUEEN DOWAGER**.

DOWER, [*Dotarium*, *Doarium*, or *Dos*], in law, a portion of lands or tenements which a widow enjoys for term of life from her husband, in case she survives him: and which, at her death, descends to their children. See **JOINTURE**.

DOWLAS HEAD, a cape of Ireland, on the coast of Kerry in Munster.

DOWLATABAD, or **DOWLET-ABAD**, a province in the Deccan of Hindostan, formerly called Amednagur, bounded on the N. by Candeish and Malwa; on the W. by the Balagat mountains; on the S. by Visiapour and Golconda, and on the E. by Berar. It is also called Balagat. Aurundabad is the chief city.

DOWLATABAD, **DOWLET-ABAD**, or **AMEDNAGUR**, a town and fort in the above province, 15 miles from Aurungabad. Lon. 76. 0. E. Lat. 19. 55. N.

DOWN, in commerce, the fine feathers from the breasts of several birds, particularly of the duck kind. That of the eider duck, see **ANAS**, is the most valuable. Three pounds of this down may be compressed into a space scarce bigger than one's fist; yet is afterwards so dilatable as to fill a quilt five feet square. (*Salern. Orn. p. 416.*)

DOWN, in geography, a county of Ireland in the province of Ulster, bounded on the E. and S. by the Irish sea; on the W. by the county of Armagh; and on the N. by that of Antrim. It lies opposite to the Isle of Man, Cumberland, and Westmoreland; and the N. part of it fronts the Mull of Galloway in Scotland, and is about 44 miles from it.

DOWN, or **DOWN-PATRICK**, the capital of the above county, one of the most ancient in that kingdom. It is 74 miles N. E. of Dublin. Lon. 5. 50. W. Lat. 54. 23. N.

DOWNHAM, a town of Norfolk, 35 miles N. E. of Cambridge.

DOWNINGS, a town of Pennsylvania, in Chester county, 33 miles W. by N. of Philadelphia.

DOWNS, [from *Dune*, Fr. of *Dun*, Celt. a mountain,] a bank or elevation of sand, which the sea gathers and forms along its shores; and which serves it as a barrier.

Downs, a famous road for ships, extending six miles along the E. coast of Kent, between N. and S. Foreland; where both the outward and homeward-bound ships frequently make some stay; and squadrons of men of war rendezvous in time of war. It affords excellent anchorage; and is defended by the castles of Deal, Dover, and Sandwich, as well as by Goodwin Sands.

DOWNTON, or **DUNKTON**, an ancient borough in Wiltshire, 84 miles W. S. W. of London.

DOWRY, [*dos*], is properly the money or fortune which the wife brings her husband in marriage: it is otherwise called *maritimum*, marriage-goods, and differs from dower. See **DOWER**. Among the Germans it was customary, in former times for the husband to bring a dowry to his wife.

Dowry is also used, in a monastic sense, for a sum of money given along with a maid, upon entering her in some religious order.

DOXOLOGY, [*δοξα* and *λογος*], a form of giving glory to God.

Doxology, a hymn used in praise of the Almighty, distinguished by the title of greater and less. Both the doxologies have a place in the church of England, the former being repeated after every psalm, and the latter used in the communion service.

1. **DOXOLOGY, THE GREATER**, or the angelic hymn, was of great

great note in the ancient church. It began with these words, which the angels sung at our Saviour's birth, Glory be to God on High, &c. It was chiefly used in communion service, and in private devotions.

2. **DOXOLOGY, THE LESS**, was anciently only a single sentence, without response, running in these words, 'Glory be to the Father, and to the Son, and to the Holy Ghost, world without end, Amen.' Part of the latter clause, 'As it was in the beginning, is now, and ever shall be,' was inserted some time after the first composition.

DRABA, a genus of the siliculosa order, and tetradynamia class of plants; natural order, Siliquosa. Silicula entire, oval oblong; valves a little plain, parallel to the partition; no style. There are nine species.

DRABLER, in the sea language, a small sail in a ship, which is the same to a bonnet, that a bonnet is to a course, and is only used when the course and bonnet are too shoal to clothe the mast.

DRABLING, in angling, is a method of catching barbel. Take a large line of six yards; which, before fastening it to the rod, must be put through a piece of lead, that if the fish bite, it may slip to and fro, and that the water may something move it on the ground; bait with a lobe worm well secured, and so by its motion the barbel will be enticed into the danger without suspicion. The best places are in running water near piles, or under wooden bridges, supported with oaks floated and slimy.

DRABS, in the salt-works, a kind of wooden boxes for holding the salt when taken out of the boiling pan; the bottoms of which are made shelving or inclining forwards, that the briny moisture of the salt may drain off.

DRAC, an imaginary being, formerly much dreaded by the country people in many parts of France. The dracs were supposed to be malicious or at least tricksome demons; but which was very rare, if one of them happened to take a fancy to a man or woman, they were sure to be the better for it.

DRACENA, a genus of the monogynia order, and hexandria class of plants. Corolla sexpartite, erect; filaments a little thicker about the middle; berry trilobular, monospermous. It has nine species, natives of the East Indies.

DRACHM, a Grecian coin, of the value of $\frac{73}{4}$ d. Drachm is also a weight used by our physicians; containing just sixty grains, three scruples, or the eighth part of an ounce. See COIN.

DRACO, a celebrated lawgiver of Athens. When archon, he made a code of laws for his fellow citizens, wherein all crimes were made capital; and even idleness was punished with death as well as murder. These laws were at first enforced, but they were afterwards neglected on account of their extreme severity; and Solon totally abolished them, except that one which punished a murderer with death. The respect of Draco's admirers proved fatal to him. When at Ægina, he appeared on the theatre, he was received with repeated applause; but the people, according to the custom of the Athenians, shewing their respect by throwing their garments upon him, they did it in such profusion, that Draco was soon hid under them, and smothered. He lived about B. C. 624.

DRACO, a constellation. See ASTRONOMY.

DRACO, the **DRAGON**, in zoology, a genus of the class and order amphibia reptilia; legs four; tail cylindrical; wings two, membranaceous, radiated like the fins of a fish, by which he is enabled to fly, but not to any great distance at a time. There are two species, both harmless creatures, feeding on flies, ants, and small insects, viz.

1. **DRACO PRÆPOS**, with the wings fixed to the fore-legs. It is a native of America.

2. **DRACO VOLANS**, the **FLYING DRAGON**, with the wings entirely distinct from the fore-legs. It is found in America and the East Indies. See Plate LIV. fig. 14.

DRACO VOLANS, in meteorology, a fiery exhalation, frequent in marshy and cold countries. It is most common in summer; and though principally seen playing near the banks of rivers, or in boggy places, yet sometimes mounts up to a considerable height in the air: its appearance being that of an oblong, sometimes roundish, fiery body, with a long tail. It is entirely harmless.

DRACOCEPHALUM, **DRAGON'S HEAD**, a genus of the gymnospermia order, and didynamia class of plants. Corolla throat inflated, upper lip concave. There are fifteen species, most of them herbaceous, annual or perennial plants, from 18

inches to 3 feet high, garnished mostly with entire leaves, and whorled spikes of small monopetalous and ringent flowers, of a blue, white, or purple colour.

DRACONARIUS, [*Δρακοναριος* and *Δρακονοειδης*,] in antiquity, dragon-bearer. The Persians, Parthians, Scythians, &c. bore dragons on their standards; whence the standards themselves were called Dracones.

DRACONES, among the Romans, were figures of dragons painted in red on their flags, as appears from Ammianus Marcellinus; but among the Persians and Parthians they were like the Roman eagles, figures in full relieve; so that the Romans were frequently deceived, and took them for real dragons.

DRACONTIC MONTH, the time of one revolution of the moon from her ascending node, called *caput draconis*, to her return thither.

DRACONTIUM, **DRAGONS**; a genus of the polyandria order, and gynandria class of plants; natural order, Pipérac. Spathia cymbiform, or shaped like a boat; spadix covered all over; no calyx; petals five; berries polyspermous. There are five species, all natives of the Indies.

DRACUNCULI, in medicine, small long worms which breed in the muscular part of the arms and legs, called Guinea worms. The common way of getting out these worms is by the point of a needle; and to prevent their forming again, to wash the parts with wine, vinegar, alum, nitre, or common salt, or with a strong lixivium, of oak-ashes, and afterwards anointing them with an ointment of the common kind used for scorbutic eruptions, with a small mixture of quicksilver.

DRAG, in sea language, is a machine consisting of a sharp, square, iron ring, encircled with a net, and commonly used to take the wheel off from the platform or bottom of the decks. The word is also used for whatever hangs over the ship in the sea, as shirts, coats, or the like; boats, when towed, or whatever else may retard the ship's way when she sails.

DRAGOMAN, or **DROGMAN**, a term of general use through the East for an interpreter, whose office is to facilitate commerce between the orientals and occidentals.

DRAGON, [*draco*, Lat.] See DRACO.

DRAGON FLY. See LIBELLULA.

DRAGONE, in heraldry, where the upper half resembles a lion or other beast, the other half going off like the hinder part of a dragon.

DRAGONS, in botany. See ARUM, and DRACONTIUM.

DRAGONS-BLOOD, a gummi-resinous substance brought from the East-Indies, either in oval drops wrapped up in flag leaves, or in large masses composed of smaller tears. It is said to be obtained from the palmijuncus draco, the calamus rotang, the dracena draco, the pterocarpus draco, and several other vegetables. The writers on the materia medica prefer the former, though the others are often of equal goodness. The fine dragon's blood of either sort breaks smooth, free from any visible impurities, of a dark red colour, which changes upon being powdered into an elegant bright crimson. Several artificial compositions, coloured with the true dragon's blood, or Brazil wood, are sometimes sold for this commodity. A solution of dragon's blood in the spirit of wine is used for staining marble, to which it gives a red tinge, which penetrates more or less deeply according to the heat of the marble during the time of application. But as it spreads at the same time that it sinks deep, for fine designs the marble should be cold. Mr. Du-Fay says, that by adding pitch to this solution the colour may be rendered deeper.

DRAGONS HEAD AND TAIL, [*caput & cauda draconis*] in astronomy, are the nodes of the planets; or the two points wherein the ecliptic is intersected by the orbits of the planets, and particularly that of the moon; making with it angles of $5^{\circ} 18'$. The northern is called the ascending node, and the southern the descending node. These points have a retrograde motion in the zodiac, $3^{\circ} 11'$ per day; completing their circle in 18 years 225 days: so that the moon can be but twice in the ecliptic during her monthly period, but at all other times she will have a latitude or declination from the ecliptic. About these points of intersection all eclipses happen. They are usually denoted by these characters ♄ dragon's head, and ♆ dragon's tail; thus by ♄ ♄ $14^{\circ} 29' 59'' 59'' 17'''$ is meant that the moon's ascending node is in $14^{\circ} 29' 59'' 59'' 17'''$ of Capricorn, consequently the moon's ♆ is in ♄ $14^{\circ} 29' 59'' 59'' 17'''$.

DRAGOON, [from *dragen*, German, to carry] a kind of soldier that serves indifferently either on foot or horseback.

DRAGOONS are divided into brigades as the cavalry; and each regiment into troops; each troop having a captain, lieutenant, cornet, quarter-master, two serjeants, three corporals, and two drums. They are very useful on any expedition that requires dispatch; for they can keep pace with the cavalry, and do the duty of infantry: they encamp generally on the wings of the army, or at the passes leading to the camp; and sometimes they are brought to cower the general's quarters; they march in front and rear of the army. The first regiment of dragoons raised in England was in 1681, and called the regiment of dragoons of North Britain. In battles or attacks they generally fight sword in hand after the first fire. Their arms are, a sword, firelock, and bayonet.

DRAGOONING, one of the methods used by Papists for converting refractory heretics. The troopers, soldiers, and dragoons went into the Protestants' houses, where they marred and defaced their household stuff, broke their looking-glasses, and other utensils and ornaments, let their wine run about their cellars, and threw about their corn and spoiled it. Those things which they could not destroy in this manner, such as furniture of beds, linens, wearing apparel, plate, &c. they carried to the market-place, and sold them to the Jesuits and other Roman Catholics. By these means the Protestants in Montauban alone were, in four or five days, stripped of above a million of money. Besides this they exercised upon them the most horrid barbarities that can possibly be conceived.

DRAGUIGNAN, a town of France, in the department of Var. Lon. 6. 35. E. Lat. 43. 31. N.

DRAINS, and **DRAINING**. See **HUSBANDRY**.

DRAKE, in ornithology. See **ANAS**.

DRAKE, **SIR FRANCIS**, the renowned English admiral, was the son of Edmund Drake a sailor, and born near Tavistock in Devonshire, in 1545. He was brought up under the care of Sir John Hawkins, who was his kinsman. In 1570, he made his first expedition with two ships; and in 1571, with one only, in which he returned safe, if not with such advantages as he expected. He made another expedition in 1572, wherein he gained considerable booties. In these expeditions he was much assisted by a nation of Indians, who then were, and have been ever since, engaged in perpetual wars with the Spaniards. The prince of these people was named Pedro; to whom Drake presented a fine cutlass from his side, which he saw the Indian greatly admired. Pedro, in return, gave him four large wedges of gold: which Drake threw into the common stock, saying, That he thought it but just that such as bore the charge of so uncertain a voyage on his credit, should share the utmost advantage that voyage produced. His success in this expedition, joined to his honourable behaviour towards his owners, gained him a high reputation; and the use he made of his riches, a still greater. For, fitting out three stout frigates at his own expence, he sailed with them to Ireland; where under Walter earl of Essex, he served as a volunteer, and performed many exploits. Sir Christopher Hatton introduced him to Q. Elizabeth, to whom he proposed a voyage into the South Seas through the Straights of Magellan; which was what hitherto no Englishman had ever attempted. The project was well received at court: the queen furnished him with means; and his own fame quickly drew together a sufficient force. The fleet with which he sailed, on this extraordinary undertaking, consisted only of five vessels, small when compared with modern ships, and no more than 164 able men. He sailed on the 13th Dec. 1577; on the 25th fell in with the coast of Barbary, and on the 29th with cape Verd. On the 13th March he passed the equinoctial, made the coast of Brazil on the 5th April, and entered the River de la Plata, where he lost the company of two of his ships; but meeting them again, and taking out their provisions, he turned them adrift. On the 29th May he entered the port of St. Julian's, where he continued two months for the sake of laying in provisions: on the 20th Aug. he entered the Straits of Magellan, and on the 25th Sept. passed them, having then only his own ship. On the 25th Nov. he came to Machao, which he had appointed for a place of rendezvous in case his ships separated; but captain Winter, his vice-admiral, having repassed the Straits, was returned to England. Thence he continued his voyage along the coasts of Chili and Peru, taking all opportunities of seizing Spanish ships, and attacking them on shore, till his men were sated with plunder; and

then, coasting America to the height of 48°, he endeavoured to find a passage that way back into our seas, but could not. However, he landed, and called the country New Albion, taking possession of it in the name of queen Elizabeth; and, having careened his ship, set sail from thence, on the 29th Sept. 1579, for the Moluccas. He is supposed to have chosen this passage round, partly to avoid being attacked by the Spaniards at a disadvantage, and partly from the lateness of the season, whence dangerous storms and hurricanes were dreaded. On the 13th Oct. he fell in with certain islands inhabited by the most barbarous people he had met with in all his voyage: on the 4th Nov. he had a sight of the Moluccas; and, coming to Ternate, was extremely well received by the king thereof, who appears, from the most authentic relations of this voyage, to have been a wise and polite prince. On the 10th Dec. he made Celebes; where his ship unfortunately ran upon a rock, the 9th Jan. following; from which, beyond all expectation, and almost miraculously, they got off, and continued their course. On the 16th March he arrived at Java Major; and on the 25th began to think of returning home. On the 15th June he doubled the Cape of Good Hope, having then on board 57 men, and but three casks of water. On the 12th July he passed the line, reached the coast of Guinea on the 16th, and there watered. On the 11th Sept. he made the island of Tercera; and on the 3d Nov. entered the harbour of Plymouth. This voyage round the world was performed in two years and about ten months. Shortly after his arrival, the queen going to Deptford, went on board his ship; where, after dinner, she conferred on him the order of knighthood, and declared her absolute approbation of all he had done. She likewise gave directions for the preservation of his ship, that it might remain a monument of his own and his country's glory. This celebrated ship, which had been contemplated many years at Deptford, at length decaying, it was broke up, and a chair, made out of the planks, was presented to the university of Oxford. In 1585, he sailed with a fleet to the West-Indies; and took the cities of St. Jago, St. Domingo, Carthagena, and St. Augustin. In 1588, he went to Lisbon with a fleet of 30 sail; and having intelligence of a great fleet assembled in the bay of Cadiz, which was to have made part of the armada, he with great courage entered that port, and burnt there upwards of 10,000 tons of shipping: which he afterwards merrily called burning the king of Spain's beard. In 1588, when the armada from Spain was approaching our coasts, Sir Francis Drake was appointed vice-admiral under Charles lord Howard of Effingham, high admiral of England, where fortune favoured him as remarkably as ever: for he made prize of a very large galleon, commanded by Don Pedro de Valdez, who was reputed the projector of this invasion; and who surrendered, as soon as he learned it was Drake who summoned him. This Don Pedro remained about two years Sir Francis Drake's prisoner in England; and, when he was released, paid him for his own and his captain's liberties, a ransom of 3500*l*. Drake's soldiers were well recompensed with the plunder of this ship; for they found in it 55,000 ducats of gold, which was divided among them. After this he went to the West-Indies with Sir John Hawkins, but the two commanders disagreeing in their plans, little was done by them. Drake died off Nombre de Dios in 1596. He was representative for the town of Plymouth, to which he was a great benefactor, by causing water to be conveyed to it from springs at eight miles distance.

DRAM, [from *drachm*, *drachma*, Latin,] the eighth part of an ounce.

DRAMA, [*δραμα*,] a poem accommodated to action; a poem in which the action is not related, but represented; and in which therefore such rules are to be observed as make the representation probable. The principal species of the drama are two, comedy and tragedy. Some others there are of less note, as pastoral, satire, tragi-comedy, opera, &c. See **POETRY**.

DRANK, among farmers, a term used to denote wild oats, which never fail to infest worn-out lands; so that when plowed lands run to these weeds and thistles, the farmer knows it is high time to fallow them, or else to sow them with hay-seed, and make pasture of them. Some, indeed, destroy the drank, by sowing the lands with beans, and letting loose sheep upon them when young. This must be done in dry weather, and the sheep eat up the drank and other weeds, without touching the beans.

DRAPERY, in sculpture and painting, signifies the representation of the clothing of human figures, and also hangings, tapestry, curtains,

curtains, and most other things that are not carnations or landscapes. See **DRAWING** and **PAINTING**.

DRASTIC, [δραστικόν,] in physic, an epithet bestowed on such medicines as are of present efficacy, and potent in operations; and is commonly applied to emetics and cathartics.

DRAVE, a large navigable river of Germany, which rises in the archbishopric of Salzburg, and falls into the Danube at Esseck.

DRAUGHT, in architecture, or as it is pronounced *Draft*, the figure of an intended building described on paper; wherein are laid down, by scale and compasses, the several divisions and partitions of the apartments, rooms, doors, passages, conveniences, &c. in their due proportion. It is exceedingly convenient, before a building is begun to be raised, to have draughts of the ichnography, or ground plot of each floor; as also of the form and fashion of each front, with the windows, doors, ornaments, &c. in an orthography, or upright. Sometimes the several fronts, &c. are taken, and represented in the same draught, to shew the effect of the whole building: this is called a scenography, or perspective.

DRAUGHT, in medicine. See **POTION**.

DRAUGHT, in trade, called also *Cloff* or *Clouch*, is a small allowance on weighable goods, made by the king to the importer, or by the seller to the buyer, that the weight may hold out when the goods are weighed again. The king allows 1 lb. draught for goods weighing no less than 1 Cwt. 2 lb. for goods weighing between 1 and 2 Cwt. 3 lb. for goods weighing between 2 and 3 Cwt. 4 lb. from 3 to 10 Cwt. 7 lb. from 10 to 18 Cwt. 9 lb. from 18 to 30 or upwards.

DRAUGHT is also used sometimes for a bill of exchange, and commonly for an order for the payment of any sum of money due, &c. The person who gives the order is said to draw upon the other.

DRAUGHT HOOKS, large hooks of iron, fixed on the cheeks of a cannon carriage, two on each side, one near the trunnion hole, and the other at the train, distinguished by the name of fore and hind. Large guns have draught hooks near the middle transom, to which are fixed the chains that serve to keep the shafts of the limbers on a march. The fore and hind hooks are used for drawing a gun backwards or forwards, by men with strong ropes, called draught ropes, fixed to these hooks.

DRAUGHT HORSE, in farming, a sort of coarse made horse, destined for the service of a cart or plough.

DRAUGHT, to draw off troops from the main army, or out of one regiment into another.

DRAW, in the sea-language, a ship is said to draw so much water, according to the number of feet she sinks into it; so that if a ship sinks into the water 18 feet perpendicularly, she is said to draw 18 feet water; and according as she draws more or less, she is said to be of more or less draught.

DRAWBACK, in commerce, certain duties, either of the customs or of the excise, allowed upon the exportation of some of our own manufactures; or upon certain foreign merchandise, that have paid duty on importation. The oaths of the merchants importing and exporting are required, to obtain the drawback on foreign goods, affirming the truth of the officers certificate on the entry, and the due payment of the duties: and these may be made by the agent or husband of any corporation or company; or by the known servant of any merchant usually employed in making his entries, and paying his customs. In regard to foreign goods entered outward, if less quantity or value be fraudulently shipped out than what is expressed in the exporter's certificate, the goods therein mentioned, or their value, are forfeited, and no drawback is allowed. Foreign goods exported by certificate in order to obtain the drawback, not shipped or exported, or re-landed in Great Britain, unless in case of distress to save them from perishing, lose the benefit of the drawback, and are forfeited, or their value, with the vessel, horses, carriages, &c. employed in the relanding thereof; and the persons employed in the relanding them, or by whose privity they are re-landed, or into whose hands they shall knowingly come, are to forfeit double the amount of the drawback. Officers of the customs conniving at or assisting in any fraud relating to certificate goods, besides other penalties, are to forfeit their office, and suffer six months imprisonment without bail or mainprize; as are also masters, or persons belonging to the ships employed therein. Bonds given for the exportation of certificate goods to Ireland must not be delivered up, nor drawback allowed for any goods, till a certificate under the hands and seals of the collector or comptroller, &c. of the customs be produced, testifying the landing.

DRAW-BRIDGE, a bridge made after the manner of a floor, to draw up, or let down, as occasion serves, before the gate of a town or castle. See **BRIDGE**. A Draw-bridge may be made after several different ways; but the most common are made with plyers, twice the length of the gate, and a foot in diameter. The inner square is traversed with a cross, which serves for a counterpoise: and the chains which hang from the extremities of the plyers to lift up or let down the bridge, are iron or brass. In navigable rivers it is sometimes necessary to make the middle arch of bridges with two moveable platforms, to be raised occasionally, in order to let the masts and rigging of ships pass through. This kind of draw-bridge is represented in Plate LIV, fig. 15, where AB is the width of the middle arch; AL and BL, the two piers that support the draw-bridge; one of the platforms of which is raised, and the other let down, having the beam PQ for its pleyer. From the platform are suspended two moveable braces EH, EF, which resting on the support E, press them against the braket M, and thereby strengthen the draw-bridge. These braces are conducted to the rest by means of the weight S, pulling the chain SLE.

DRAWING.

DRAWING is the art of justly representing the appearance of objects upon a plain surface, by means of lines, shades, and shadows, formed with certain colouring materials. This art is founded on a knowledge of geometry and perspective: the study of both is therefore the first step towards the attainment of the art of drawing. See **GEOMETRY** and **PERSPECTIVE**. Drawing has been cultivated from the earliest antiquity but for its history, see **PAINTING**.

I. OF MATERIALS AND INSTRUMENTS.

To acquire this elegant art, the learner must furnish himself with proper materials and instruments; such as black lead pencils, crayons of black, white, or red chalk, crow-quill pens, a rule and compasses, camels hair pencils, Indian ink, Indian rubber, drawing paper, drawing boards, &c. He must accustom himself to hold the pencil farther from the point than he does a pen in writing; which will give him a better command of it, and contribute to render the strokes more free and bold. The use of the pencil is to draw the

first outlines of the piece, as any stroke that is amiss may be easily rubbed out; and when he has made the sketch as correct as he can with the pencil, he may then draw carefully the best outline he has got, with his crow-quill pen and ink; after which he may discharge the pencil lines, by rubbing the piece gently with the crumb of stale bread or Indian rubber. The ink used for this purpose should be Indian ink; which is much softer than the common, and does not run. By mixing it with water, it may be made to any degree of strength, and used in a pen like common ink. Having got the outline clear, his next work is to shade the piece properly, either by drawing fine strokes with his pen where it requires to be shaded, or by washing it with his pencil and the Indian ink. As to his rule and compasses, they are very rarely to be used, except in measuring the proportions of figures after he has drawn them, to prove whether they be right or not; or in houses, fortifications and other pieces of architecture. The best kind of drawing-boards, are made with a frame and a moveable panel, upon which the paper is simply put wet, and then forced into the frame, where it is con-

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finied by wedges at the back. A ruler made in the form of the letter T will be convenient to use with the drawing boards for drawing parallel and perpendicular lines.

II. OF DRAWING LINES, SQUARES, CIRCLES, AND OTHER GEOMETRICAL FIGURES.

The first practice of a learner must be to draw straight and curve lines, with ease and freedom, upwards and downwards, sideways to the right or left, or in any direction whatsoever. He must also learn to draw by command of hand, squares, circles, ovals, and other geometrical figures: for as the alphabet, or a knowledge of the letters, is an introduction to grammar, so is geometry to drawing. The practice of drawing these simple figures till he is master of them, will enable him to imitate, with greater ease and accuracy, many things both in nature and art. Four general rules may here be laid down; 1. Never to be in a hurry; but to make himself perfectly master of one figure before he proceeds to another: the advantage, and even necessity, of this, will appear as he proceeds: 2. To accustom himself to draw all his figures very large, which is the only way of acquiring a free bold manner of designing: 3. To practise drawing till he has gained a tolerable command of his pencil, before he attempts to shade any figure or object of any kind whatever: And, 4. Not to finish perfectly at first any single part, but to sketch out faintly, with light strokes of the pencil, the shape and proportion of the whole figure; and afterwards to correct it where it is amiss.

III. OF DRAWING EYES, EARS, FLOWERS, FRUITS, BIRDS, BEASTS, LEGS, ARMS, HANDS, &c.

The learner may begin with drawing the outlines of eyes, ears, noses, &c. See Plate LX. He may next proceed with flowers, fruits, birds, beasts, and the like; not only as it will be a more pleasing employment, but as it is an easier task, than the drawing of hands and feet, and other parts of the human body, which require not only more care, but greater exactness and nicer judgement. Very few instructions are requisite upon this head; the best thing the learner can do, is to furnish himself with good prints or drawings, by way of examples, and with great care and exactness to copy them. If it is the figure of a beast, begin with the forehead, and draw the nose, the upper and under jaw, and stop at the throat. Then go to the top of the head, and form the ears, neck, and back; and continue the line till you have given the full shape of the buttock. Then form the breast, and mark out the legs and feet, and all the smaller parts. See Plate LXI. After which the figure is to be finished with the proper shadows. The learner may then proceed to the drawing of legs and arms, by copying carefully the examples given in Plate LX. but the actions and postures of the hands are so many and various, that no certain rules can be given for drawing them, that will universally hold good. Yet as the hands and feet are difficult to draw, it is very necessary to bestow some time and pains about them, carefully imitating their various postures and actions, so as not only to avoid all lameness and imperfection, but also to give them life and spirit. To arrive at this, great care, study, and practice, are requisite; particularly in imitating the best prints or drawings that can be got of hands and feet, examples of which are given in Plate LX; for, as to the mechanical rules of drawing them by lines and measures, they are not only perplexed and difficult, but also contrary to the practice of the best masters. And here the general rule abovementioned must be applied, viz. to sketch out faintly, with light strokes, the shape and proportion of the whole hand, with the action and turn of it; and after considering whether this first sketch be perfect, and altering it where it is amiss, to proceed to the bending of the joints, the knuckles, the veins, and other small particulars, which when the learner has got the whole shape and proportion of the hand or foot, will not only be more easily but also more perfectly designed.

IV. OF DELINEATING FACES.

The head is usually divided into 4 equal parts, viz. 1. From the crown of the head to the top of the forehead. 2. From the top of the forehead to the eye-brows. 3. From the eye-brows to the bottom of the nose. 4. From thence to the bottom of the chin. But this proportion is not constant; those features in different men being often very different as to length and shape. In a well-proportioned

face, however, they are nearly right. To direct the learner, therefore, in forming a perfect face, his first business is to draw an oval, or rather the form of an egg; in the middle of which, from the top to the bottom, draw a perpendicular line. Through the middle of this line draw a diameter-line, directly across from one side to the other of the oval. On these two lines all the features of the face are to be placed as follows: Divide the perpendicular line into four equal parts: the first must be allotted to the hair of the head; the second is from the top of the forehead to the top of the nose between the eye-brows; the third is from thence to the bottom of the nose; and the fourth includes the lips and chin. The diameter-line, or the breadth of the face, is always supposed to be the length of five eyes; it must therefore be divided into five equal parts, and the eyes placed upon it so as to leave exactly the length of one eye betwixt them. This is to be understood only of a full front face, Plate LX. for if it turn to either side, the distances are to be lessened on that side which turns from you, less or more in proportion to its turning. The top of the ear is to rise parallel to the eye-brows, at the end of the diameter-line; and the bottom of it must be equal to the bottom of the nose. The nostrils ought not to come out farther than the corner of the eye in any face; and the middle of the mouth must always be placed on the perpendicular line.

V. OF DRAWING HUMAN FIGURES.

When the learner is tolerably perfect in drawing faces, heads, hands, and feet, he may next attempt to draw the human figure at full length. In this performance he ought to attend with great care to the true proportions of the body and limbs, for which observe, that in a well-formed person, his arms extended make a distance between the extremities of the middle fingers equal to his length; that the face consists of three exact divisions, from the hair on the forehead to the eyes, from the eyes to the bottom of the nose, and from that to the chin. The whole figure is ten faces in length; from the chin to the collar-bone is twice the length of the nose, thence to the lowest part of the breast one face, from that to the navel another, to the groin one, to the upper part of the knee two, the knee is half a face in length, from the lower part of which to the ankle is two faces, and hence to the sole of the foot is one-half. Measuring from the extremes of the breast, the breadth will be found to contain two faces, and the bone of the arm from the shoulder to the elbow, the same number; thence, including part of the hand, two faces; and from the shoulder-blade to the hollow between the collar-bones, is one face. The thumb is the length of the nose; from the commencement of the hand to the middle of the arm is five lengths of the nose; and from the pectoral muscle to the same place is four. The great toe is of the length of the nose, and the sole of the foot is the sixth part of the length of the figure; the hands are double their breadth in length, and when extended they are exactly the length of the face. The breadth of the limbs vary according to the state of health in the body, and the particular situation of the muscles whenever moved. The length of the whole figure being divided into ten equal parts or faces, the points of division answering to the different parts of the body, will appear from the figure in Plate 61. No. 2, in which the divisions are marked and numbered. To draw a figure correctly, the intended length should be marked, and all the preceding measurements strictly adhered to, beginning the sketch with the head, following with the shoulders, the trunk, the leg most in action, then the other, finishing with the arms, and making the outline perfect before any part is finished; as we may imagine a living or plaster model placed before the student, that will serve better for improving him than any written instructions, but he will find the greatest difficulty in correctly copying the eyes, mouth, ears, hands, and feet, and should consequently be particularly careful when employed in those parts. Let the learner remember, in whatever he intends to draw, first to sketch its several parts, measuring the distances and proportions between each with his finger or pencil, without using the compasses; and then judging of them by the eye, which by degrees, will be able to judge of truth and proportion; and will become his best and principal guide. And let him observe, as a general rule, always to begin on the left hand, or the right side of the piece he is copying: for thus he will always have what he has done before his eyes; and the rest will follow more naturally, and with greater ease. All the bowings and bendings that are in the body, must be taken notice of, making the

part which is opposite to that which bends correspond to it in bending with it. For instance: if one side of the body bend in, the other must stand out answerably to it: if the back bend in, the belly must stick out; if the knee bend out, the ham must fall in; and so of any other joint of the body. In a word, the learner must endeavour to form all the parts of the figure with truth, and in just proportion: not one arm or one leg bigger or less than the other: not broad Herculean shoulders, with a thin and slender waist; nor raw and bony arms, with thick and gouty legs; but let there be a kind of harmonious agreement amongst the members, and a beautiful symmetry throughout the whole figure. The proportions of children are generally thus: three heads in length from the crown of the head to the groin, and thence to the sole of the foot two, one head and a half between the shoulders, one, of the body between the hips and armpits; the breadth of the limbs should be ascertained from a healthy child. It is a leading principle, in which every person conversant in designing has agreed, that without a perfect knowledge of the proportions, nothing can be produced but monstrous and extravagant figures; and it is also universally admitted, that the ancient Greek and Roman sculptors attained the highest success in producing the most perfect models. It is perhaps impossible to draw a perfectly beautiful figure from any one person: the most skilful statuary and painters, sensible of this fact, have composed their finest works from different subjects. Hence artists who have examined the subject with attention, have never found any man so perfect in all his parts as are some of the figures produced by the ancient sculptors.

VI. OF THE EFFECTS OF THE EXERTION OF THE MUSCLES.

The most obvious effects of the exertion of those muscles, which chiefly demand the attention of a painter, are the following: If either of the mastoid muscles act, the head is turned to the contrary side, and the muscle which performs that action appears very plain under the skin. If the arms are lifted up, the deltoid muscles placed on the shoulders, which perform that action, swell, and make the extremities of the spines of the shoulder-blades, called the tops of the shoulders, appear indented or hollow. The shoulder-blades following the elevation of the arms, their bases incline at that time obliquely downward. If the arms are drawn down, put forwards, or pulled backwards, the shoulder-blades necessarily vary their positions accordingly. When the cubitus or fore-arm is bended, the biceps has its belly very much raised, as appears in the left arm. The like may be observed of the triceps, when the arm is extended, as observed in the right arm. The straight muscles of the abdomen appear very strong when rising from a decumbent posture. Those parts of the great serratus muscle, which are received in the beginnings of the oblique descending muscle immediately below, are very much swelled when the shoulder on the same side is brought forwards; the serratus muscle then being in action in drawing the scapula forwards. The long extending muscles of the trunk act alternately in walking: if the right leg bears the weight of the body, and the left is in translation as on tiptoe, the last mentioned muscles of the back on the left side may be observed to be tumified on the other side about the region of the loins, and so on the other side. The trochanters, or outward and uppermost heads of the thigh-bones, vary in their positions in such a manner as no precise observations can explain their several appearances; but the study after the life ought to be carefully attended to. If the thigh is extended, as when the whole weight of the body rests on that side, the gluteus or buttock muscle makes a very different appearance from what it offers at another time; but if the thigh is drawn backwards, that muscle appears still more and more tumified. When the whole leg is drawn upwards forwards, and at the same time the foot is inclined inwards, the upper part of the sartorius muscle appears rising very strong; in other positions of the thigh, that muscle makes a furrowing appearance in its whole progress. If a man is upon tiptoe, the extending muscles of the leg placed on the fore-part of the thigh, and those of the foot that compose the calf of the leg, appear very strong, and the long peronæus makes a considerable indentation or furrowing at that time in its progress on the outside of the leg. Many other remarks might be made on this subject; but for a knowledge of these, and the foregoing, the painter ought to study anatomy, and consult with care different anatomical plates, in which the muscles are represented; to this must be add-

ed a due attention to nature which will supersede any further instruction on this head.

VII. OF THE EFFECTS OF THE PASSIONS IN GENERAL.

When the student of drawing has made himself acquainted with the various attitudes and muscular exertions of the human body, it will be proper for him next to study the effects of the passions upon the limbs and features. The passions, says M. Le Brun, are motions of the soul, either upon her pursuing what she judges to be for her good, or shunning what she thinks hurtful to her; and commonly, whatever causes emotion of passion in the soul, creates also some action in the body. It is therefore necessary for a painter to know which are the different actions in the body that express the several passions of the soul, and how to delineate them.

M. Le Brun has been extremely happy in expressing many of the passions, and the learner cannot study any thing better than the examples which he has left us of them; and of which we have given a copy in Plate LXII. However, as M. De Piles justly observes, it is absurd as well as impossible, to pretend to give such particular demonstrations of them, as to fix their expression to certain strokes, which the painter should be obliged to make use of, as essential and invariable rules. This, says he, would be depriving the art of that excellent variety of expression, which has no other principle than diversity of imagination, the number of which is infinite. The same passion may be finely expressed several ways, each yielding more or less pleasure in proportion to the painter's understanding, and the spectators discernment. Though every part of the face contributes towards expressing the sentiments of the heart, yet the eye-brow, according to M. Le Brun, is the principal seat of expression, and where the passions best make themselves known. It is certain, says he, that the pupil of the eye, by its fire and motion, very well shews the agitation of the soul, but then it does not express the kind or nature of such an agitation; whereas the motion of the eye-brow differs according as the passions change their nature. To express a simple passion, the motion is simple; to express a mixed passion, the motion is compound: if the passion be gentle, the motion is gentle; and if it be violent, the motion is so too. We may observe farther, says he, that there are two kinds of elevation in the eye-brows: one, in which the eye-brows rise up in the middle; this elevation expresses agreeable sensations, and it is to be observed that then the mouth rises at the corners: the other, in which the eye-brows rise up at the ends, and fall in the middle; this motion denotes bodily pain, and then the mouth falls at the corners. In laughter, all the parts agree; for the eye-brows, which fall toward the middle of the forehead, make the nose, the mouth, and the eyes, follow the same motion. In weeping, the motions are compound and contrary; for the eye-brows fall toward the nose and over the eyes, and the mouth rises that way. It is to be observed also, that the mouth is the part of the face which more particularly expresses the emotions of the heart: for when the heart complains, the mouth falls at the corners; when it is at ease, the corners of the mouth are elevated, and when it has an aversion, the mouth shoots forward, and rises in the middle. "The head (says M. De Piles) contributes more to the expression of the passions, than all the other parts of the body put together. Those separately can only shew some few passions, but the head expresses them all. Some, however, are more peculiarly expressed by it than others; humility, by hanging it down; arrogance, by lifting it up; languishment, by inclining it on one side; and obstinacy, when with a stiff and resolute air it stands upright, fixed, and stiff between the two shoulders. The head also best shews our supplications, threats, mildness, pride, love, hatred, joy, and grief. The whole face, and every feature, contributes something: especially the eyes; which, as Cicero says, are the windows of the soul. The passions they more particularly discover are, pleasure, languishing, scorn, severity, mildness, admiration, and anger; to which one might add joy and grief, if they did not proceed more particularly from the eye-brows and mouth; but when those two passions fall in also with the language of the eyes, the harmony will be wonderful. "But though the passions of the soul are most visible in the lines and features of the face, they often require the assistance also of the other parts of the body. Without the hands, for instance, all action is weak and imperfect; their motions, which are almost infinite, create numberless expressions: it is by them

them that we desire, hope, promise, call, send back; they are the instruments of threatening, prayer, horror, and praise; by them we approve, condemn, refuse, admit, fear, ask; express our joy and grief, our doubts, regrets, pain, and admiration. In a word, it may be said, as they are the language of the dumb, that they contribute not a little to speak a language common to all nations, which is the language of painting. But to say how these parts must be disposed for expressing the various passions, is impossible, nor can any exact rules be given for it, both because the task would be infinite, and because every one must be guided in this by his own genius, and the particular turn of his own studies." According to M. Le Brun, the particular passions produce their action on the body as expressed in the following rules:

1. The effects of **ATTENTION** are to make the eye-brows sink and approach the sides of the nose; to turn the eye-balls towards the object that causes it; to open the mouth, and especially the upper part; to decline the head a little, and fix it without any other remarkable alteration.

2. **ADMIRATION** causes but little agitation in the mind, and therefore alters but very little the parts of the face; nevertheless the eye-brow rises: the eye opens a little more than ordinary; the eye-ball placed equally between the eye-lids appears fixed on the object; the mouth half opens, and makes no sensible alteration in the cheeks.

3. The motions that accompany **ADMIRATION** with **ASTONISHMENT**, are hardly different from those of simple admiration, only they are more lively and stronger marked; the eye-brows more elevated; the eyes more open; the eye-ball further from the lower eye-lid, and more steadily fixed: the mouth is more open, and all the parts in a much stronger emotion.

4. Admiration begets esteem, and this produces **VENERATION**, which, when it has for its object something divine, or beyond our comprehension, makes the face decline, and the eye-brows bend down; the eyes are almost shut and fixed: the mouth is shut. These motions are gentle, and produce but little alterations in the other parts.

5. Although **RAPTURE** has the same object as veneration, only considered in a different manner, its motions are not the same; the head inclines to the left side; the eye-balls and eye-brows rise directly up; the mouth half opens, and the two corners are also a little turned up: the other parts remain in their natural state.

6. The passion of **DESIRE** brings the eye-brows close together and forwards toward the eyes, which are more open than ordinary; the eye-ball is inflamed, and places itself in the middle of the eye; the nostrils rise up, and are contracted towards the eyes; the mouth opens, and the spirits being in motion, give a lively glowing colour.

7. Very little alteration is remarked in the face of those that feel within themselves the sweetness of **JOY**, or joy with **TRANQUILITY**. The forehead is serene; the eye-brow without motion, elevated in the middle; the eye pretty open, and with a laughing air; the eye-ball lively and shining; the corners of the mouth turn up a little; the complexion is lively; the cheeks and lips are red.

8. **LAUGHTER**, which is produced by joy mixed with surprise, makes the eye-brows rise towards the middle of the eye, and bend towards the sides of the nose; the eyes are almost shut, and sometimes appear wet, or shed tears, which make no alteration in the face; the mouth half open, shews the teeth; the corners of the mouth drawn back, cause a wrinkle in the cheeks, which appear so swelled as to hide the eyes in some measure; the nostrils are open, and all the face is of a red colour.

9. **ACUTE PAIN** makes the eye-brows approach one another, and rise towards the middle; the eye-ball is hid under the eye-brows; the nostrils rise and make a wrinkle in the cheeks; the mouth half opens and draws back: all the parts of the face are agitated in proportion to the violence of the pain.

10. **SIMPLE BODILY PAIN** produces proportionally the same motions as the last, but not so strong: the eye-brows do not approach and rise so much; the eye-ball appears fixed on some object; the nostrils rise, but the wrinkles in the cheeks are less perceptible; the lids are further asunder towards the middle, and the mouth is half open.

11. The dejection that is produced by **SADNESS** makes the eye brows rise towards the middle of the forehead more than towards the cheeks; the eye-ball appears full of perturbation; the white of the eye is yellow; the eye-lids are drawn down, and a little

swelled; all about the eyes is livid; the nostrils are drawn downward; the mouth is half open, and the corners are drawn down; the head carelessly leaning on one of the shoulders: the face is of a lead colour; the lips pale.

12. The alterations that **WEeping** occasions are strongly marked: the eye-brows sink down towards the middle of the forehead; the eyes are almost closed, wet, and drawn down towards the cheeks; the nostrils swelled; the muscles and veins of the forehead appear; the mouth is shut, and the sides of it are drawn down, making wrinkles on the cheeks; the under lip pushed out presses the upper one: all the face is wrinkled and contracted; its colour is red, especially about the eye-brows, the eyes, the nose, and the cheeks.

13. The lively attention to the misfortunes of another, which is called **COMPASSION**, causes the eye-brows to sink towards the middle of the forehead; the eye-ball to be fixed upon the object; the sides of the nostrils next the nose to be a little elevated, making wrinkles in the cheeks; the mouth to be open; the upper lip to be lifted up and thrust forwards; the muscles and all the parts of the face sinking down and turning towards the object which excites the passion.

14. The motions of **SCORN** are lively and strong: the forehead is wrinkled; the eye-brow is knit; the side of it next the nose sinks down, and the other side rises very much; the eye is very open, and the eye-balls in the middle; the nostrils rise, and draw towards the eyes, and make wrinkles in the cheeks; the mouth shuts, its sides sinking down, and the upper lip is pushed out beyond the upper one.

15. An object despised sometimes causes **HORROR**, and then the eye-brow knits, and sinks a great deal more. The eye-ball, placed at the bottom of the eye, is half-covered by the lower eye-lid; the mouth is half open, but closer in the middle than the sides, which being drawn back, makes wrinkles in the cheeks; the face grows pale, and the eyes become livid; the muscles and the veins are marked.

16. The violence of **TERROR**, or **FRIGHT**, alters all the parts of the face; the eye-brow rises in the middle; its muscles are marked, swelled, pressed one against the other, and sunk towards the nose, which draws up as well as the nostrils; the eyes are very open; the upper eye-lid is hid under the eye-brow; the white of the eye is encompassed with red; the eye-ball fixes toward the lower part of the eye; the lower part of the eye-lid swells and becomes livid; the muscles of the nose and cheeks swell, and these last terminate in a point toward the sides of the nostrils; the mouth is very open, and its corners very apparent; the muscles and veins of the neck stretched; the hair stands on end; the colour of the face, that is, the end of the nose, the lips, the ears, and round the eyes, is pale and livid; and all ought to be strongly marked.

17. The effects of **ANGER** shew its nature. The eyes become red and inflamed; the eye-ball is staring and sparkling; the eye-brows are sometimes elevated, and sometimes sunk down equally; the forehead is very much wrinkled, with wrinkles between the eyes; the nostrils are open and enlarged; the lips pressing against one another, the under one rising over the upper one leaves the corners of the mouth a little open, making a cruel and disdainful grom.

18. **HATRED** or **JEALOUSY** wrinkles the forehead; the eye-brows are sunk down and knit; the eye-ball is half hid under the eye-brows, which turn towards the object; it should appear full of fire, as well as the white of the eye and the eye-lid; the nostrils are pale, open, more marked than ordinary, and drawn backward so as to make wrinkles in the cheeks; the mouth is so shut as to shew the teeth are closed; the corners of the mouth are drawn back and very much sunk; the muscles of the jaw appear sunk; the colour of the face is partly inflamed and partly yellowish; the lips pale or livid.

19. As **DESPAIR** is extreme, its motions are so likewise; the forehead wrinkles from the top to the bottom; the eye-brows bend down over the eyes, and press one another on the sides of the nose; the eye seems to be on fire, and full of blood; the eye-ball is disturbed, hid under the eye-brow, sparkling and unfixed; the eye-lid is swelled and livid; the nostrils are large, open, and lifted up; the end of the nose sinks down; the muscles, tendons, and veins are swelled and stretched; the upper part of the cheek is large, marked, and narrow towards the jaw; the mouth drawn backwards is more open at the sides than in the middle; the lower lip

lip is large and turned out; the persons gnash their teeth; they foam; they bite their lips, which are pale; as is the rest of the face; the hair is strait and stands on end.

VIII. OF THE DISTRIBUTION OF LIGHT AND SHADE.

After the learner has made himself in some measure perfect in drawing outlines, his next endeavour must be to shade them properly. It is this which gives an appearance of substance, shape, distance, and distinction, to whatever bodies he endeavours to represent, whether animate or inanimate. The best rule for doing this is to consider from what point, and in what direction, the light falls upon the objects which he is delineating, and to let all his lights and shades be placed according to that direction throughout the whole work. That part of the object must be lightest which has the light most directly opposite to it; if the light falls sideways on the picture, he must make that side which is opposite to it lightest, and that side which is farthest from it darkest. If he is drawing the figure of a man, and the light be placed above the head, then the top of the head must be made lightest, the shoulders next lightest, and the lower parts darker by degrees. That part of the object, whether in naked figures, or drapery, or buildings, that stands farthest out, must be made the lightest, because it comes nearest to the light; and the light loseth so much of its brightness, by how much any part of the body bends inward, because those parts that stick out hinder the lustre and full brightness of the light from striking on those parts that fall in. Titian used to say, that he knew no better rule for the distribution of lights and shadows than his observations drawn from a bunch of grapes. Satins and silks, and all other shining stuffs, have certain glancing reflections, exceeding bright where the light falls strongest. The like is seen in armour, brass pots, or any other glittering metal, where a sudden brightness appears in the centre of the light, which discovers the shining nature of such things. A strong light requires a strong shade, a fainter light a fainter shade; and an equal balance must be preserved throughout the piece between lights and shades. Those parts which must appear round require but one stroke in shading, and that sometimes but very faint; such parts as should appear steep or hollow, require two strokes across each other, or sometimes three, which is sufficient for the deepest shade. Care must be also taken to make the outlines faint and small in such parts as receive the light; but where the shades fall, the outline must be strong and bold. The learner must begin his shadings from the top, and proceed downward, and use his utmost endeavours, both by practice and observation, to learn how to vary the shadings properly; for in this consist a great deal of beauty and elegance in drawing. Another thing to be observed is, that as the human sight is weakened by distances, so objects must seem more or less confused or clear according to the places they hold in the piece: those that are very distant, weak, faint, and confused; those that are near and on the foremost ground, clear, strong, and accurately finished.

IX. OF DRAPERY.

In the art of clothing the figures, or casting the drapery properly and elegantly upon them, many things are to be observed. 1. The eye must never be in doubt of its object; but the shape and proportion of the part or limb, which the drapery is supposed to cover, must appear; or at least so far as art and probability will permit: and this is so material a consideration, that many artists draw first the naked figure, and afterwards put the draperies upon it. 2. The drapery must not fit too close to the parts of the body; but let it seem to flow round, and as it were to embrace them; yet so that the figure may be easy, and have a free motion. 3. The draperies which cover those parts that are exposed to great light, must not be so deeply shaded as to seem to pierce them; nor should those members be crossed by folds that are too strong, lest, by the two great darkness of their shades, the members look as if they were broken. 4. The great folds must be drawn first, and then stroked into less ones: and great care must be taken that they do not cross one another improperly. 5. Folds in general should be large, and as few as possible. However, they must be greater or less, according to the quantity and quality of the stuffs of which the drapery is supposed to be made. The quality of the persons is also to be considered in the drapery. If they are magistrates, their draperies ought to be large and ample; if country clowns or slaves, they ought to be coarse

and short; if ladies or nymphs, light and soft. 6. Suit the garments to the body, and make them bend with it, according as it stands in or out, straight or crooked; or as it bends one way or another; and the closer the garment fits to the body, the narrower and smaller must be the folds. 7. Folds well imagined give much spirit to any kind of action; because their motion implies a motion in the acting member, which seems to draw them forcibly, and makes them more or less stirring as the action is more or less violent. 8. An artful complication of folds in a circular manner greatly helps the effect of fore-shortenings. 9. All folds consist of two shades, and no more; which may be turned with the garment at pleasure, shadowing the inner side deeper, and the outer more faintly. 10. The shades in silk and fine linen are very thick and small, requiring little folds and a light shadow. 11. Observe the motion of the air or wind, in order to draw the loose apparel all flying one way: and draw that part of the garment that adheres closest to the body, before you draw the looser part that flies off from it; lest, by drawing the loose part of the garment first, you should mistake the position of the figure, and place it awry. 12. Rich ornaments, when judiciously and sparingly used, may sometimes contribute to the beauty of draperies. But such ornaments are far below the dignity of angels or celestial figures; the grandeur of whose draperies ought rather to consist in the boldness and nobleness of the folds, than in the quality of the stuff or the glitter of ornaments. 13. Light and flying draperies are proper only to figures in great motion, or in the wind; but when in a calm place, and free from violent action, their draperies should be large and flowing; that, by their contrast, and the fall of the folds, they may appear with grace and dignity. Examples of drapery are given in Plate LXI. See also PAINTING.

X. OF DRAWING LANDSCAPES, BUILDINGS, &c.

Of all the branches of drawing, this is the most useful and necessary, as it is what every man may have occasion for at one time or another. To be able, on the spot, to take the sketch of a fine building, or a beautiful prospect; of any curious production of art, or uncommon appearance in nature; is not only a very desirable accomplishment, but a very agreeable amusement. Rocks, mountains, fields, woods, rivers, cataracts, cities, towns, castles, houses, fortifications, ruins, or whatsoever else may present itself to view on our journeys or travels, in our own or foreign countries, may be thus brought home and preserved for our future use either in business or conversation. On this part, therefore, more than ordinary pains should be bestowed. All drawing consists in nicely measuring the distances of each part of the piece by the eye. In order to facilitate this, let the learner imagine in his own mind, that the piece he copies be divided into squares. For example: suppose a perpendicular and horizontal line crossing each other, in the centre of the picture you are drawing from; then suppose also two such lines crossing your own copy. Observe in the original, what parts of the design those lines intersect, and let them fall on the same parts as the supposed lines in the copy. To draw a landscape from nature, let him take his station on a rising ground, where he will have a large horizon; and mark his tablet into three divisions, downwards from the top to the bottom; and divide in his own mind the landscape he is to take, into three divisions also. Then let him turn his face directly opposite to the midst of the horizon, keeping his body fixed, and draw what is directly before his eyes upon the middle division of the tablet; then turn his head, but not his body, to the left hand, and delineate what he views there, joining it properly to what he had done before; and, lastly, do the same by what is to be seen upon his right hand, laying down every thing exactly both with respect to distance and proportion. Examples are given on Plate LXI. fig. E. The best artists of late, in drawing their landscapes, make them shoot away one part lower than another. Those who make their landscapes mount up higher and higher, as if they stood at the bottom of a hill to take the prospect, commit a great error: the best way is for the artist to get upon a rising ground, make the nearest objects in the piece the highest, and those that are farther off to shoot away lower and lower, till they come almost level with the line of the horizon, lessening every thing proportionably to its distance, and observing also to make the objects fainter and less distinct, the farther they are removed from the eye. He must make all his lights and sades fall one way, and let every thing have its proper motion: as trees shaken by the wind, the small bows bending more, and the large

large ones less: water agitated by the wind, and dashing against ships or boats; or falling from a precipice upon rocks or stones, spirting up again into the air, and sprinkling all about: clouds also in the air, now gathered with the winds: now violently condensed into hail, rain, and the like: Always remembering, that whatever motions are caused by the wind must be made all to move the same way. For further particulars on this and the other parts of drawing, see PAINTING.

XI. OF MECHANICAL DRAWING, OR COPYING.

There are various methods by which those who are ignorant of the art of drawing may copy very accurately the outlines of pictures, prints, and drawing; and these methods are often useful to those who can draw, and to engravers, when either great expedition, or great accuracy, is required; though none of them should ever be used by one who is learning to draw.

TRACING AGAINST THE LIGHT. Hold the drawing you wish to copy against one of the panes of the window; or have a pane of glass put in a frame, and fitted up like a music-stand, with a candle behind it. Lay your paper over the drawing, and you will see all the lines of the original distinctly through it, by which means you can easily trace them with a pen, or black-lead pencil.

TO MAKE TRACING-PAPER. Mix together equal parts of oil of turpentine and drying-oil, and with a rag rub it evenly over some fan or tissue-paper, or any other very thin paper. Hang it by to dry for a day or two, and it will be fit for use. Lay this over the print or drawing you want to copy, and you will see every line distinctly through, so that you can go over it with the black-lead pencil. If you wish to do it in ink, you must mix a little ox's gall with the ink, to make the paper take it, which it would not otherwise do on account of the oil.

TO MAKE CAMP-PAPER. Take some hard soap, mix it with lamp-black; make it into the consistence of a jelly with water; with this, brush over one side of your paper, and let it dry. When you use it, put it between two sheets of clean paper, with its black side downwards; and with a pin, or stick with a sharp point, draw or write what you please upon the clean paper; and where the tracer was touched, there will be an impression upon the lowermost sheet of paper as if it had been written or drawn with a pen. It may be made of any colour, by mixing with the soap, black lead, vermilion, &c.

STENCILING. Lay the print or drawing you wish to have copied over a sheet of paper, and with a pin or needle prick all the outline over with holes, through both the papers. Then take the clean paper with the holes made in it, and lay it upon the paper you wish to have the design transferred to, and dust it over with the powder of charcoal in a small muslin bag; the dust will penetrate through the holes, and leave a correct copy of the original upon the paper. This pricked paper will do again for any number of copies. This is very useful for ladies who work flowers upon muslin.—The method of enlarging and contracting by squares. Divide the sides of your original with a pair of compasses into any number of equal parts, and rule lines across with a black-lead pencil from side to side, and from top to bottom. Then having your paper of the size you intend, divide it into the same number of squares, either larger or less, as you would enlarge or contract it. Then placing your original before you, draw, square by square, the several parts, observing to make the part of the figure you are drawing fall into the same part of the squares in the copy as it does in your original. To prevent mistakes, number the squares both of the original and copy. This method is much used by engravers. To prevent the necessity of ruling across the original, which in some cases may injure it, take a square pane of crown glass, and divide its sides, and also its top and bottom, into equal parts: then for each division draw lines across the glass with lamp-black ground with gum water, and you will divide the glass into squares. Then lay the glass upon the original which you wish to copy, and having drawn the same number of squares upon your paper, proceed to copy into each square on your paper what appears behind each corresponding square of the glass. Instead of a glass, an open frame with threads stretched across will answer the same purpose.

THE PENTAGRAPH. The pentagraph is an instrument, by means of which one may copy, enlarge, or reduce, the outlines of any picture, print, or drawing. It may be had at most mathematical

cal instrument-makers, and is extremely useful for copying plans, maps, and other complicated figures.

TRANSPARENCIES. The effect of this kind of drawing, which has lately become very fashionable, though by no means a modern invention, is very pleasing, if managed with judgement, particularly in fire and moonlights, where brilliancy of light and strength of shade are so very desirable. The very great expence attending the purchase of stained-glass, and the risk of keeping it secure from accident, almost precludes the use of it in ornamenting rooms; but transparencies form a substitute nearly equal, and at a very small expence. The paper upon which you intend to draw must be fixed in a straining-frame, in order that you may be able to place it between you and the light, when you see occasion in the progress of your work. After tracing in your design, the colours must be laid on in the usual method of stained drawing. When the tints are got in, you must place your picture against the window, on a pane of glass framed for the purpose, and begin to strengthen the shadows with Indian ink, or with colours, according as the effect requires, laying the colours sometimes on both sides of the paper, to give greater force and depth of colour. The last touches for giving final strength to shadows and forms, are to be done with ivory-black, or lamp-black, prepared with gum-water, as there is no pigment so opaque and capable of giving strength and decision.

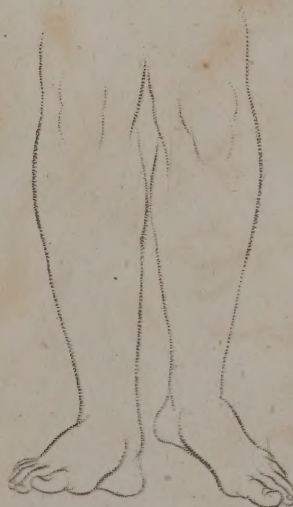
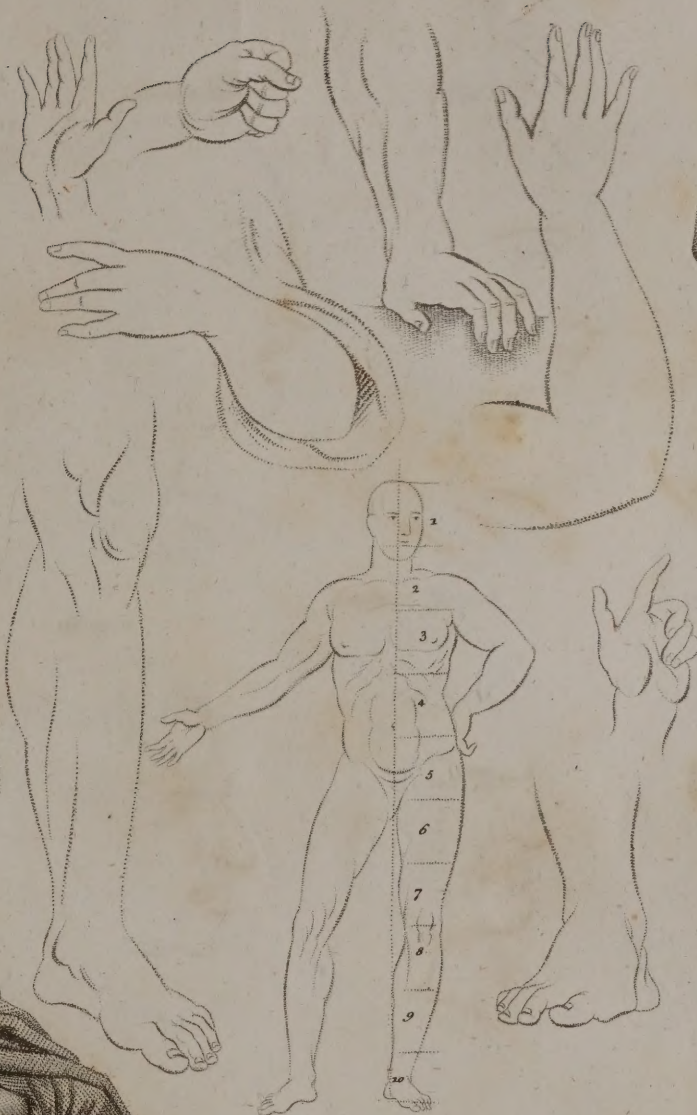
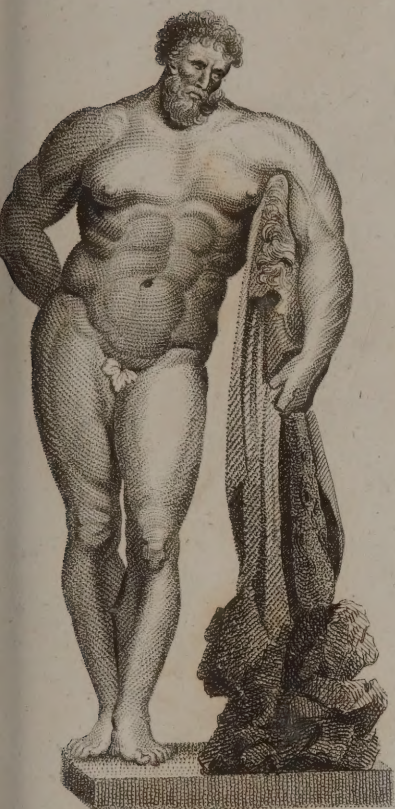
When the drawing is finished, and every part has got its depth of colour and brilliancy, being perfectly dry, you touch very carefully with spirits of turpentine on both sides those parts which are to be the brightest, such as the moon and fire; and those parts requiring less brightness, only on one side. Then lay on immediately with a pencil a varnish, made by dissolving one ounce of Canada balsam in an equal quantity of spirit of turpentine. You must be cautious with the varnish, as it is apt to spread. When the varnish is dry you tint the flame with red lead and gamboge, slightly tinging the smoke next the flame: the moon must not be tinted with colour. Much depends upon the choice of the subject; and none is so admirably adapted to this species of effect as the gloomy Gothic ruin, whose antique towers and pointed turrets finely contrast their dark battlements with the pale yet brilliant moon. The effect of rays passing through the ruined windows, half-choked with ivy; or of a fire among the clustering pillars and broken monuments of the choir, round which are figures of banditti, or others whose haggard faces catch the reflecting light: these afford a peculiarity of effect not to be equalled in any other species of painting. Internal views of cathedrals also where windows of stained glass are introduced, have a beautiful effect. The following is a very easy method of drawing and shading objects. Take a sheet of the thinnest, or white-brown paper, and brush it over with oil of turpentine, which will immediately render it transparent: then, after drying the paper in the air, strain it upon a frame, and fix it against the object you design to draw: this done, place right before it a piece of wood with a hole in it, fit for one's eye to look through, and as you meet any outlines of the object on the transparent paper, trace them over with a pencil; by which means you will obtain the just proportion, and true representation of any object in its outlines. To render this still more pleasing, observe the tracings of your draught, wherever the shades are, and mark them with your pencil; for all the art in the world can never dispose the shades so regularly, as one may touch by this method; but the shades must be drawn quickly after the outlines are drawn, not at different times, because the sun instantly changes them. Here observe, as in certain objects you will have fainter, stronger, and darker shades, in your remarks of them, to take such memorandums as may direct you how to finish them with Indian ink, or other colour, when you sit down to complete your work. To this end the best way before you trace out your object, is to prepare three shells or gallipots of Indian ink, mixed with common water, viz. one of a very faint black, one of a middling black, and one of an intense black, numbering them 1, 2, 3; and as you make your obscuration on the shades of your object, mark upon your draught the same numbers as they happen to appear, so that afterwards you may finish with certainty. In this regard the transparent paper is of great use; for, being laid upon any paper or print in a loose sheet, all the lines will be seen so perfectly through it, that you may copy them with the greatest ease; and if the print or picture be done by a good master, you can see which lines are strong, which soft, and how to imitate them. Some prefer to the transparent



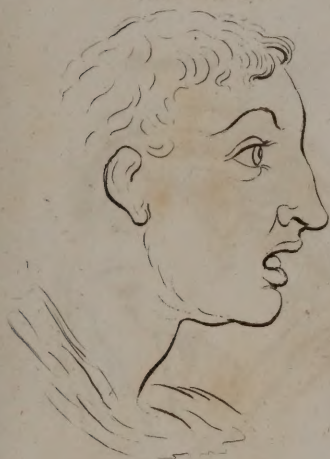
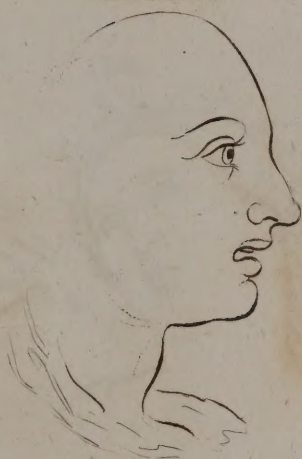
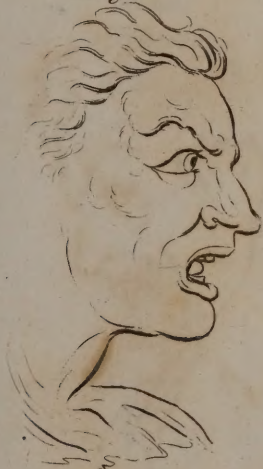
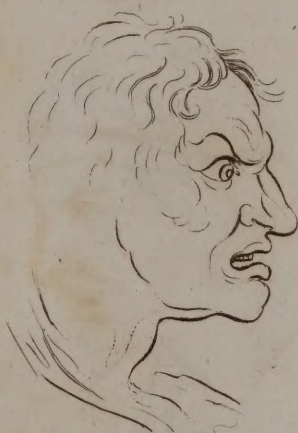
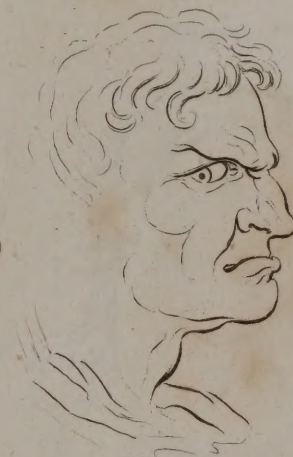
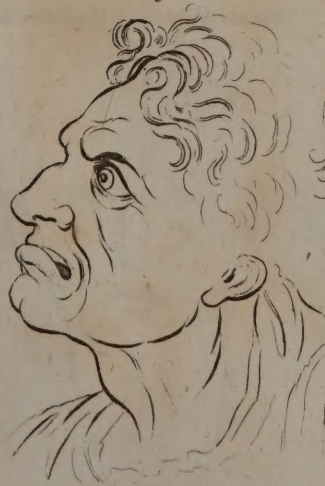
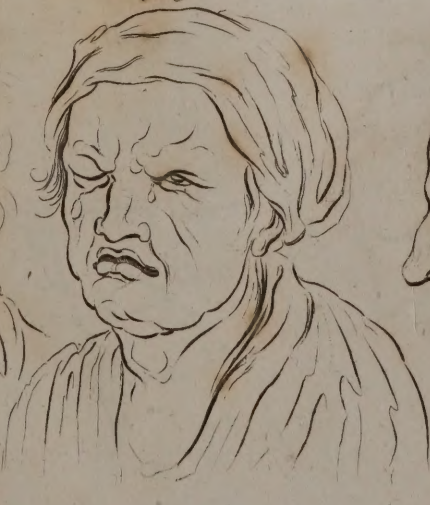
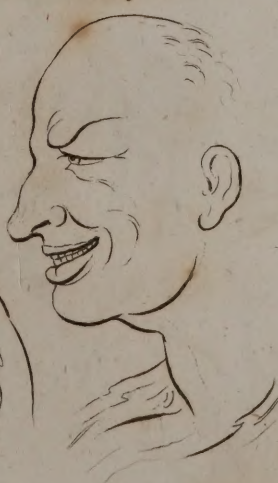
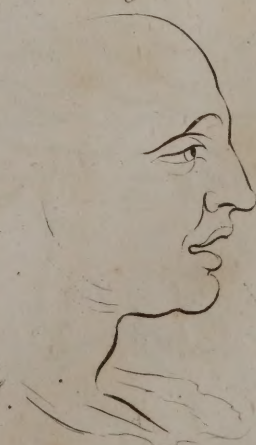








PASSIONS.

Astonishment*Admiration**Joy**Tranquillity**Fright**Horror**Scorn & Hatred**Attention & Esteem**Anger**Weeping**Laughter**Sadness*



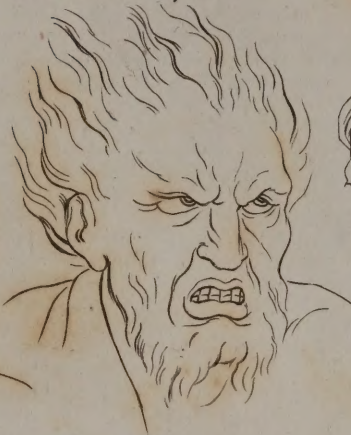
Humility



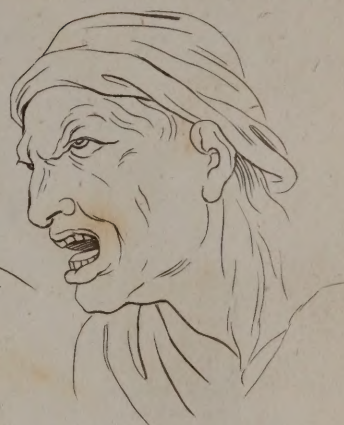
Love



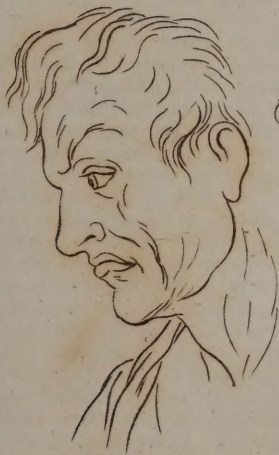
Extreme Despair



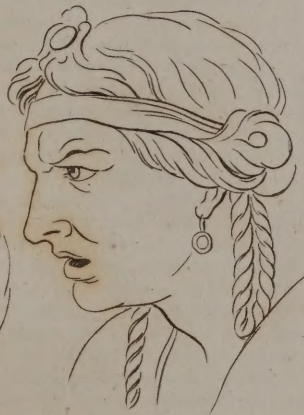
Anger mixed with fear



Disdain



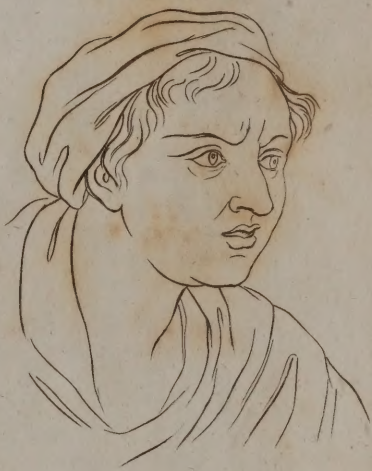
Fear



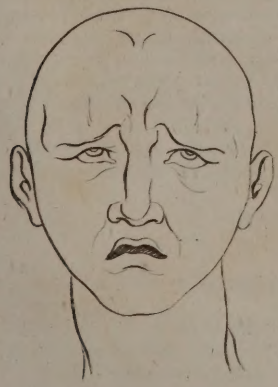
Rapture



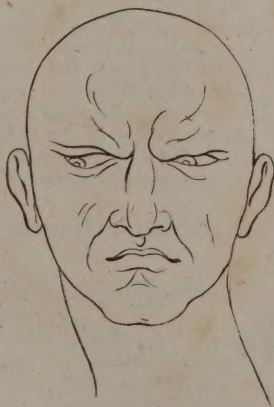
Desire



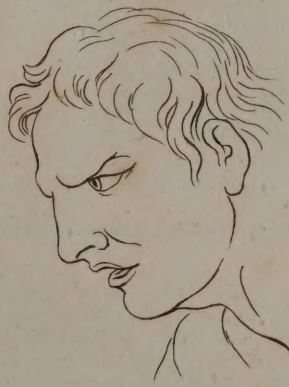
Acute Distress of body & mind



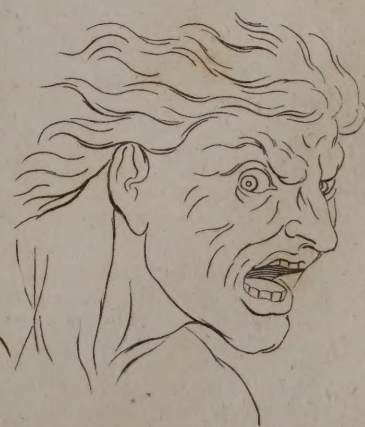
Jealousy



Compassion



Terror



parent paper, either white or black tiffany or lawn stained upon a frame, and used in the same manner as the paper, excepting that, as the black-lead pencil is used to the paper, on the white tiffany and on the lawn you must use charcoal very soft and finely powdered; but on the black tiffany very tender white chalk is to be used. A draught may be taken regularly, from a drawing, on transparent paper, as follows: Take a piece of paper of the same size with that of the draught; rub one side of it with some powder of black lead, till it be well and equally blacked, so that a finger touching it, will hardly be tinged with the blacking; then take the print, and laying the paper underneath it with the black side downwards, upon another place of white paper of the same size, pin the three together in two or three places: afterwards, take a pin or needle, somewhat blunted at the point, and trace it over the outlines of your picture, which, with a little pressing, will direct the black paper to impress the white, so as to receive every stroke you draw: this done, you may carefully correct what errors you see with your black-lead pencil, cleaning the new-made draught slightly with the crumb of stale bread. As for the draughts taken on tiffany or lawn, they are only to be laid on paper; that is, such as are drawn with charcoal upon white, and those drawn with chalk upon black or blue paper; and then, giving each of them a knock or two with the hammer, the charcoal or the chalk will fall through them upon the papers directly in the lines they were drawn, and give you the true representation of the object drawn from the life, in white lines upon the black paper, and in black lines upon the white. Then strengthen these shadows of drawings with your black-lead pencil, chalk, or red oker, upon the pieces of paper where they made the marks; for otherwise the lines will easily be rubbed out. But it must be observed, that this amendment is to be made soon after the lines; because those tender draughts will quickly vanish, if care be not taken to strengthen them immediately. You are to begin this operation at the bottom of the drawing. There is another way which may be more easy to the hand or arm of a person not accustomed to drawing upon a paper or lawn placed upright, which is by the use of a camera obscura; though to help the hand one may hold a baguette, or such a stick in the left hand as the oil-painters use to rest the right hand upon; or have some other rest made for the right hand, as may be easily screwed up and down at pleasure. But there is this difference still between drawing a piece of perspective, or view, on a transparent paper or lawn placed upright against any object, and drawing by the camera obscura; that such a piece will take in more of the view or object, and from a greater distance, than the camera obscura will: however, the portable camera obscura will, at first, be very easy to the arm of a beginner, by reason the objects appear on a horizontal plane, such as a table; and the hand, having a proper rest, will more easily follow the line represented on the plane with great exactness. The camera obscura is a machine or apparatus wherein the images of external objects are represented distinctly, and in their genuine colours, either in an inverted or erect situation. This machine may be made as follows; Darken a chamber, one of whose windows looks into a place set with a variety of objects, leaving only one little aperture open in the window. In this aperture fit a lens, either a plano convex one, or one convex on both sides, so as to be the portion of a large sphere. At a due distance, to be determined by experience, spread a paper or white cloth on the wall, unless the wall itself be whitened so as to serve the purpose; and on this the images of the desired objects will be delineated invertedly, and hence may be copied with ease. It is to be observed, that if the aperture does not exceed the bigness of a pea, the objects will be represented thereon, even though there be no lens at all. To render the images clear

and distinct, it is necessary that the objects be illuminated by the sun; and they will be still brighter if the spectator first stay a quarter of an hour in the dark. Care must be likewise taken that no light escape through any chinks, and that the wall be not too much illuminated. Farther, the greater the distance between the aperture and the wall, the larger and more distinct will the images be; but the rays becoming thus too much dilated, the brightness of the image is weakened, till at length it becomes insensible. But the portable camera obscura is more proper for beginners, as being more easy for their arm; besides, the objects appearing on a horizontal plane, may, of course, be drawn with greater exactness. Two other methods, both easy and entertaining, for taking of draughts or drawing, are as follows: 1st. Prick with a pin the outlines of the print or drawing you design to copy, and then laying the same on a sheet of paper, take a powder-puff or tuft of cotton, dipping it now and then in charcoal-dust, and beat it over the pricked lines through the picture, by which means you will have full directions marked on your cloth or paper sufficient to finish a just drawing. 2d. The other way is by making such an impression from the print as shall give a just copy of it; and it is of great use when we want to carry every stroke of the graver along with us; which method, if you are very careful, will indeed but very little sully the print. For this end, take some white or green soap, which mix with such a quantity of water as will bring it to the consistency of a jelly; with this mixture rub the print, and with a wet sponge gently wet the paper designed for receiving the impression; then laying it on the print, cover all with two or three other pieces of dry paper, and rub it very hard all over with any thing that is smooth and polished; and thus the wetted paper will have upon it the reverse of the print you rubbed it upon, with every distinct line in the original, if you have been careful to rub it equally.

TO TAKE THE NATURAL FORM OF A LEAF. First take the leaf you would copy, and gently rub the veins on the back side of it with a piece of ivory, or some such like matter, so as to bruise them a little; afterwards wet the same side gently with linseed-oil, and then press it hard upon a piece of white paper, and you shall have the perfect figure of the leaf, with every vein in it justly expressed: this impression being afterwards coloured will seem truly natural, and may be useful to such as would remember plants. Another way of painting the leaves of plants, so that the impression shall appear as black as if it had been done in a printing-press, is as follows: When the leaf is dry, take such a ball as the pressmen use for blacking the types, and rubbing it equally over with printer's ink, strike it gently four or five times on the back of the leaf, till all the veins are blacked with the ink: then laying the leaf on a flat board or the like, with the back side upwards, clap a piece of white paper well moistened on the leaf; and pressing it pretty hard, but not so as to bruise the fibres, you shall have a fine impression. But this may be done to still greater advantage by means of a piece of wood in the form of a cylinder, about a foot long, and an inch and a half diameter, the middle part about six or eight inches long, being covered with a woollen cloth rolled three or four times round it. With this cylinder roll the paper over the leaf four or five times backwards and forwards, and you will have a curious impression. But where printer's ink is not conveniently come at, the following method may be made use of: Rub the back of the leaf, as before directed, with burnt linseed-oil: then, strewing some powder of black lead, or, for want of that, some charcoal or small-coal dust, or the powder of burnt cork, upon a smooth board, so as equally to cover it, stroke the powder gently over; and oiling the back side of the leaf, clap it upon the board; then laying the white paper upon the back of the leaf, press or roll it as before.

DRAYTON, a town in Shropshire, on the Torn, 17 miles N. E. of Shrewsbury.

DREAMS are all those thoughts which people feel passing through their minds, and those imaginary transactions in which they often fancy themselves engaged, when in the state of sleep. Scarce any part of nature is less open to our observation than the human mind in this state. The dreamer himself cannot well observe the manner in which dreams arise or disappear to him.

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When he awakes, he cannot in general recollect the circumstances of his dreams with sufficient accuracy. Were we to watch over him with the most vigilant attention, we could not perceive what emotions are excited in his mind, or what thoughts pass through it, during his sleep. But though we could ascertain these phenomena, many other difficulties would still remain. What parts of a human being are active, what dormant, when he dreams? Why does he not always dream while asleep? Or why dreams he

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at all? Do any circumstances in our constitution, situation, and peculiar character, determine the nature of our dreams? Without pretending to solve the above difficulties we shall here briefly mention the following facts concerning dreams, as deduced by those who have paid particular attention to the subject. 1. In dreaming, we are not conscious of being asleep. This is well known from a thousand circumstances. When awake, we often recollect our dreams; and we remember on such occasions, that while those dreams were passing through our minds, it never occurred to us, that we were separated by sleep from the active world: except in those cases, where we have a kind of double dream; *i. e.* when, after dreaming for some time, we dream that we have awaked from sleep, and told our preceding dream, while in fact we still continue asleep the whole time. But during this second dream, and rehearsal of our former one, we are fully persuaded that we are awake, till by awaking in reality, we are convinced that we are asleep all the time. We are also often observed to act and talk in dreaming, as if we were busily engaged in the intercourse of social life. 2. In dreaming, we do not consider ourselves as witnessing or bearing a part in a fictitious scene: we seem not to be in a similar situation with the actors in a dramatic performance, or the spectators before whom they exhibit, but engaged in the business of real life. All the varieties of thought, that pass through our minds when awake, may also occur in dreams; all the images which imagination presents in the former state, she is also able to call up in the latter; all the same emotions may be excited, and we are often actuated by equal violence of passion; none of the transactions, in which we are capable of engaging while awake, is impossible in dreams: in short, our range of action and observation is equally wide in the one state as in the other; nay often more so; for we may dream of flying, walking upon waters, and the like actions, which we cannot perform when awake: and while dreaming, we are not sensible of any distinction, between our dreams and the events and transactions in which we are actually concerned, in our intercourse with the world. 3. It is said, that all men are not liable to dream. Dr. Beattie, in a very pleasing essay on this subject, relates, that he knew a gentleman who never dreamed, except when his health was in a disordered state: and Locke mentions, that a person of his acquaintance was a stranger to dreaming till the 26th year of his age; when he began to dream in consequence of having a fever. These instances, however, are two few; and, besides, it does not appear that those persons had always attended, with the care of a philosopher making an experiment, to the circumstances of their sleep. They might dream, but not recollect their dreams on awaking; and they might both dream and recollect their dreams immediately upon awaking, yet afterwards suffer them to slip out of their memory. We do not advance this therefore as a certain fact concerning dreaming; we are rather inclined to think it a mistake. But though it is by no means certain, that any of the human race are through the whole of life absolute strangers to dreaming; yet it is well known, that all men are not equally liable to dream. The same person dreams more or less at different times; and as one person may be more exposed than another, to those circumstances which promote this exercise of fancy, one person may therefore dream much oftener than another. The same diversity will naturally take place in this as in other accidents to which mankind are in general liable. 4. Though in dreams imagination appears to be free from all restraint, and indulges in the most wanton freaks; yet it is agreed, that the imaginary transactions of the dreamer, if in health, generally bear some relation to his particular character in the world, his habits of action, and the circumstances of his life. The lover dreams of his mistress; the miser of his money; the philosopher renews his scientific researches in sleep with the same assiduity as when awake; and the merchant returns to balance his books, and compute the profits of an adventure, when slumbering on his pillow. And not only to do the general circumstances of a person's life influence his dreams; but his passions and habits are nearly the same when asleep as when awake. A person whose habits of life are virtuous, does not in his dreams plunge into a series of crimes; nor are the vicious reformed, when they pass into this imaginary world. The choleric man finds himself offended by slight provocations in his dreams, as well as in his ordinary intercourse with the world, and a mild temper continues pacific in sleep. 5. The character of a person's dreams is influenced by his circumstances

when awake, in a still more unaccountable manner. Certain dreams usually arise in the mind after a person has been in certain situations. Dr. Beattie relates, that he once, after riding thirty miles in a high wind, passed a part of the succeeding night in dreams beyond description terrible. The state of a person's health, and the manner in which the vital functions are carried on, have a considerable influence in determining the character of dreams. After too full a meal, or after eating of an unusual sort of food, a person has dreams of a certain nature. 6. In dreaming, the mind for the most part carries on no intercourse through the senses with surrounding objects. Touch a person gently who is asleep, he feels not the impression. You may awake him by a smart blow; but when the stroke is not sufficiently violent, he remains insensible of it. We speak softly beside a person asleep without fearing that he will overhear it. His eye-lids are shut; and even though light should fall upon the eyeball, yet still his powers of vision are not awakened to active exertion, unless the light be so strong as to rouse him from sleep. He is insensible both to sweet and to disagreeable smells. It is not easy to try whether his organs of taste retain their activity, without awakening him; yet from analogy it may be presumed, that these too are inactive. With respect to the circumstances here enumerated, it is indifferent whether a person be dreaming or buried in a deep sleep. Yet there is one remarkable fact concerning dreaming which may seem to contradict what has been here asserted. In dreams, we are liable not only to speak aloud in consequence of the suggestions of imagination, but some persons even get up, and walk about and engage in little enterprises, without awaking. Now, as we are in this instance so active, it seems that we cannot be then insensible of the presence of surrounding objects. The sleep-walker is really sensible, in a certain degree, of the presence of the objects around him; but he does not attend to them with all their circumstances, nor do they excite in him the same emotions, as if he were awake. He feels no terror on the brink of a precipice; and in consequence of being free from fear, he is also without danger in such a situation unless suddenly awaked. This is one of the most inexplicable phenomena of dreaming. There is another fact not quite consonant with what has been above advanced. It is said, that in sleep a person will continue to hear the noise of a cataract in the neighbourhood, or regular strokes with a hammer, or any similar sound sufficiently loud, and continued uninterruptedly from before the time of his falling asleep. And it is affirmed, that he awakes on the sudden cessation of the noise. This fact is asserted on sufficient evidence: it is curious. Even when awake, if deeply intent on study, or closely occupied in business, the sound of a clock striking in the neighbourhood, or the beating of a drum, will escape us unnoticed: and it is therefore the more surprising, that we should thus continue sensible to sounds when asleep. 7. Not only do a person's general character, habits of life, and state of health, influence his dreams; but those concerns, in which he has been most deeply interested during the preceding day, and the views which have arisen most frequently to his imagination, very often afford the subjects of his dreams. When one looks forward with anxious expectation towards any future event, he is likely to dream either of the disappointment, or the gratification of his wishes. If engaged through the day, either in business or amusements which he found exceedingly agreeable, or in a way in which he has been extremely unhappy, either his happiness or his misery is likely to be renewed in his dreams. 8. Though all kinds of dreams have been regarded among almost all nations, at least in some periods of their history, as prophetic of future events; yet it does not appear that this popular opinion has been established on good grounds. Christianity, indeed, teaches us to believe, that the Supreme Being may, and actually does, operate on our minds, and influence at times the determinations of our will, without making us sensible of the restraint to which we are thus subjected. And, in the same manner, no doubt, the suggestions which arise to us in some particular dreams may be produced. The imaginary transactions, in which we are then engaged, may be such as are actually to occupy us in life; the strange and seemingly incoherent appearances, which are then presented to the mind, may allude to some events which are to befall ourselves or others. It is, therefore, by no means inconsistent with the general providence of God, that some dreams should have a respect to futurity. We have no reason to regard the dreams, which are related in the Holy Scriptures, as

not inspired by heaven, or to laugh at the idea of a prophetic dream as absurd or ridiculous. The dreams of Joseph and Pharaoh; his chief butler and baker; of Nebuchadnezzar and the prophet Daniel, &c. are decisive on this point. Yet it would be too much, to allow to dreams all that importance which has been ascribed to them by the priesthood among heathen nations, or by the vulgar among ourselves. We know how easily ignorance imposes on itself, and what arts imposture adopts to impose upon others. We cannot trace any certain connection between our dreams and those events, to which the simplicity of the vulgar pretends that they refer. And we cannot, therefore, join with the vulgar and the superstitious in believing them really referable to futurity. 9. It appears that the brutes are also capable of dreaming. The dog is often observed to start suddenly up in his sleep, in a manner which cannot be accounted for any other way, than by supposing that he is roused by some impulse received in a dream. The same thing is observable of other brutes. That they should dream, is not an idea inconsistent with what we know of their economy and manners in general. We may, therefore, consider it as a pretty certain truth, that many, if not all, of the inferior animals are liable to dream, as well as human beings. It appears, then, that in dreaming we are not conscious of being asleep: that to a person dreaming, his dreams seem realities: that though it be uncertain whether mankind are all liable to dreams, yet it is well known that they are not all equally liable to dream: that the nature of a person's dreams depends in some measure on his habits of action, and on the circumstances of his life: that the state of the health too, and the manner in which the vital functions are carried on, have a powerful influence in determining the character of a person's dreams: that in sleep and in dreaming, the senses are either absolutely inactive, or nearly so: that such concerns as we have been very deeply interested in during the preceding day, are very likely to return upon our minds in dreams in the hours of rest: that dreams may be rendered prophetic of future events; and therefore, wherever we have such evidence of their having been prophetic, as we would accept on any other occasion, we cannot reasonably reject the fact as absurd; but that they do not appear to have been actually such, in those numerous instances in which the superstition of nations, ignorant of true religion, has represented them as referring to futurity, nor in those instances in which they are viewed in the same light by many among ourselves: and, lastly, that dreaming is not a phenomenon peculiar to human nature, but that brutes, in some instances, are liable to dream. We cannot tell by what laws of our constitution, we are thus liable to be so frequently engaged in imaginary transactions, nor what are the particular means by which the delusion is accomplished. The delusion is indeed remarkably strong. One will sometimes fancy that he reads a book, and actually enter into the nature of the imaginary composition before him, and even remember, after he awakes, what he then knows, that he only fancied himself reading. Another will sometimes dream that he is at church, and hears a sermon delivered, which he would be incapable of composing when awake. Can this be delusion? If delusion, how or for what purpose is it produced? The mind, it would appear, does not, in sleep, become inactive like the body; or at least is not always inactive while we are asleep. When we do not dream, the mind must either be inactive, or the connection between the mind and the body must be considered as in some manner suspended: and when we dream, the mind, though it probably acts in concert with the body, yet does not act in the same manner as when we are awake. It seems to be clouded or bewildered, in consequence of being deprived for a time of the service of the senses. Imagination becomes more active and more capricious: and all the other powers, especially judgement and memory, become disordered and irregular in their operations. We are far from wishing to restore the reign of superstition in the most distant degree; or to lead our readers to put faith in the numberless ridiculous interpretations, given by some pretenders to divination, of the ordinary run of dreams. The absurdity of the many traditional rules, laid down by such persons; such as, that dreaming of eggs prognosticates anger; of the washing of linens forebodes flitting; of green fields, sickness; of hanging, honour; of death, marriage; of fish, children; and of raw flesh, death, &c. &c. can only be exceeded by the folly of those who put faith in such fooleries. But notwithstanding this, innumerable instances might be adduced, in which the interference of

a Divine Providence is evident. Of these we give the following one from the "Perthensis," which the editors from their personal acquaintance with the parties know to be a fact. It is narrated in the "Weekly Mirror," printed at Edinburgh in 1781, and signed Verax. "In June 1752, Mr. Robert Aikenhead, farmer in Denstrath of Arnhall, in the Mearns, about five miles N. of Brechin, and seven from Montrose, went to a market called Tarrenty Fa'r, where he had a large sum of money to receive. His eldest son, Robert, a boy between seven and eight years of age, was sent to take care of the cattle, and happening to lie down upon a grassy bank before sun-set, fell fast asleep. Although the boy had never been far from home, he was immediately carried in his imagination to Tarrenty market, where, he dreamed, that his father, after receiving the money, set out on his return home, and was followed all the way by two ill-looking fellows, who, when he had got to the western dykes of Inglis-Mauldy, (the seat of the then lord Halkerton, now earl of Kintore,) and little more than a mile from home, attacked and attempted to rob him. Whereupon the boy thought he ran to his assistance, and when he came within a gun-shot of the place, called out some people, who were just going to bed, who put the robbers to flight. He immediately awoke in a fright, and without waiting to consider, whether it was a vision or a reality, ran as fast as he could to the place he had dreamed of, and had no sooner reached it, than he saw his father in the very spot and situation he had seen in his dream, defending himself with his stick against the assassins. He therefore immediately realized his own part of the visionary scene, by roaring out murder! which soon brought out the people, who running up to Mr. Aikenhead's assistance, found him victor over one of the villains, whom he had previously knocked down with a stone, after they had pulled him off his horse; but almost overpowered by the other, who repeatedly attempted to stab him with a sword; against which he had no other defence than his stick and his hands, which were considerably mangled by grasping the blade. Upon sight of the country people, the villain who had the sword ran off, but the other not being able was apprehended and lodged in jail. Mean time there was no small hue and cry after young Robert, whose mother missing him, and finding the cattle among the corn, was in the utmost anxiety, concluding that he had fallen into some water or peat moss. But her joy and surprise were equally great, when her husband returned with the boy, and told her how miraculously both his money and life had been preserved by his son's dream; although she was at first startled at seeing her husband's hands bloody. To those who deny the existence of a God, (adds the writer,) or the superintendence of a divine providence, the above narrative will appear as fabulous as any story in Ovid. To those who measure the greatness and littleness of events, by the arbitrary rules of human pride and vanity, it will perhaps appear incredible, that such a miracle should have been wrought for the preservation of the life of a country-farmer. But all who found their opinions upon the unerring rule of right and truth, which assures us, that a sparrow cannot fall to the ground without the permission of our heavenly father, (and who know, that in the sight of Him with whom there is no respect of persons or dignities, the life of the greatest monarch on earth, and that of the lowest of his subjects are of equal value,) will laugh at such silly objections, when opposed to well attested facts. That the above is one, could be attested upon oath, were it necessary, by Mr. and Mrs. Aikenhead, from whom I had all the particulars above narrated about 15 months ago."—"Edin. March 12, 1781." Various theories have been proposed to explain what appears most inexplicable in dreaming. The ingenious Mr. Baxter, in his treatise on the "Immateriality of the Human Soul," endeavours to prove that dreams are produced by the agency of some spiritual beings, who either amuse or employ themselves seriously in engaging mankind in all those imaginary transactions with which they are employed in dreaming. This theory, however, is far from being plausible. It leads us entirely beyond the limits of our knowledge. It requires us to believe without evidence. It is unsupported by any analogy. It creates difficulties still more inexplicable than those which it has been proposed to remove. Till it appear that our dreams cannot possibly be produced without the interference of other spiritual agents, possessing such influence over our minds as to deceive us with fancied joys, and involve us in imaginary afflictions,

tions, we cannot reasonably refer them to such a cause. Besides, from the facts which have been stated as well known concerning dreams, it appears that their nature depends both on the state of the body and on that of the mind. But were they owing to the agency of other spiritual beings, how could they be influenced by the state of the body; however, that the agency of spiritual intelligence is employed in some dreams there can be no doubt?—Wolfius, and after him M. Forney, have supposed, that dreams never arise in the mind, except in consequence of some of the organs of sensation having been previously excited. Either the ear or the eye, or the organs of touching, tasting, or smelling, communicate information, somehow, in a tacit, secret manner; and thus partly rouse its faculties from the lethargy in which they are buried in sleep, and engage them in a series of confused and imperfect exertions. But what passes in dreams is often so very different from all that we do when awake, that it is impossible for the dreamer himself to distinguish, whether his powers of sensation perform any part in this office. It is not necessary that imagination be always excited by sensation. Fancy, even when we are awake, often wanders from the present scene. Absence of mind is incident to the studious: the poet and the mathematician often forget where they are. We cannot discover from any thing that a person in dreaming displays to the observation of others, that his organs of sensation take a part in the imaginary transactions in which he is employed. In those instances, indeed, in which persons asleep are said to hear sounds; the sounds which they hear are also said to influence, in some manner, the nature of their dreams. But such instances are singular. Since then it appears, that the person who dreams is himself incapable of distinguishing, either during his dreams, or by recollection when awake, whether any new impressions are communicated to him in that state by his organs of sensation; that even by watching over him, and comparing our observations of his circumstances and emotions, in his dreams, with what he recollects of them after awaking, we cannot except in one or two singular instances, ascertain this fact; and that the mind is not incapable of acting while the organs of sensation are at rest, and on many occasions refuses to listen to the information which they convey; we may conclude, that the theory is groundless. Other physiologists tell us, that the mind, when we dream, is in a state of delirium. Sleep, they say, is attended with what is called a collapse of the brain; during which either the whole or part of the nerves of which it consists, are in a state in which they cannot carry on the usual intercourse between the mind and the organs of sensation. When the whole of the brain is in this state, we become entirely unconscious of existence, and the mind sinks into inactivity: when only a part of the brain is collapsed, we are then neither asleep nor awake, but in a sort of delirium between the two. This theory, like the last, supposes the mind incapable of acting without the help of sensation: it supposes that we know the nature of a state, of which we cannot ascertain the phenomena; it also contradicts a known fact, in representing dreams as confused images of things around us, not fanciful combinations of things not existing together in nature or in human life. We must treat it likewise, therefore, as a baseless fabric. It seems more probable that dreams arise from a constant flow of ideas which it appears are constantly presenting themselves to the mind. Every person must have observed, that when alone, and while his attention is not called to any particular subject, either by study, conversation, manual labour, sudden noise, or the objects around him; a kind of involuntary motion, (so to speak,) will take place in his ideas; and that if he makes no voluntary exertion of mind, to fix his attention upon one idea more than another, a rapid succession of very different ideas, some old and some recent, will occur in the course of a few minutes. Every person, who attends church regularly, or who has attended the lectures of an unentertaining public speaker, must be sensible, that such involuntary motions of his ideas have often taken place, when, either through the fault of the speaker, or that of the hearer, his attention has not been sufficiently fixed upon what was spoken. A person much addicted to study, and to the habit of fixing his ideas constantly upon one subject or another, may perhaps be less sensible of the involuntary motion we here allude to, than others: but let such a studious person be placed in a company, where a trifling conversation is going on, and he will soon find himself in a situation here described. A current of ideas will rapidly intrude upon

his mind, and carry off his attention from the trifles in which those around him are engaged; and thus subject him to what is commonly called absence of mind. And it will be also admitted, that the most studious, as well as the most thoughtless, will sometimes find an idea, of a long forgotten fact, sentiment, or circumstance, suddenly recurring to their minds, without any seeming cause. The inference we would draw from all these facts, to our present subject, is, that during sleep, a similar involuntary motion or current of ideas takes place; but that in consequence of the fatigue occasioned by the labours of the day, (no matter whether these operate by exhausting the excitability, or, by occasioning a deficiency of the nervous fluid,) the three chief powers of the mind—the will, the judgement, and the memory, are rendered in a considerable degree inactive; at least in so far, that the will has no power over these faculties, while the imagination, rendered more active, (as it would seem,) by being freed from the controul of both the will and the judgement, gives every new idea that occurs in a visionary form; and thus creates a fresh and rapid succession of various images, according to the unlimited current of uncontrolled ideas, that succeeded each other. How this happens, perhaps the human faculties will never be able to comprehend or explain; at least till they shall be capable of explaining the connection by which the soul and body are united, if indeed mankind shall ever attain to such a degree of perfection in physiology. But that dreams take their rise chiefly, if not solely, from the mere succession of ideas, dressed into form by the imagination, uncontrolled by the will, or the judgement, appears to us to be an undoubted fact, though hitherto it would seem little, if at all, attended to. And it appears to be a sufficient confirmation of this theory, that persons in good health, and engaged in active employments, most commonly dream of those matters wherein they are daily occupied; the uniform current of their ideas when awake, seldom taking any other direction during sleep; whereas persons in a bad habit of body, or weak state of mind, and those who take little exercise, or who are not engaged in active business, have generally wild and extravagant dreams, and sometimes very disagreeable ones, of monsters, mad dogs, devils, deep pits, houses on fire, stormy oceans, and the like. In a word, when we consider the operations of our minds when awake,—particularly of that active faculty, the imagination—how readily upon hearing, reading, or speaking, of any person, place, action, or circumstance, it forms an idea in the mind of such person, place, &c. though perhaps many years have elapsed since we saw them, or even though we have never seen them,—we need not be surprised, that the same active faculty should be able, when uncontrolled by the will and judgement, and but partially assisted by the memory, to raise up a series of images in succession, and thus to create an ideal world, and various ideal transactions, in the mind. But in cases of divine interference the ideas are most probably suggested by a spiritual being. In whatever way we attempt to account for the manner, in which our powers of mind and body perform their functions in dreaming, we can, at least, apply to useful purposes the imperfect knowledge, which we have been able to acquire concerning this series of phenomena. Our dreams are affected by the state of our health, by the manner in which we have passed the preceding day, by our general habits of life, by the hopes which we most fondly indulge, and the fears which prevail most over our fortitude when awake. From recollecting our dreams, therefore, we may learn to correct many improprieties in our conduct; to refrain from bodily exercises, or from meats and drinks that have unfavourable effects on our constitution; to resist, in due time, evil habits that are stealing upon us; and to guard against hopes and fears which detach us from our proper concerns, and unfit us for the duties of life. Instead of thinking what our dreams may forebode, we may with much better reason reflect by what they have been occasioned, and look back to those circumstances in our past life, to which they are owing. The sleep of innocence and health is sound and refreshing; their dreams delightful and pleasing. A distempered body, and a polluted or perturbed mind, are haunted in sleep with frightful, impure, and unpleasing dreams.

DREIN, in the military art, a trench made to draw the water out of a moat, which is afterwards filled with hurdles and earth, or with fascines, or bundles of rushes and planks, to facilitate the passage over the mud.

DRENGFURTH,

DRENGFURTH, a town of Prussia, in the province of Na-
tangen, 44 miles S. E. of Königsberg.

DRENTE, a district of Batavia, in the department of the
Yssel.

DRENTELBURG, or **TRENTELBURG**, a town of Ger-
many, in the circle of the Upper Rhine, 18 miles N. N. W. of
Cassel.

DREPANE, or **DREPANUM**, in ancient geography, a town
of Bithynia, situated between the Sinus and Astacenus and the
Bosphorus Thracius; called Helenopolis by Constantine, in hon-
our of his mother.

DREPANE, the ancient name of Corcyra, from the curvity of its
figure, resembling a sickle.

DREPANUM, the name of three ancient towns, viz. 1. on
the Arabic Gulf, on the side of Egypt: 2. on the N. side of
Crete, between Cydonia and the Sinus Amphinallus: 3. on the
W. side of Cyprus.

DRESDEN, the capital of the late electorate of Saxony, in
Germany, 75 miles N. W. of Prague. Lon. 13. 50. E. Lat. 51.
10. N.

DRESSING, in surgery. The apparatus of dressing consists
of dossils, tents, plasters, compresses, bandages, bands, ligatures,
and strings. See **SURGERY**.

DREUX, a town of France, in the department of Eure and
Loire, 48 miles W. of Paris. Lon. 1. 27. E. Lat. 48. 44. N.

DREYE, or **DREIHE**, a town of Germany, in the circle of
Westphalia, and county of Hoya, 5 miles S. S. E. of Bremen.

DREYEN, a small island of Denmark, in the Little Belt, 3
miles S. W. of Middelfahrt.

DREYSELHAUSEN, a town of Germany, in the circle of
the Lower Rhine, 5 miles N. W. of Bingen.

DRIESSEN, or **DRESNO**, a town of Germany, in the New
Marche of Brandenburg, 90 miles E. N. E. of Berlin.

DRIFT, in mining, a passage cut out under the earth betwixt
shaft and shaft, or turn and turn; or a passage or way wrought
under the earth to the end of a meer of ground, or part of a
meer.

DRIFT, in navigation, the angle which the line of a ship's mo-
tion makes with the nearest meridian, when she drives with her
side to the wind and waves, and is not governed by the power of
the helm: it also implies the distance which the ship drives on
that line. A ship's way is only called drift in a storm; and then
when it blows so vehemently as to prevent her from carrying any
sail, or at least restrains her to such a portion of sail, as may be
necessary to keep her sufficiently inclined to one side, that she
may not be dismasted by her violent labouring produced by the
turbulence of the sea.

DRIFT-SAIL, a sail used under water, veered out right a-head
by sheets, as other sails are. It serves to keep the ship's head
right upon the sea in a storm, and to hinder her driving too fast in
a current.

DRILL, or **DRILL-BOX**, a name given to an instrument for
sowing land in the new method of horse-hoeing husbandry. See
HUSBANDRY.

DRILL-SOWING, a method of sowing grain or seed of any kind,
so that it may all be at a proper depth in the earth, which is ne-
cessary to its producing healthful and vigorous plants. For this
purpose a variety of drill-ploughs have been invented and recom-
mended; but from the expence attending the purchase, and the
extreme complication of their structure, there is not an instrument
of that kind, as yet discovered, that is likely to be brought into
general use. This method, however, is greatly recommended in
the Geographical Essays. See **HUSBANDRY**.

DRINKING, is one of the animal functions, essential to the
proper solution and digestion of food. Although the proportion
of liquid to that of dry, or solid food, cannot be precisely ascer-
tained; yet, if the constant secretion of fluids be laid down as the
basis of this computation, we should, perhaps, drink double the
quantity of the solid provisions we daily consume. Nevertheless,
even this proportion is but too often exceeded, merely to please
the artificial cravings of a corrupted palate. Thus, we no longer
drink with a view to quench thirst only, but at certain hours of
the day, whether we are naturally inclined, or not. Nay, we
frequently meet with sots in beer, ale, spirits, wine, punch, and
even tea. Excessive drink, however, though it distend and op-
press the stomach, and thus impede digestion, is not nearly so per-

nicious as gluttony, unless the former be attended with intoxica-
tion. It however impoverishes the whole mass of the blood, by
rendering it too thin and watery; so that relaxation of the urinary
and other canals, at length, general debility of the system, are its
necessary concomitants. On the contrary, too little drink dis-
poses persons of a sedentary life to indigestion; because many par-
ticles of solid food are, for want of dilution, passed unassimilated
through the alimentary canal; and the blood becomes viscid, and
inert in its circulation. The active and laborious should, there-
fore, drink more than the idle or phlegmatic; and either of these
more in summer than in winter, to supply the great loss of hu-
mours exhaled by insensible perspiration. Persons, whose natural
appetite is not depraved in consequence of irregular living, may
easily regulate the due proportion of their drink to that of dry ali-
ment; as, to them, thirst will be the safest guide. But those in-
dividuals who have become slaves to the libations of Bacchus, are
unfortunately deprived of this beneficent instinct, which is the
privilege even of irrational animals. If the moral turpitude of
committing excess in drinking, affords no argument to induce the
habitual votary to abstain from such pernicious practice, we shall
only add, that he will sooner or later feel the effects of it in pain-
ful and lingering sickness. To a reflecting mind, it affords matter
of just surprize, how so many persons of worth and character,
while sober, can devote themselves to a custom which they can-
not but abhor in their friends. For the sake of a momentary gra-
tification of the palate, wines and spirits are indiscriminately swal-
lowed, and especially by those whose age, labours, and merit in
society, often entitle them to neither. Immense quantities of va-
luable grain by Nature designed for the support of the poor and
indigent, are annually converted into liquid fire, or more properly,
poison! Where is the philanthropist, in our Imperial Senate,
who possesses virtue and influence sufficient to stem the torrent of
so extensive a system of mischief? After this involuntary digres-
sion, we shall only observe, that large potations are, at all times,
and in every constitution, improper; that they are particularly
injurious when indulged in previously to the taking of food, and
especially before dinner; that all beverage is more pernicious to
the healthy in a warm, than in a cold state; that the human sto-
mach should never be inundated with immoderate quantities of
drink at one time; and that the most natural drink, and the most
conducive to health, without exception, is pure water.

DRINO, a river of European Turkey, formed by the junction
of the two following:

DRINO BIANCA, or **WHITE DRINO**, which rises near Rechla,
on the borders of Dalmatia; and

DRINO, NERO, or **BLACK DRINO**, which rises in a lake near
Akrida; joining the Drino Bianca, it takes the name of Drino
only, and runs into the Adriatic, about 8 miles S. W. of Alessio,
forming a bay at its mouth, called The Gulf of Drino.

DRIVERS, among sportsmen, a machine for driving pheasant
pows, consisting of good strong ozier wands, such as the basket-
makers use, set in a handle, and twisted or bound with small oziers
in two or three places. With this instrument the sportsman drives
the young pows into his nets. See the next article.

DRIVING, among sportsmen, a method of taking pheasant
pows. The sportsman having found out the haunts of these birds,
and fixed his nets there, he calls upon them together by a pheasant
call, imitating the voice of the dam; after this he makes a noise
with his driver, which will make them run a little way forward in
a cluster; and this he repeats till he has made sure of them, by
driving them into his nets.

DRIVING, in metallurgy, is said of silver, when, in the opera-
tion of refining, the lead being burnt away, the remaining copper
rises upon its surface in red fiery bubbles.

DRIVING, in the sea language, is said of a ship, when an anchor
being let fall will not hold her fast, nor prevent her sailing away
with the wind or tide. The best help in this case is to let fall
more anchors, or to veer out more cable; for the more cable she
has out, the safer she rides. When a ship is a hull, or a-try, they
say she drives to leeward.

DROGHEDA, or **TREDAH**, a town of Ireland, in the pro-
vince of Leinster and county of Lowth, 5 miles W. of the Irish chan-
nel, and 23 N. of Dublin. Lon. 6. 1. W. Lat. 51. 53. N.

DROGHEDA BAY, a bay of the Irish Sea, on the coast of Louth,
Ireland.

DROIT, [*jus*, Lat.] signifies right or law, of which some dis-
tinguish

tinguish six kinds, 1. *Jus recuperandi*, right of recovery. 2. *Jus entrandi*, right of entering. 3. *Jus habendi*, right of having. 4. *Jus retinendi*, right of retaining. 5. *Jus percipiendi*, right of receiving. 6. *Jus possidendi*, right of possessing.

DROIT is also the highest writ of all other real writs, and takes its name of a writ of right, from the greatest regard being shewn to it; and as it has the most assured and final judgement. There are several sorts of these writs used in our law, as *droit de avowson*, *droit de dower*, *droit de garde*, *droit patent*, *droit rationabili parte*, and *droit sur disclaimer*.

DROITWICH, a town of Worcestershire in England, noted for excellent white salt made from the salt springs in its neighbourhood. It is 6 miles E. N. E. of Worcester.

DRÔME, a river of France, which runs through the department so named from it, into the Rhone.

DROME, a department of France, formed out of part of the late province of Dauphiné. It is bounded on the N. and N. E. by the department of Isère; on the E. by that of the Upper Alps; on the S. by that of the Mouths of the Rhone, and on the W. by the Rhone itself. Valence is the capital.

DROMEDARY. See **CAMELUS**.

DROMO, a small island in the Archipelago.

DROMORE, a town of Ireland, in the county of Down, 17 miles E. of Armagh, and 15 S. W. of Belfast.

DRONE, in music, the largest tube of the bag-pipe; the office of which is to emit one continued deep note, as an accompanying bass to the air or tune played on the smaller pipes.

DRONE. See **BEE**.

DRONFIELD, a town of Derbyshire, 6 miles N. of Chesterfield, and 28 N. of Derby.

DRONTHEIM, a town of Norway, formerly the capital, and the usual residence of the kings; situated on a gulf of the North sea. It is 270 miles N. W. of Stockholm. Lon. 11. 9. E. Lat. 63. 26. N.

DRONTHEIM, or **DRONTHEIM HUSS**, a province of Norway, N. of Bergen, extending from S. to N. about 500 miles along the coast of the Northern Ocean, and from the ocean on the W. to the mountains that separate it from Sweden on the E.

DROPS, in medicine, a liquid remedy, the dose of which is estimated by a certain number of drops.

DROPS, in meteorology, small spherical bodies which the particles of fluids spontaneously form themselves into when let fall from any height. This spherical figure, the Newtonian philosophers demonstrate to be the effect of corpuscular attraction; for, considering that the attractive force of one single particle of a fluid is equally exerted to an equal distance, it must follow, that other fluid particles are on every side drawn to it, and will therefore take their place at an equal distance from it, and consequently form a round superficies. See **ATTRACTION**, **FLUIDITY**, **HYDROSTATICS**, **RAIN**, and **PHYSICS**.

DROPSY, [*hydrops*, Latin; whence anciently *hydropisy*, thence *dropisy*, *dropsy*,] a collection of water in the body, from too lax a tone of the solids, whereby digestion is weakened, and all the parts stuffed. See **MEDICINE**.

DROPPWORT, in botany. See **SPIRÆA**.

DROSENDORF, a town of Germany, in the archduchy of Austria, 46 miles N. W. of Vienna.

DROSERA, **ROS SOLIS**, or **SUN-DEW**, a genus of the pentagynia order, and pentandria class of plants; natural order, *Gruinales*. Calyx quinquefid; petals five; capsule unilocular, quinquevalved at top; seeds very numerous. There are nine species, which grow naturally in boggy places, in many parts of the kingdom. They are named sun-dew from a very striking circumstance in their appearance. The leaves, which are circular, are fringed with hairs, supporting small drops or globules of a pellucid liquor like dew, which continue even in the hottest part of the day, and in the fullest exposure to the sun. The whole plant is acrid, and sufficiently caustic to erode the skin; but some ladies know how to mix the juice with milk, so as to make it an innocent and safe application to remove freckles and sun-burn. The juice that exudes from it unmixed, will destroy warts and corns. The plant has the same effect upon milk, that the common butter-wort has; and like that too is supposed to occasion the rot in sheep.

DROWNING, the act of being suffocated by a total immersion in water. In some respects, there seems to be a great simi-

larity between the death occasioned by immersion in water, and that by strangulation, suffocation by fixed air, apoplexies, epilepsies, sudden faintings, violent shocks of electricity, or even violent falls and bruises. Physicians, however, are not agreed with regard to the nature of the injury done to the animal system, in any or all of these accidents. It is indeed certain, that in all the cases abovementioned, particularly in drowning, there is very often such a suspension of the vital powers, as to us hath the appearance of a total extinction of them; while yet they may be again set in motion, and the person restored to life, after a much longer submersion, than hath been generally thought capable of producing absolute death. The length of time during which a person may remain under water, without being drowned, is very unequal, in different individuals; and depends as much on the temperature of the water as on the particular constitution of the subject: in general, however, there is less prospect of recovery, after having continued fifteen minutes in a watery grave. In such cases, death ensues from impeded respiration, and the consequent ceasing of the circulation of the blood, by which the body loses its heat, and, with that, the activity of the vital principle. Dr. Goodwyn justly observes, that the water produces all the changes which take place in drowning, only indirectly, by excluding the atmospheric air from the lungs, as they admit but a very inconsiderable quantity of fluid to pass into them, during immersion. Hence we shall find, in the progress of this inquiry, that inflation of the lungs is one of the principal means of restoring life. Before we describe the various methods and instruments that have been successfully adopted, for recovering drowned persons, it will be useful to advert (on the plan of Dr. STURVE) to those circumstances which deserve to be duly weighed, previously to any active measures being taken on such unfortunate occasions: 1. The season and weather; 2. Length of time the person has continued under water; 3. The state of his mind when the accident happened: whether he was intoxicated, frightened, &c.; 4. Constitution of the body, and whether he was in a state of perspiration; 5. The height from which he fell, and whether his head plunged foremost; 6. Depth of the water; whether it was cold or warm, sea, or river water, and how he was dressed. Lastly, 7. The manner in which he was taken out, whether by the legs, and without receiving any injury, or by instruments; and whether he was rolled about in a tub, or what other methods were pursued for his restoration. Few improvements appear to have been made in the treatment of the drowned, since this important branch of medical science was first discussed, in a popular manner, by the late Dr. Tissot; yet the names of Cullen, Goodwyn, Cogan, Hawes, and Coleman, in Britain, as well as those of Unzer, Reimarus, and Struve, in Germany, deserve to be respectfully mentioned; from their various publications, and especially of the two last mentioned, we shall briefly state the principal rules of conduct to be observed, with respect to persons in that deplorable situation.

DROWNING, SYMPTOMS OF APPARENT DEATH BY.—Coldness; paleness of the whole body; the lips of a livid hue; the mouth either open or firmly closed; the tongue blue, swelled and protruded; the eye-lids closed, the eyes turned, and their pupils dilated; the face swelled and blue; the lower belly hard and inflated. The first signs of returning animation are, convulsive starting of the muscles of the face, or feet; motion of the eye-lids; a spasmodic shivering of the body.

Treatment.—1. After having been carefully taken out of the water by the arms, so as to prevent the least injury to the head and breast, the body ought to be carried to the nearest house (if possible, in a bier, as represented in Plate LIX. fig. 10.) with the head somewhat raised; or, in fine warm weather, the resuscitative process may with more advantage be performed in the open air, especially in sun-shine. 2. When the subject is deposited, the upper part of the body should be supported half-sitting, with the head inclining towards the right side. 3. The clothes are to be taken off without delay, but with the greatest precaution; as violent shaking of the body might extinguish the latent spark of life. 4. The mouth and nose must be cleansed from the mucus and froth, by means of a feather dipped in oil. 5. The whole body should now be gently wiped and dried with warm flannel cloths, then covered with blankets, feather-beds, hay, straw, &c. In cold or moist weather, the patient is to be laid on a mattress or bed, at a proper distance from the fire, or in a room moderately heated; but

but in the warm days of summer, a simple couch is sufficient. 6. If the patient be very young, or a child, it may be placed in bed between two persons, to promote natural warmth. See also the warming machine, delineated in Plate LIX. fig. 11, and described below. 7. In situations where the bath cannot be conveniently procured, bladders filled with lukewarm water should be applied to different parts of the body, particularly to the pit of the stomach; or a warming-pan wrapped in flannel gently moved along the spine; or aromatic fomentations frequently and cautiously repeated. 8. As the breathing of many persons in an apartment would render the air impure, and thus retard, or even prevent the restoration of life, not more than five or six assistants should be suffered to remain in the room where the body is deposited.

Stimulants generally employed.—1. Moderate friction with soft, warm flannel, at the beginning, and gradually increased by means of brushes dipped in oil, till pulsations of the heart are perceptible. 2. Inflation of the lungs, which may be more conveniently effected by blowing into one of the nostrils, than by introducing air into the mouth. For the former purpose, it is necessary to be provided with a wooden pipe, fitted at one extremity for filling the nostril, and at the other for being blown into by a healthy person's mouth, or for receiving the muzzle of a pair of common bellows, by which, the operation may be longer continued. At first, however, it will always be more proper to introduce the warm breath from the lungs of a living person, than to commence with cold atmospheric air. During this operation, the other nostril and the mouth should be closed by an assistant, while a third person gently presses the chest with his hands, as soon as the lungs are observed to be inflated. For a more effectual method of alternately introducing fresh air into the lungs, and expelling that which is rendered noxious, or unfit for respiration, see the description of fig. 8. Plate LIX, which follows these observations. 3. Stimulating clysters, consisting of warm water and common salt; or a strong solution of tartar emetic; or decoctions of aromatic herbs; or six ounces of brandy, should be speedily administered. We do not consider injections of the smoke of tobacco, or even clysters of that narcotic plant, in all instances safe or proper. 4. Let the body be gently rubbed with common salt, or with flannels dipped in spirits; the pit of the stomach fomented with hot brandy; the temples stimulated with spirit of hartshorn; and the nostrils occasionally tickled with a feather. 5. Persons of a very robust frame, and whose skin after being dried, assumes a rigid and contracted surface, may be put into the sub-trepid bath, of about 65°, which must be gradually raised to 75 or 80°, of Fahrenheit's scale, according to circumstances; or the body carried to a brewhouse, and covered with warm grains for three or four hours; but these expedients generally require medical assistance. 6. Violent shaking and agitation of the body by the legs and arms, though strongly recommended, and supposed to have often forwarded the recovery of children and boys, appears to us a doubtful remedy, which can be practised only in certain cases. 7. Sprinkling the naked body of a drowned person with cold water; submitting it to the operation of a shower-bath, or the sudden shocks of the electric fluid; as well as whipping it with nettles, administering emetics, and blood-letting—are desperate expedients, which should be resorted to only after the more lenient means have been unsuccessfully employed. It is, however, a vulgar and dangerous error, to suppose that persons apparently dead by immersion under water, are irrecoverable, because life does not soon re-appear: hence we seriously entreat those who are thus employed in the service of humanity, to persevere for three or four hours at least, in the application of the most appropriate remedies above described; for there are many instances recorded, of patients who recovered, after they had been relinquished by all their medical and other assistants.

Treatment on the return of life.—As soon as the first symptoms of that happy change become discernible, additional care must be taken to cherish the vital action, by the most soothing means. All violent proceedings should, therefore, be immediately abandoned, no farther stimulants applied, nor even the ears of the patient be annoyed by loud speaking, shouting, &c. At that important crisis, moderate friction only is requisite. And, if the reviving person happen to be in the bath, he may either remain there, provided his sensation be easy and agreeable, or be removed to a

comfortable bed after being expeditiously dried with warm flannels: fomentations of aromatic plants may then be applied to the pit of the stomach; bladders filled with warm water, placed to the left side; the soles of the feet rubbed with salt; the mouth cleared of froth and mucus, and a little white wine, or a solution of salt in water, dropped on the tongue. But all strong stimulants, such as powerful electric shocks, strong odours of volatile salts, &c. are at this period particularly injurious. Lastly, the patient, after resuscitation, ought to be for a short interval resigned to the efforts of Nature, and left in a composed and quiescent state: as soon as he is able to swallow, without compulsion or persuasion, warm wine, or tea, with a few drops of vinegar, instead of milk, or gruel, warm beer, and the like, should be given in small doses frequently repeated. Having stated the leading particulars to be attended to, in the practical treatment of persons who are on the eve of suffering from aquatic suffocation, we shall accompany them with a few directions, addressed to those humane assistants who often fall victims for want of due precaution in the execution of their benevolent design. As many fatal accidents happen to individuals who wish to rescue others in danger of being drowned, especially when the former are unskilful in the useful art of swimming, which ought to be learnt at an early period of life, we think it our duty to remind the reader of the two excellent contrivances already described under the articles AIR-JACKET, and BAMBOE HABIT. Every family dwelling on the banks of lakes or rivers, or near ponds, ought to be always provided with two or three such useful articles, to serve in cases of emergency; as it will generally be too late to procure them on the spur of the occasion. In Plate LIX, is given a representation of instruments employed for recovering the bodies of drowned persons; and also for their restoration from drowning.

Fig. 5. A forked instrument with blunt points, for making a superficial search after the drowned body, and sounding the particular situation in which it lies.

Fig. 6. A ladder with a long, jointed handle.

Fig. 7. An extractor, or a linked pair of tongs, which in the plate appears closed; but, on immersing it into water, opens by its own weight, as well as by the sliding down of the iron ring *o* from the part marked *x*, to that of *u*. It may again be closed, by pulling the double rope fastened to the ring *o*, which is thus shifted upward from *u* to *x*: by means of expanding the iron arms *nn*, which are likewise connected with this ring, the mouth or flaps of the instrument *rr*, may be shut: and to prevent their opening till required, the two ropes are firmly tied round the iron bolt *ss*; in which situation they remain till the body is extracted.

Fig. 8. A pair of bellows with two separate bags, so contrived that by opening them, when applied to the nostrils or mouth of a patient, one bag will be filled with common air, and the other with the air extracted from the lungs; and, by shutting them again, pure atmospheric air will be introduced into those organs, and that drawn out, consequently discharged into the room. Thus, the artificial breathing may be continued, while the other operations on the surface of the body are carried on; which could not be conveniently done, if the muzzle of a common pair of bellows were introduced into the nostril. *a*. Is an intermediate board, but which admits of no communication between the two bags. In the external board of each side, there is the usual hole, marked *b*, provided with a valve; and the cylindrical part through which the air is expelled in common bellows, is here soldered to a copper box, within which two other valves are applied to the tubes conducting the air. The cover *d* of this box, which may be unscrewed by means of an interposed leather ring, is almost of the shape of a funnel, to the neck of which is fastened a flexible tube *e*, made of varnished silk cloth, and a spiral wire that forms the cavity. To the extremity of this tube is attached a small ivory pipe *f*, the front of which may either be tubular and round, for introducing it into the nostril: or flat like the top-piece of a clarinet, if it be intended for the mouth. The valves consist of stiffened taffety, and are so arranged, that the corresponding ones stand in an inverted order. If, therefore, both bags of the bellows be expanded, two of the valves open themselves towards the internal part of the machine: one of these is fixed to one of the side-boards, but the other is within the box, on the mouth of the conducting tube belonging to the opposite bag of the bellows. By this contrivance, the air enters both bags of the bellows at the same

same time, and is, on compression, again expelled by means of two other valves, which open from within toward the external parts. Both bags of the bellows terminate below the valve in one principal tube of communication; because, though the action of both bellows is simultaneous, the stream of air, conformably to the arrangement before pointed out, can only enter, and escape, alternately. In using this machine, the small ivory pipe is applied either to one of the nostrils, or put into the mouth: in the former case, the other nostril and the mouth must be closed; in the latter, both nostrils. When the bellows are set in action, one of the bags receives a column of atmospheric air through its valve; while the other, by means of its flexible tube and its valve, extracts a portion of air from the lungs. But, if the bellows are again shut, one of the bags parts with the impure gas drawn out of the pulmonary vessels; and the second conveys pure atmospheric air to the organs of respiration. By properly repeating this alternate process, the patient may again be enabled to exercise the important function of breathing. As, however, a precipitate and irregular method of proceeding might be productive of injury, this delicate operation ought to be performed by persons who are acquainted with the mechanism of respiration. In some cases, where the patient has, for a considerable time, lain under water, or was afterwards neglected for want of due assistance, it would be desirable to introduce into his lungs oxygen, or pure vital air, instead of that of the common atmosphere; as the latter is generally more or less corrupted on such occasions by the breath of many persons in the same room. For this purpose may be used a bladder, marked *g*, which is provided with a cock and pipe fitted or screwed to the board of the inspiring valve and bag of the bellows. If, therefore, after opening the cock, the machine is set in motion, it will extract the pure air contained in the bladder, and, on the subsequent compression of the bellows, force it into the lungs of the patient.

Fig. 9. A machine for injecting the smoke of tobacco by way of clyster, in those desperate cases which require the application of this remedy. It consists of a pair of bellows, to the muzzle of which is fitted a metal box, *a*, provided with a ring, in the middle of which it may be unscrewed, and again closed, after being filled with tobacco, and set on fire: the pipe *c* of the flexible tube *b*, is introduced into the fundament; and thus, by means of the bellows *d*, the smoke is forced into the rectum.

Fig. 10. A bier of wicker work, in the form of a slanting, oblong basket, for conveying the body of the drowned, in a posture somewhat raised. This simple contrivance has the advantage, that the water may easily run off, while the patient is carried: and, as many unfortunate persons are materially injured by rough treatment, before they arrive at a house of reception, so that their recovery is thus often frustrated, we recommend the universal adoption of this useful implement.

Fig. 11. The warming machine of block tin, or other metal, was originally invented by Mr. Harvey, of London, who suggested it to our Royal Humane Society, and it was subsequently improved by M. Braasch, an ingenious mechanic, of Hamburg. Its object is to procure a uniform degree of warmth, throughout the apparatus, in the most expeditious manner, by filling the hollow, or double bottom and sides of the whole implement, with boiling water. *a* is the body of the machine, seven feet long, and made of solid pieces of block-tin, to prevent the necessity of soldering them, and consequently the formation of iron-rust: it rests on two wooden legs *ff*, and may be easily carried by the handles *g g*. The water is poured in through both funnels *d d*, in order to warm it more speedily; and each of these is provided with a stopper as suspended on a chain, represented in the figure with a view to prevent, if necessary, too sudden evaporation and cooling of the water: *h* is the intermediate space between the two metallic plates, producing a vacuum of $2\frac{1}{2}$ inches, in which the fluid is diffused over the whole machine; *b* is a wooden desk to support the head of the patient, and to protect it from the immediate contact with the heated parts; but, on the opposite end of the machine, there is an enlarged intermediate space *c*, for holding such a quantity of water and vapours as will procure an additional, or at least a more permanent, degree of heat towards the lower extremities, than to the trunk of the body. For discharging the water, when it is not wanted, or changing it when too cold, there is a cock at *e*. The hollow sides of this machine are about twelve inches high; and in order to ensure an uniform warmth,

the body apparently dead should be placed on a straw mattress, and tucked in with blankets. A pailful of water is required to fill the whole machine, as a smaller quantity would warm the sides only for a short time, by means of the vapour. It deserves to be remarked, that this ingenious contrivance may also be used for a warm bath; for which purpose, the inner space in which the body lies, should be supplied with water.

DRUGGET, in commerce, a stuff sometimes all wool, and sometimes half wool half thread, sometimes corded, but usually plain. Those that have the woof of wool, and the warp of thread, are called threaded druggets; and those wrought with the shuttle on a loom of four marches, as the serges of Mouti, Beauvois, and other like stuffs, corded, are called corded druggets. As to the plain, they are wrought on a loom of two marches, with the shuttle, in the same manner as cloth, camlets, and other like stuffs, not corded.

DRUIDS, DRUIDES, or DRUIDÆ, the priests or ministers of religion among the ancient Gauls, Britons, and Germans. Some derive the word from the Hebrew דְּרוּשִׁים *drussim*, which they translate *contemplatores*. Picard, (Celtopæd. lib. ii. p. 58,) believes the druids to have been thus called from Drui, or Dryius, their leader, the fourth or fifth king of the Gauls, and father of Saron or Naumes. Pliny, Salmasius, Vigenere, &c. derive the name from δρυς, an oak; on account of their inhabiting, or frequenting, and teaching in forests; or because, they never sacrificed but under the oak. But it is hard to imagine how the druids should come to speak Greek. Menage derives the word from the old British *drus*, demon, or magician; Borel, from the Saxon *dry*, magician; or from the old British *dru* or *derw*, "oak," whence he takes the Greek word δρυς to be derived; which is the most probable supposition. Gorop. Becanus, lib. i. takes drui to be an old Celtic and German word, formed from *trouis* or *truwis*, "a doctor of the truth and the faith;" which etymology Vossius acquiesces in. The druids were the first and most distinguished order among the Gauls and Britons; they were chosen out of the best families; and the honours of their birth, joined with those of their function, procured them the highest veneration among the people. They were versed in astrology, geometry, natural philosophy, politics, and geography; they were the interpreters of religion, and the judges of all affairs indifferently. Whoever refused obedience to them was declared impious and accursed. We know but little as to their peculiar doctrines; only that they believed the immortality of the soul; and, as is generally supposed, the metempsychosis; though a late author makes it appear highly probable they did not believe this last, at least not in the sense of the Pythagoreans. Their chief settlement in Britain was in the isle of Anglesey, the ancient Mona, which was well stored with spacious groves of their favourite oak. They were divided into several classes, viz. the vacerri, bard, eubages, semnothi or semnothei, and saronide. The vacerri are held to have been the priests; the bard, the poets; the eubages, the augurs; and the saronide, the civil judges and instructors of youth. As to the semnothei, who are said to have been immediately devoted to the service of religion, it is probable they were the same with the vacerri. Strabo, however, (lib. iv. p. 197,) only distinguishes three kinds, hardi, vates, and druids. The hardi were the poets; the vates, *vates* (probably the vacerri,) were the priests and naturalists; and the druids, besides the study of nature, applied themselves to morality. Diogenes Laertius assures us, that the druids were the same among the ancient Britons with the philosophers among the Greeks; the magi among the Persians; the gymnosophists among the Indians; and the Chaldeans among the Assyrians. Their garments were remarkably long; and, when employed in religious ceremonies, they wore a white surplice. They generally carried a wand in their hands; and wore a kind of ornament encased in gold about their necks, called the druid's egg. Their necks were also decorated with gold chains, and their hands and arms with bracelets: they wore their hair very short, and their beards remarkably long. The druids had one chief, or arch-druid, in every nation, who acted as high-priest. He had absolute authority over the rest; and commanded, decreed, punished, &c. at pleasure. At his death he was succeeded by the most considerable among his survivors; and, if there were several pretenders, the matter was ended by an election, or else decided by arms. The druids presided at sacrifices, and other ceremonies; and had the direction of every thing relating to religion. The

British and Gaulish youth were instructed by them. The children of the nobility, Mela tells us, they carried into caves, or the most desolate parts of forests, and kept them there, sometimes for 20 years, under their discipline. They were here instructed in the motion of the heavens, and the course of the stars; the magnitude of the heavens and the earth; the power and wisdom of the gods, the metempsychosis, immortality, &c. They preserved the memory and actions of great men in their verses, which they never allowed to be wrote down, but made their pupils get them by heart. In their common course of learning, they are said to have taught them 24,000 such verses. Thus their doctrines appeared more mysterious by being unknown to all but themselves; and having no book to recur to, they were the more careful to fix them in their memory. They worshipped the Supreme Being under the name of Esus, or Hesus, and the symbol of the oak; and had no other temple than a wood or a grove, where all their religious rites were performed. Nor was any person admitted to enter that sacred recess, unless he carried with him a chain, in token of his absolute dependence on the Deity. Indeed, their whole religion originally consisted in acknowledging, that the Supreme Being, who made his abode in these sacred groves, governed the universe; and that every creature ought to obey his laws, and pay him divine homage. They considered the oak as the emblem, or rather the peculiar residence, of the Almighty; and accordingly chaplets of it were worn both by the druids and people, in their religious ceremonies; the altars were strewed with its leaves, and encircled with its branches. The fruit of it, especially the mistletoe, was thought to contain a divine virtue, and to be the peculiar gift of heaven. It was, therefore, sought for on the sixth day of the moon with the greatest earnestness and anxiety; and when found was hailed with such raptures of joy, as almost exceeds imagination to conceive. As soon as the druids were informed of this fortunate discovery, they prepared every thing ready for the sacrifice under the oak, to which they fastened two white bulls by the horns; then the arch-druid, attended by a prodigious number of people, ascended the tree dressed in white; and with a consecrated golden knife, or pruning-hook, cropped the mistletoe, which he received in his sagum or robe, amidst the rapturous exclamations of the people. Having secured this sacred plant, he descended the tree; the bulls were sacrificed; and the Deity invoked to bless his own gift, and render it efficacious in those distempers in which it should be administered. The consecrated groves, in which they performed their religious rites, were fenced round with stones, to prevent any person's entering between the trees, except through the passages left open for that purpose, and which were guarded by some inferior druids, to prevent any stranger from intruding into their mysteries. These groves were of different forms; some quite circular, others oblong, and more or less capacious, as the votaries in the districts to which they belonged were more or less numerous. The area in the centre of the grove was encompassed with several rows of large oaks set very close together. Within this large circle were several smaller ones surrounded with large stones; and near the centre of these smaller circles, were stones of a prodigious size and convenient height, on which the victims were slain and offered. Each of these being a kind of altar, was surrounded with another row of stones, the use of which cannot now be known, unless they were intended as cinctures to keep the people at a convenient distance from the officiating priest. Suetonius, in his life of Claudius, assures us the druids sacrificed men; and Mercury is said to be the god to whom they offered these victims. Diodorus Siculus, (lib. vi.) observes it was only upon extraordinary occasions they made such offerings; as, to consult what measures to take, to learn what should befall them, &c. by the fall of the victim; the tearing of his members, and the manner of his blood gushing out. Augustus condemned the custom, and Tiberius and Claudius punished and abolished it.

DRUM, TYMPANUM, is a marshal musical instrument in form of a cylinder, hollow within, and covered at the two ends with vellum, which is stretched or slackened at pleasure by the means of small cords and sliding knots. It is beat upon with sticks. Some drums are made of brass, but they are commonly of wood. There are several beats of the drum, as assembly, chamade, reveillé, retreat, &c.

DRUMS, KETTLE, are two sorts of large basons of copper or brass, rounded in the bottom, and covered with vellum or goat-skin, which is kept fast by a circle of iron, and several holes fast-

ened to the body of the drum, and a like number of screws to screw up and down. They are much used among the horse, as also in operas, oratorios, concerts, &c.

DRUM OF THE EAR, an elliptical, concave, membrane, composed of two or three lamellæ, and furnished with many blood-vessels. It is situated obliquely inwards, about the middle part of the ear, at the extremity of the auditory passage. See **ANATOMY**.

DRUMLANRIG, a town of Scotland, in Dumfries-shire, 13 miles N. of Dumfries.

DRUMMER, or **DRUM**, he that beats the drum; of whom each company of foot has one, and sometimes two. Every regiment has a drum-major, who has the command over the other drums. They are distinguished from the soldiers by clothes of a different fashion: their post, when a battalion is drawn up, is on the flanks, and on march it is betwixt the divisions.

DRUMMOND, WILLIAM, a Scotch poet, was the son of sir John Drummond, of Hawthornden, and born there in 1585. He was destined for the law, but Parnassus had more charms for him than the courts. In his retirement at Hawthornden he wrote several beautiful poems; but the death of a lady, to whom he was about to be married, affected him so much, that he went abroad, where he remained some years, and then returned to his own country. He wrote his History of the Seven Kings of the name of James, and several pieces to promote peace and union in that turbulent time. He died in 1649, leaving a widow and three children. His works were printed in folio at Edinburgh in 1711.

DRUNKENNESS. See **INTOXICATION**.

DRUPA, in botany, a species of pericarpium, or seed-vessel, which is succulent or pulpy, has no valve or external opening like the capsule and pod, and contains within its substance a stone or nut. The cherry, plum, peach, apricot, and all other stone-fruit are of this kind. The stone or nut, which in this sort of fruit is surrounded by the soft pulpy flesh, is a kind of ligneous or woody cup, which contains a single kernel or seed. The almond is a drupa, so is the seed-vessel of the elm-trees and the genus rumphia, though far from being pulpy or succulent; the first and third are of a substance like leather, the second like parchment. The same may be said of the walnut, the pistachia nut, guetterda, quisqualis, jack-in-a-box, and some others. The seeds of the elm, schrehera, stagellaria, and the mango-tree, are not contained in a stone. The seed-vessel of burr-reed is dry, shaped like a top, and contains two angular stones.

DRUSENHEIM, a small town of France, in the department of the Lower Rhine, 5 miles S.E. of Haguenau.

DRUSSES, or **DRUZES**, a remarkable nation in Palestine, inhabiting the environs of Mount Lebanon. In the year of the Hejira 386 (A.D. 996), the third caliph of the race of the Fatemites, called Hakem B' Amr-Ellah, succeeded to the throne of Egypt at the age of eleven years. He was one of the most mad and capricious princes of whom history has preserved the name, not excepting Caligula himself. He caused the first caliphs, the companions of Mohammed, to be cursed in the mosques, and afterwards revoked the anathema: he compelled the Jews and Christians to abjure their religion, and then permitted them to resume it. He prohibited the making of slippers for women, to prevent them from coming out of their houses. He burnt one-half of the city of Cairo for his diversion, while his soldiers pillaged the other. He prohibited the pilgrimage to Mecca, fasting, and the five prayers; and at length carried his madness so far as to desire to pass for God himself! He ordered a register of those who acknowledged him to be so, and the number amounted to 16,000! This impious pretension was supported by a false prophet, named Mohammed Ben Ismael, who came from Persia into Egypt, and taught that it was not necessary to fast or pray, to practise circumcision, to make the pilgrimage to Mecca, or observe festivals; that the prohibition of pork and wine was absurd; and that marriage between brothers and sisters, fathers and children, was lawful. To ingratiate himself with Hakem, he maintained that the caliph was God himself incarnate; and instead of his name *Hakem B' Amrellah*, which signifies governing by the order of God, he called him *Hakem B' Amr-Eh*, governing by his own order. Unluckily for the prophet, his new god had not the power to protect him from the fury of his enemies, who slew him in a tumult almost in the arms of the caliph, who was himself massacred soon after on mount Mokattam, where he, as he said, had held conversation

with angels. The death of these two chiefs did not stop the progress of their opinions: a disciple of Mohammed Ben Ismael, named Hamzah Ben Ahmud, propagated them with indefatigable zeal in Egypt, in Palestine, and along the coast of Syria, as far as Sidon and Berytus. His proselytes being persecuted by the sect in power, they took refuge in the mountains of Lebanon, where they were better able to defend themselves; at least it is certain, that, shortly after this era, we find them established there, and forming an independent society. The difference of their opinions disposes them to be enemies; but the urgent interest of their common safety forces them to allow mutual toleration, and they have always appeared united, and have jointly opposed, at different times, the Crusaders, the sultans of Aleppo, the Mamelukes, and the Ottomans. The conquest of Syria by the latter, made no change in their situation. Selim I., on his return from Egypt, meditating no less than the conquest of Europe, disdained to waste his time before the rocks of Lebanon. Soliman II. his successor, incessantly engaged in important wars, either with the knights of Rhodes, the Persians, the kingdom of Yemen, the Hungarians, the Germans, or the emperor Charles V. had no time to think of the Druzes. Emboldened by this inattention, and not content with their independence, they frequently descended from their mountains to pillage the Turks. The pachas in vain attempted to repel their inroads; their troops were invariably routed or repulsed. And it was not till 1588, that Amurath III. wearied with the complaints made to him, resolved, at all events, to reduce these rebels, and had the good fortune to succeed. His general, Ibrahim Pacha, marched from Cairo, and attacked the Druzes and Maronites, with so much address and vigour as to force them into their strong holds in the mountains. Dissention took place among their chiefs, of which he availed himself to exact a contribution of upwards of one million of piasters, and to impose a tribute which has continued to the present time. The opinions of Mohammed ben Ismael may be regarded as the substance of the religion of the Druzes. They practise neither circumcision, nor prayers, nor fasting; they observe neither festivals nor prohibitions. They drink wine, eat pork, and allow marriage between brothers and sisters, though not between fathers and children. From this we may conclude, that the Druzes have properly no religion; but one class of them must be excepted, whose religious customs are very peculiar. Those who compose it are to the rest of the nation what the initiated were to the profane; they assume the name of Okkals, which means spiritualists, and bestow on the vulgar the epithet of Djahel or ignorant; they have various degrees of initiation, the highest orders of which require celibacy. These are distinguishable by the white turban they affect to wear, as a symbol of their purity; and so proud are they of this supposed purity, that they think themselves sullied by even touching a profane person. If such eat out of their plate, or drink of their cup, they break them; and hence the custom so general in this country of using vases with a sort of cock, which may be drank out of without touching them with the lips.

DRUSIUS, JOHN, a Protestant writer of great learning, born at Oudenarde in Flanders, in 1555. He was designed for the study of divinity; but his father being outlawed, and deprived of his estate, they both retired to England, where the son soon became professor of the oriental languages at Oxford: but upon the pacification of Ghent, they returned to their own country, where Drusius was also appointed professor of the oriental languages. From thence he removed to Friesland, where he was admitted Hebrew professor in the university of Franeker; the functions of which he discharged with great honour till his death in 1616. His works shew him to have been well skilled in Hebrew; and the states-general employed him in 1600 to write notes on the most difficult passages in the Old Testament, with a pension of 400 florins a-year: but being frequently disturbed in this undertaking, it was not published till after his death. He held very great correspondence with the learned: for besides letters in Hebrew, Greek, and other languages, there were found 2300 Latin letters among his papers.

DRUSIUS, JOHN, the son of the preceding, was a prodigy of learning. He was born at Franeker in 1588; began to learn Latin and Hebrew at five years old; at seven explained the Hebrew Psalter so exactly, that he astonished a Jewish teacher at Leyden; at nine he could read the Hebrew without points, and add them where wanted. He spoke Latin as readily as his native tongue, and could make himself understood in English. At twelve, he

wrote in Hebrew extempore, in verse and prose, like the Jews. At seventeen he made a speech in Latin to king James I. in the midst of his court, and was admired by all present. He was endowed with a lively genius, a strong memory, a solid judgement, an agreeable temper, and an indefatigable ardour for study; and was also extremely pious. He died of the stone in 1609, aged 21, at the house of Dr. W. Thomas, dean of Chichester, who gave him a considerable salary. He left several works; many letters and verses in Hebrew; Notes on Solomon's Proverbs, &c. and digested into alphabetical order Elias Levita's Nomenclator; to which he added the Greek words, and had begun some translations.

DRUYN, DREVIN PETRI, or GRAND DREVIN, a town of Africa, on the Ivory coast. Lon. 4. 5. W. Lat. 5. N.

DRYADES, or DRYADS, in the heathen mythology, a sort of deities, who, the ancients believed, inhabited groves and woods. They differed from the Hamadryades; these latter being attached to some particular tree, with which they were born, and with which they died; whereas the Dryads were goddesses of trees and woods in general. See **HAMADRYADES**.

DRYANDRIA, in botany, a genus of the dioecia monadelphia class and order: natural order Tricocceæ. Calyx two-leaved; corolla five-petaled; or, calyx five-leaved, resembling a corolla, surrounded by a two or three-leaved calycle; stamina nine; fruit three or four grained. There is but one species, viz. *D. cordata*.

DRYAS, in botany, a genus of the polygynia order, and icosandria class: natural order Senticoseæ. Calyx from five to ten cleft; petals from five to eight; seeds hairy, tailed. It has two species.

DRYDEN, JOHN, one of the most eminent English poets of the seventeenth century, descended of a genteel family in Huntingdonshire, born in that county at Oldwinkle, 1631, and educated at Westminster school under Dr. Busby, from whence he was elected to Trinity college, Cambridge, in 1650. He proceeded to the degree of M.A. and in 1657 removed to London, where he wrote, the year following, an elegy on the death of Cromwell; and at the Restoration he complimented the king by a poem, entitled *Astrea Redux*. In 1666 he married lady Elizabeth Howard, daughter of the earl of Berkshire. On the establishment of the Royal Society, he was chosen one of the first members. In 1662 appeared his first play, called *The Wild Gallant*. Soon after the fire of London he engaged with the king's theatre for an annual stipend, on condition of furnishing a certain number of plays in each year. On the death of sir William Davenant he was nominated poet laureat; and about the same time he obtained the place of historiographer royal, with a salary of 200*l.* a year, and a butt of wine. His eminence as a dramatic writer exposed him to the envy of several rival wits; the duke of Buckingham held him up to ridicule in the character of Bays in *The Rehearsal*; and the earl of Rochester being offended at some things in an Essay on Satire, written jointly by our poet and lord Mulgrave, caused the former to be cudgelled by some hired ruffians as he came home from a coffee-house. At the accession of James II. Dryden turned Roman Catholic, and, like most converts, endeavoured to defend his new faith at the expence of the old one, in a poem, called *The Hind and Panther*, which was admirably answered by Prior and Montague in *The Country Mouse and the City Mouse*. At the Revolution he lost his posts, and was succeeded by Shadwell, whom Dryden satirised under the name of Mac Flecknoe. Mr. Dryden's circumstances had never been affluent; but now being deprived of this little support, he found himself reduced to the necessity of writing for mere bread. From this period, therefore, he was engaged in works of labour as well as genius, viz. in translating the works of others; and to this necessity our nation stands indebted for some of the best translations extant. In the year he lost the laurel, he published the life of St. Francis Xavier from the French. In 1693, came out a translation of Juvenal and Persius; in the first of which he had a considerable hand, and of the latter the entire execution. In 1695, was published his prose version of Fresnoy's *Art of Painting*; and the year 1697 gave the world that translation of Virgil's works entire, which still does, and perhaps ever will, stand foremost among the attempts made on that author. The petite pieces of this eminent writer, such as prologues, epilogues, epitaphs, elegies, songs, &c. are too numerous to specify here, and too much dispersed to direct

rect the reader to. The greatest part of them, however, are to be found in a collection of miscellanies, in 6 vols. 12mo. His last work is his Fables, which consist of many of the most interesting stories in Homer, Ovid, Boccace, and Chaucer, translated or modernized in the most elegant and poetical manner; together with some original pieces, among which is that amazing ode on St. Cecilia's day, which, though written in the very decline of the author's life, and at a period when old age and distress conspired, as it were, to damp his poetic ardor, and clip the wings of fancy, yet possess so much of both, as would be sufficient to have rendered him immortal had he never written a single line besides. His critical prefaces are admirable; and his poetry is correct, harmonious, and strong, particularly his satires. As a dramatic writer he chiefly excelled in tragedy. He had three sons: Charles became usher of the palace to pope Clement XI. and was drowned in 1704; John wrote a comedy, called The Husband his own Cuckold; and Henry entered into a religious order abroad. Though Dryden was addicted to astrology, yet the story of his predicting the fate of his eldest son is not true. He died in 1700, and was buried in Westminster abbey; but had no monument erected to him for several years; to which Mr. Pope alludes in his epitaph intended for Mr. Rowe, in this line,

Beneath a rude and nameless stone he lies.

In a note upon which we are informed, that the tomb of Mr. Dryden was erected by this hint, by Sheffield, duke of Buckingham, to which was originally intended this epitaph:

This Sheffield rais'd.—The sacred dust below
Was Dryden once; the rest, who does not know?

Which was since changed into the plain inscription now upon it, viz.

J. DRYDEN,
Natus Aug. 9, 1631.
Mortuus Maii 1, 1701.

Johannes Sheffield, dux Buckinghamiensis, fecit.

DRYPIS, in botany, a genus of the trigynia order, and pentandria class of plants; natural order, Caryophyllææ. Calyx quinque-dentate; petals five; opening at the capsule as if cut round horizontally; monospermous. It has only one species, a biennial, native of Italy and Barbary.

DRY ROT, a disease incident to timber used for building, such as flooring-boards, joists, wainscoting, &c. Dr. Darwin is of opinion, that the dry-rot may be entirely prevented, by soaking the timber first in lime-water, till it has absorbed as much of it as possible, and, after it has become dry, immersing it in a weak solution of vitriolic acid in water, which he supposes will not only preserve it from decay for many centuries (if it be kept dry), but also render it less inflammable; a circumstance that merits considerable attention in constructing houses. In the Transactions of the Society for the Encouragement of Arts, we meet with the following account of the cause of the dry rot in timber, and the method of preventing it, communicated by Mr. Batson, of Limehouse. He observes, that the dry rot having taken place in one of his parlours, to such a degree as to require the pulling down part of the wainscot every third year, and perceiving that it arose from a damp, stagnated air, and from the moisture of the earth, he determined, in the month of June, 1783, to build a narrow closet next the wall through which the moisture came to the parlour. This expedient had the desired effect. But, though the rot in the parlour was totally stopped, the evil soon appeared in the closet, where fungi of a yellow colour arose in various parts. In the autumn of the year 1786 the closet was locked up about ten weeks: on opening it, numerous excrescences were observed about the lower part; a white mould was spread by a plant resembling a vine, or sea-weed; and the whole of the inside, china, &c. was covered with a fine powder of the colour of brick-dust. On cleaning out the closet, it was discovered that the disease had affected the wood so far as to extend through every shelf, and the brackets that supported them. In the beginning of the year 1787, he determined to strip the whole closet of lining and floor, not to leave a particle of the wood behind, and also to dig, and take away, about two feet of the earth in depth, and leave the walls to dry, so as to destroy the roots or seeds of the evil. When, by time, the

admission of air, and good brushing, it had become properly dry and cleansed, he filled it, of sufficient height for the joists, with anchor-smith's ashes, because no vegetable will grow in them. The joists being sawed off to their proper lengths, and fully prepared, they and their plates were well charred, and laid upon the ashes; particular directions being given, that no scanting or board might be cut or planed in the place, lest any dust or shavings might drop among the ashes. The flooring-boards being very dry, he caused them to be laid close, to prevent the dust getting down, which perhaps, in the course of time, might bring on vegetation. The framing of the closet was then fixed up, having all the lower panels let in, to be fastened with buttons only, so that, if any vegetation should arise, the panels might with ease be taken out and examined. In some situations it might be expedient and necessary to take out a greater depth of earth; and where ashes can be had from a foundry, they may be substituted for those of anchor-smiths; but house ashes are by no means to be depended upon. At the expiration of seven years from the period of making this experiment the wainscot was removed, and the flooring-boards also taken up, when they were found entirely free from any appearance of the rot: two pieces of wood (yellow fir) which had been driven into the wall as plugs, without being previously charred, were alone affected with this disease.

DSAPRONG, or **CHAPARANG**, a considerable city of Asia, in Thibet. Lon. 78. 42. E. Lat. 34. 0. N.

DSJABEL, an island in the Red Sea, lying N. of the Straits of Babel-Mandel.

DSJEI, a district of Arabia, in Sana, wherein there are a great number of schiechs.

DSJEI, the capital of the above district. Lon. 43. 50. E. Lat. 14. 37. N.

DSJEDSJAL, a sect of Mohammedan Arabs, chiefly inhabiting Mecran, a maritime province of Persia. "Its first author, says Mr. Niebuhr, was a venerable old man, who was found by some wood-cutters shut up in the middle of a tree, and having a book in his hand." This miraculous origin, he was informed of at Maskat, but "each sect," he adds, "tells ridiculous stories of the others to bring them into contempt."

DSJENNED, a town of Yemen. Lon. 43. 49. E. Lat. 15. 39. N.

DSJESAN, a town of Yemen, on the coast of the Red Sea. Lon. 41. 50. E. Lat. 16. 45. N.

DSJIDDA, or **JIDDA**, a city and sea-port of Arabia, in the country of Hedsjas, near Mecca, in the dominions of the sherriffe of Mecca.

DSJILIBAT, and **DSJIMUM**, two districts of Arabia, in the country of Hedsjas, on the coast of the Red Sea.

DSJOBEL ALA, a town of Arabia, in the province of Yemen. Lon. 43. 38. E. Lat. 15. 47. N.

DSJOBLA, an ancient city of Arabia, in the province of Yemen. Its streets are paved, which is not common in Arabia. Lon. 44. 10. E. Lat. 13. 55. N.

DSJERHAMIE, a tribe of Arabs who inhabit between Rama and Jerusalem.

DSJOF, a large province of Arabia, in the country of Yemen, extending S. from Nedsjeran to Hadramaut, and E. from Hachid-u-Bekil to the Desert, by which Yemen is separated from Oman. It is full of sandy and desert plains.

DSJULFAR, a principality of Arabia, in the province of Oman, called also Seer.

DUAL, [*dualis*, Lat.] expressing the number two.

DUBKI, a town of Russia, in the government of Petersburg; on the Gulph of Finland, 16 miles N. N. W. of Petersburg.

DUBLIN, a county of Ireland, in the province of Leinster; bounded on the N. by the county of Meath, on the E. by the Irish sea, on the S. by the county of Wicklow, and on the west by those of Meath and Kildare. It is 25 miles long from N. to S. and from nine to 16 broad; and contains about 142,050 acres. The soil is fertile.

DUBLIN, the metropolis of Ireland, the second city in his majesty's dominions, and esteemed the fifth for magnitude in Europe, is situated in the province of Leinster, and county of Dublin, at the bottom of a large bay. The river Liffey, which here disembogues itself into the ocean, divides the town nearly into two equal parts. Dublin is situated 60 miles W. of Holyhead in Wales; and 330 N. W. of London. Lon. 6. 6. W. Lat. 53. 20. N. Dublin is a place

a place of great antiquity. It was anciently confined to the S. side of the Liffey. In the 10th century, after the fortifications of Dublin were repaired by the Ostmen, the walls of the city, including those of the castle, did not occupy more than an Irish mile. Ptolemy, who flourished about A. D. 140, says, it was anciently called *Aschled*. In 155, Alpinus, whose daughter Auliana was drowned in the Liffey, changed the name from *Aschled* to *Auliana*. It was afterwards named *Dublana*, and Ptolemy calls it *Eblana*. *Dublana*, (whence *Dublinum* and *Dublin*;) is evidently derived from *Dub-leana*, the place of the black harbour or lake, or rather the lake of the sea; the bay of Dublin being frequently so called. The city has had a variety of names. The Irish call it *Drom-choll-coil*, "the brow of a hazle wood." In 181, Eogan king of Munster being on a royal tour, paid a visit to this place, which was then called *Atha Cliath-Dubb-Line*, "the passage of the ford of hurdles over the black pool." This city has two cathedrals, 18 parish-churches, two chapels, of ease, 15 Roman catholic chapels, six meeting houses for presbyterians, one for anabaptists, four for methodists, two for quakers, a church for French Calvinists, a Danish and a Dutch church, and a Jewish synagogue.

DUBLIN, a town of Pennsylvania, in Philadelphia county; 10 miles N. E. of Philadelphia.

DUBOS, JOHN BAPTIST, a learned and ingenious French author, born at Beauvais in 1670. He finished his studies at Paris, and was intrusted with the management of several important affairs in Italy, England and Holland. At his return to Paris, he got a prebendary: afterwards he had a pension of 2000 livres, and the abbey of Notre Dame at Recons, near Beauvais. He died at Paris, when perpetual secretary of the French academy, on the 23d March, 1742. His principal works are, 1. *Critical Reflections on Poetry and Painting*, 3 vols. 12mo. 2. *A Critical History of the French Monarchy in Gaul*, 2 vols. 4to.

DUCALS, letters patent granted by the senate of Venice, or wrote in the name of the senate, to foreign princes: so named because the name of the doge or duke was prefixed to them.

DUCAS, a learned Greek, who wrote a history of what passed under the last emperors of Constantinople, till the ruin of that city. This work, which is esteemed, was printed at the Louvre in 1649, with the Latin translation, and notes of Bouillaud.

DUCAT, a coin chiefly of gold. The origin of ducats is assigned by Procopius, to Longinus, governor of Italy; who, revolting against the emperor Justin II., made himself duke of Ravenna, and called himself *Exarcha*, i. e. without lord or ruler; and, to shew his independence, struck pieces of money, of very pure gold, in his own name, and with his own stamp, which were called *ducati*. Du Cange affirms, that the first ducats were struck in the duchy of Apulia. The chief gold ducats are, the single and double ones of Venice, Florence, Genoa, Germany, Hungary, Poland, Sweden, Denmark, Flanders, Holland, and Zurich. The double ducats weigh from five pennyweights 17 grains, to five pennyweights 10 grains; and the single in proportion. The Spaniards have no ducats of gold; and the silver one, with them, is no real species, but only a money of account like our pound. It is equivalent to 11 rials. The silver ducats of Florence serve there for crowns.

DUCATOON, a silver coin, struck chiefly in Italy, though there are also Dutch and Flemish ducatoons. They are valued at about 4s. 8d. or 4s. 10d. according to the rate of bullion. There is also a gold ducatoon, current principally in Holland: it is equivalent to 20 florins, at the rate of 1s. 11½d. the florin.

DUCENARIUS, [*Δουκηνάριος*,] in antiquity, an officer of the Roman army, who had the command of 200 men.

DUCENTESIMA, in antiquity, a tax of the 200th penny, exacted by the Romans.

DUCES TECUM, in law, a writ that commands a person to appear in the court of chancery, and bring with them certain writings, evidences, or other things, which the court is inclined to view.

DUCK, in ornithology. See **ANAS** and **DECOY**. This fowl is furnished with a peculiar structure of vessels about the heart, which enables it to live a considerable time under water, as is necessary for it in diving.

DUCKING, a sort of marine punishment, inflicted by the French before the revolutions on those who had been convicted of desertion, blasphemy, or sedition. It was thus performed: The

criminal was placed astride of a short thick batten, fastened to the end of a rope, which passed through a block hanging at one of the yard-arms. Thus fixed, he was hoisted suddenly up to the yard, and the rope being slackened at once, he was plunged into the sea. This was repeated several times conformably to the sentence against the culprit, who had also several cannon-shot fastened to his feet. A gun was also fired to advertise the other ships of the fleet, that their crews might become spectators.

DUCKING is also a penalty which veteran sailors pretend to have a right to inflict on those who, for the first time, pass the tropic of Cancer, the equator, or the straits of Gibraltar, in consequence of their refusal or incapacity to pay the usual fine levied on such occasions.

DUCKSFOOT. See **PODOPHYLLUM**.

DUCK UP, is a phrase used at sea by the steer's man, when the main-sail, fore-sail, or sprit-sail, hinder his seeing to steer by a land-mark: upon which he calls out, *duck up* the clew-lines of these sails, that is, hale the sails out of the way. When a shot is made by a chace-piece, if the clew of the sprit-sail hinder the sight, they call out, *duck up*, &c.

DUCT, **DUCTUS**, in general, denotes any tube or canal. It is much used by anatomists, who mention the adipose ducts, the thoracic, or chyliiferous duct; the excretory ducts of the glands; the hepatic duct; the salival ducts; the lachrymal ducts; the *ductus communis choledochus*, &c. Their use is to convey the fluids of the body to the parts to which they belong. See **ANATOMY**.

DUCTILITY, in physics, a property possessed by certain solid bodies, which consists in their yielding to percussion or pressure, and in receiving different forms without breaking. Some bodies are ductile in all circumstances. Such are metals, particularly gold and silver. Other bodies are ductile only when heated to a sufficient degree; such as wax and other substances of that kind, and glass. Other bodies, particularly some kinds of iron, called by the workmen *red-hot*, brass, and some other metallic mixtures, are ductile only when cold, and brittle when hot. The degrees of heat requisite to produce ductility in bodies of the first kind, vary according to their different natures. The great ductility of some bodies, especially gold, is very surprising: the gold-beaters and wire-drawers furnish us with abundant proofs of this property; they every day reduce gold, into lamellæ inconceivably thin, yet without the least aperture or pore discoverable, even by the microscope: a single grain of gold may be stretched under the hammer, into a leaf that will cover a house, and yet the leaf remain so compact as not to transmit the rays of light, nor even admit spirit of wine to transude. Dr. Halley took the following method to compute the ductility of gold: he learned from the wire-drawers, that an ounce of gold is sufficient to gild, that is, to cover or coat, a silver cylinder of forty-eight ounces weight, which cylinder may be drawn out into a wire so very fine, that two yards shall weigh only one grain; and consequently ninety-eight yards of the same wire, only forty-nine grains: so that a single grain of gold here gilds ninety-eight yards; and of course, the ten-thousandth part of a grain is here above one-third of an inch long. And since the third part of an inch is yet capable of being divided into ten less parts visible to the naked eye, it is evident that the hundred thousandth part of a grain of gold may be seen without the assistance of a microscope. Proceeding in his calculation, he found, at length, that a cube of gold, whose side is the hundredth part of an inch, contains 2,433,000,000 visible parts; and yet, though the gold with which such wire is coated, is stretched to such a degree, so intimately do its parts cohere, that there is not any appearance of the colour of the silver underneath. Mr. Boyle, examining some leaf-gold, found that a grain and a quarter in weight took up an area of fifty square inches; supposing therefore the leaf divided by parallel lines 100th part of an inch apart, a grain of gold will be divided into five hundred thousand minute squares, all discernible by a good eye: for the same author shews, that an ounce of gold drawn out in wire would reach 155 miles and a half. But Mr. Reaumur has carried the ductility of gold to a still greater extent. What is called gold-wire, every body knows, is only a silver one gilt. The cylinder of silver, covered with leaf-gold, they draw through the hole of an iron, and the gilding still keeps pace with the wire, stretch it to what length they can. Now Mr. Reaumur shews, that in the common way of drawing gold-wire, a cylinder of

silver twenty-two inches long, and fifteen lines in diameter, is stretched to 1,163,520 feet, or is 634,692 lines longer than before, which amounts to about ninety-seven leagues. To wind this thread on silk for use, they first flatten it, in doing which it stretches at least one-seventh farther, so that the twenty-two inches are now 111 leagues: but in the flattening, instead of one-seventh, they could stretch it one-fourth, which would bring it to 120 leagues. This appears a prodigious extension, and yet it is nothing to what this gentleman has proved gold to be capable of.

DUCTILITY OF GLASS. We all know that, when well penetrated with the heat of fire, the workmen can figure and manage glass like soft wax; but what is most remarkable, it may be drawn, or spun out, into threads exceedingly long and fine. Our ordinary spinners do not form their threads of silk, flax, or the like, with half the ease and expedition as the glass-spinners do threads of this brittle matter. We have some of them used in plumes for children's heads, and divers other works, much finer than any hair, and which bend and wave like hair with every wind. Nothing is more simple and easy than the method of making them. There are two workmen employed; the first holds one end of a piece of glass over the flame of a lamp; and, when the heat has softened it, a second operator applies a glass hook to the metal thus in fusion; and, withdrawing the hook again, it brings with it a thread of glass, which still adheres to the mass: then, fitting his hook on the circumference of a wheel about two feet and a half in diameter, he turns the wheel as fast as he pleases: which, drawing out the thread, winds it on its rim; till, after a certain number of revolutions, it is covered with a skain of glass-thread. The mass in fusion over the lamp diminishes insensibly: being wound out like a clue of silk upon the wheel; and the parts, as they recede from the flame, cooling, become more coherent to those next to them, and this by degrees: the parts nearest the fire are always the least coherent, and, of consequence, must give way to the effort the rest make to draw them towards the wheel. The circumference of these threads is usually a flat oval, being three or four times as broad as thick: some of them seem scarcely bigger than the thread of a silkworm, and are surprisingly flexible. If the two ends of such threads are knotted together, they may be drawn and bent, till the aperture, or space in the middle of the knot, does not exceed one-fourth of a line, or one forty-eighth of an inch, in diameter. Hence M. Reaumur advances, that the flexibility of glass increases in proportion to the fineness of the threads: and that, probably, had we but the art of drawing threads as fine as a spider's web, we might weave stuffs and cloths of them for wear. Accordingly, he made some experiments this way; and found that he could make threads fine enough, viz. as fine, in his judgement, as spider's thread, but he could never make them long enough to do any thing with them.

DUBERSTADT, a town of Germany, in the circle of Lower Saxony, 40 miles N. E. of Cassel. Lon. 10. 12. E. Lat. 51. 41. N.

DUDLEY, a town of England, in the county of Worcester, 10 miles W. of Birmingham.

DUEL, a single combat, at a time and place appointed, in consequence of a challenge. This custom came originally from the northern nations, among whom it was usual to decide all their controversies by arms. Both the accuser and accused gave pledges to the judges on their respective behalf; and the custom prevailed so far amongst the Germans, Danes, and Franks, that none were excused from it but women, sick people, cripples, and such as were under 21 years of age or above 60. Even ecclesiastics, priests, and monks, were obliged to find champions to fight in their stead. The punishment of the vanquished was either death, by hanging or beheading; or mutilation of members, according to the circumstances of the case. Duels were at first admitted not only on criminal occasions, but on some civil ones for the maintenance of rights to estates, and the like: in latter times, however, before they were entirely abolished, they were restrained to these four cases. 1. That the crime should be capital. 2. That it should be certain the crime was perpetrated. 3. The accused must by common fame be supposed guilty. And, 4. The matter not capable of proof by witnesses.

DUEL, at present, is used for single combat on some private quarrel; and must be premeditated, otherwise it is called a *Ren-counter*. If a person is killed in a duel, both the principals and seconds are guilty, whether the seconds engage or not. See

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MURDER. It is also a very high offence to challenge a person either by word or letter, or to be the messenger of a challenge. See *LAW*.

DUET, in music, a composition expressly written for two voices or instruments, with or without a bass and accompaniments. In good duets the execution is pretty equally distributed between the two parts, and the melodies so connected, intermingled, and dependent on each other, as to lose every effect when separated, but to be perfectly related and concinnous when heard together.

DUEREN, or **DUREN**, a handsome town of Germany, in the duchy of Juliers, 12 miles S. S. E. of Juliers.

DUERSTADT, or **WYCK DE DUERSTADT**, a town of Batavia, in the department of the Rhine, and late province of Utrecht, 11 miles from Utrecht.

DUGDALE, Sir **WILLIAM**, an eminent English historian, antiquarian, and herald, born in Warwickshire in 1605. He was introduced into the herald's office by Sir Christopher Hatton; and ascended gradually through all the degrees, until he became garter principal king at arms. His chief work is the "*Monasticum Anglicanum*," in 3 vols. folio; containing the charters and descriptions of all the English monasteries, adorned with engravings: in the former of which works he was assisted by Mr. Roger Dodsworth. Nor are his "*Antiquities of Warwickshire*" less esteemed. He wrote likewise the *History of St. Paul's Cathedral*; a *History of Embanking and Draining*; a *Baronage of England*; and completed the second volume of Sir Henry Spelman's *Councils*, with a second part of his *Glossary*. He died in 1686. His son, John, was Norroy king at arms, and published a *Catalogue of English Nobility*. His daughter Elizabeth married the famous Elias Ashmole.

DUGINSKOI, a cape of Russian Siberia, in the sea of Ochotskoi. Lon. 167. E. Lat. 59. 15. N.

DUILLIA LEX, the **DUILLIAN LAW**, a Roman law, enacted by M. Duillius, a tribune, A. U. C. 304. It made it a capital crime to leave the Roman people without its tribunes, or to create any new magistrate without a sufficient cause. There was another Duillian law in 392, regulating the interest to be paid for money lent.

DUILLIUS NEPOS, **CATUS**, a Roman consul, the first who obtained a victory over the naval power of Carthage, A. U. C. 492. He took 50 ships and was honoured with a naval triumph, the first that ever appeared at Rome. The senate rewarded his valour by permitting him to have music playing, and torches lighted, at the public expence, every day while he was at supper. There were some medals struck in commemoration of this victory; and there still exists a column at Rome, which was erected on the occasion.

DUINA, or **DUNA**, a river of Russia, which rises from a lake, 16 miles N. E. of Toropetz, and falls into the Baltic at Riga.

DUINO, or **DOINO**, or **TYBEIN**, a sea-port town of Germany, in Carniola, 8 miles N. W. of Trieste.

DUISBURG, a town of Germany, in Westphalia. Lon. 6. 49. E. Lat. 51. 30. N.

DUKE, **DUX**, was originally a Roman dignity, denominated a *duendo*, leading or commanding. Accordingly, the first dukes, *duces*, were *ductores exercituum*, commanders of armies. Under the later emperors, the governors of provinces during war were intitled *duces*. In after-times the same denomination was also given to the governors of provinces in time of peace. The first governor under the name of duke was a duke of the *Marchia Rhetica*, or *Grisons*, whereof mention is made in Cassiodorus; and there were afterwards 13 dukes in the eastern empire, and 12 in the western. The Goths and Vandals, upon their over-running the provinces of the western empire, abolished the Roman dignities wherever they settled. But the Franks, &c. to please the Gauls, who had long been used to that form of government, made it a point of politics not to change any thing therein: and accordingly they divided all Gaul into duchies and counties; and gave the names, sometimes of dukes, and sometimes of counts, *comites*, to the governors thereof. In England, during the time of the Saxons, Camden observes, the officers and commanders of armies were called dukes, *duces*, after the ancient Roman manner, without any addition. After the Conqueror came in, the title lay dormant till the reign of Edward III. who created his son Edward, first called the *Black Prince*, duke of Cornwall; which has ever since

been the peculiar inheritance of the king's eldest son during the life of his father; so that he is *dux natus*, non creatus. After him there were more made, in such manner as that their titles descended to their posterity. They were created with much solemnity, per cincturam gladii, cappæque, & circuli aurei in capite impositionem. However, in the reign of queen Elizabeth, A. D. 1572, the whole order became utterly extinct; but it was revived about 50 years afterwards by her successor, in the person of George Villiers duke of Buckingham. Though the French retained the names and form of the ducal government, yet under their second race of kings there were scarce any dukes: but all the great lords were called counts, peers, or barons; excepting, however, the dukes of Burgundy and Aquitaine, and the duke of France, which was a dignity Hugh Capet himself held, corresponding to that of *maire de palais*, or king's lieutenant. The modern dukes retain nothing of their ancient splendor but the coronet on their escutcheon, which is the only mark of their departed sovereignty. They are created by patent cincture of the sword, mantle of state, imposition of a cape, and coronet of gold upon the head, and a verge of gold in their hand. The eldest sons of dukes are by the courtesy of England styled marquisses, though they are usually distinguished by their father's second title, whether it be marquis or earl; and the younger sons lords, with the addition of their Christian name, as Lord James, Lord Thomas, &c. and they take place of viscounts though not so privileged by law. A duke has the title of grace; and being writ to, he is styled, in the herald's language, most high, potent and noble prince. Dukes of the blood royal are styled most high, most mighty, and illustrious princes.

DUKE is also the title of a sovereign prince, without the quality of king. Such were the Dukes of Holstein, of Wirtemberg, &c. The word is borrowed from the modern Greeks who call *doucas* what the Latins called *dux*. There were also two sovereigns who bore the title of grand-duke; as the grand duke of Tuscany, and the grand duke of Muscovy, now called the czar or emperor of Russia. The title of great duke belongs to the heir apparent of Russia; that of arch-duke to all the sons of the house of Austria, and that of arch-duchess to all the daughters.

DUKE, among Hebrew grammarians, is an appellation given to a species of accents answering to our comma.

DUKE-DUKE, a quality given in Spain to a grandee of the house of Sylva, on account of his having several duchies, from the uniting of two considerable houses in his person.

DULCIFYING, in chemistry, is the sweetening any matter impregnated with salts, by frequently washing it in pure water.

DULCIGNO, a town of Albania, 15 miles S. W. of Scutari.

DULCIMER, [*dolcimello*], a musical instrument played by striking the brass wires with little sticks.

DULDERSTADT, a town of Germany, in the duchy of Brunswick, 15 miles E. of Gottingen.

DULIA, [*δουλια*], an inferior kind of adoration.

DULL, in the manege. The marks of a dull horse, called by the French, *marquis de ladre*, are white spots round the eye and on the tip of the nose, upon any general colour whatsoever. Though some take these spots for signs of stupidity, it is certain they are great marks of the goodness of a horse; and the horses that have them are very sensible and quick upon the spur.

DULVERTON, a town in Somersetshire seated on a branch of the Ex; 24 miles E. of Barnstaple.

DUMARING, a town of the island of Borneo, on the E. coast. Lon 117. 30. E. Lat. 2. 10 N.

DUMBNESS, [*דום* he was silent,] is the privation, or want, of the faculty of speech. This unfortunate defect proceeds chiefly from total and native deafness; if it arise from a deficiency in the organs necessary for uttering sounds, it is always incurable. Several instances, however, have occurred of persons born deaf, who have been taught to speak distinctly; to read, write, understand arithmetic, &c. The most eminent teachers of the dumb in this country, were,

1. Dr. Wallis, who, in the 61st number of the Philosophical Transactions, gives an account of two persons he had taught to speak; and, in the 245th number of the same work, his method is explained.

2. Mr. Thomas Braidwood, late of Edinburgh, who is perhaps the first who ever brought this surprising art to any degree of perfection. He began with a single pupil in 1764, and since that period, has taught great numbers of people born deaf to speak

distinctly; to read, to write, to understand figures, the principles of religion and morality, &c. and even to make a rapid progress in those useful branches of education. Mr. Braidwood's principal difficulty, after he had discovered this art, was to make the people believe in the practicability of it. He advertised in the public papers; he exhibited his pupils to many noblemen and gentlemen; still he found the generality of mankind unwilling to believe him. The first thing in Mr. Braidwood's method is, to teach the pupil to pronounce the simple sounds of the vowels and consonants. He pronounces the sound of *a* slowly, pointing out the figure of the letter at the same time; makes the pupil observe the motion of his mouth and throat; he then puts a silver instrument, somewhat resembling the shank of a spoon, into the pupil's mouth, depresses or elevates the tongue, and makes him keep the parts in that position; he then lays hold of the out-side of the windpipe, and gives it a kind of squeeze, which it is impossible to describe; all the while he is pronouncing *a*, the pupil is anxiously imitating him, but at first is at a loss to understand what he would have him do. In this manner he proceeds, till the pupil has learned to pronounce the sounds of the letters. He goes on in the same manner to join a vowel and a consonant, till at length the pupil is enabled both to speak and read. That his pupils were taught not only the mere pronunciation, but also to understand the meaning of what they read, was easily ascertained by a conversation with any of them. Of this Mr. Pennant gives a remarkable instance in a young lady of about 13 years of age, who had been some time under the care of Mr. Braidwood. "She readily apprehended (says he) all I said, and returned me answers with the utmost facility. She read; she wrote well. Her reading was not by rote. She could clothe the same thought in a new set of words, and never vary from the original sense. I have forgot the book she took up, or the sentences she made a new version of: but the effect was as follows: Original passage. 'Lord Bacon has divided the whole of human knowledge into history, poetry, and philosophy; which are referred to the three powers of the mind, memory, imagination, and reason.' Version. A nobleman has parted the total or all of man's study or understanding into, An account of the life, manners, religion or customs, of any people or country; verse or metre; moral or natural knowledge; which are pointed to the three faculties of the soul or spirit; the faculty of remembering what is past, thought or conception, and right judgement."

3. Abbé De L'Epee of Berlin who practises a new and different method, equally laborious and successful. He begins his instructions not by endeavouring to form the organs of speech to articulate sounds, but by communicating ideas to the mind by means of signs and characters: to effect this, he writes the names of things; and, by a regular system of signs, establishes a connection between these words and the ideas to be excited by them. After he has thus furnished his pupils with ideas, and a medium of communication, he teaches them to articulate and pronounce, and renders them not only grammarians but logicians. In this manner he has enabled one of his pupils to deliver a Latin oration in public, and another to defend a thesis against the objections of one of his fellow-pupils in a scholastic disputation; in which the arguments of each were communicated to the other, but whether by signs or in writing is not said; for it does not appear that the Abbé teaches his pupils to discern what is spoken, by observing the motion of the organs of speech, which those instructed by Messrs. Braidwoods are able to do with astonishing readiness. There is perhaps no word, says the Abbé, more difficult to explain by signs than the verb *croire*, "to believe." To do this, he writes the verb with its significations in the following manner:

Je crois { Jé dis oui par l'esprit, Je pense que oui.
Jé dis oui par le coeur, J'aime a penser que oui.
Jé dis oui par la bouche.
Je ne vois pas des yeux.

After teaching these four significations, which he does by as many signs, he connects them with the verb, and adds other signs to express the number, person, tense, and mood, in which it is used. If to the four signs, corresponding with the lines above-mentioned, be added that of a substantive, the pupil will write the word *foi*, faith; but, if a sign, indicating a participle used substantively, be adjoined, he will express *la croyance*, belief; to make him write *crovable*, *credible*, the four signs of the verb must be accompanied with one that indicates an adjective terminating in *able*; all these signs are rapidly made, and immediately comprehended.

DUMFRIES, or **DUMFRIES-SHIRE**, a county in the S. of Scotland, comprehending the district of Nithsdale, the Stewartry of Annandale, and the lordship of Eskdale, extending in length from N. W. to S. E. about 60 miles, and about 30 miles in breadth where broadest. It is bounded on the S. W. by Galloway and part of Kyle; on the N. E. by the counties of Roxburgh, Selkirk, and Peebles; on the N. W. by Clydesdale; and on the S. E. by Solway Frith and the marches between Scotland and England.

DUMFRIES, the capital of the above county, a handsome town, situated on a ridge or rising ground, on the N. E. side of the river Nith, 75 miles S. S. W. of Edinburgh. Lon. 4. 25. W. Lat. 55. 8. N.

DUMFRIES, a town of the United States, the capital of Pr. William county, in Virginia.

DUMOSA, [from *dumus*, a bush] bushy plants; the name of the forty-third order in Linnaeus's Fragments of a Natural Method; consisting of a number of shrubby plants, which are thick set with irregular branches, and bushy.

DUN, [*dun*, Saxon,] 1. A colour partaking of brown and black. 2. Dark; gloomy.

DUN, or **BURCH**, the name of an ancient species of buildings, of a circular form, common in the Orkney and Shetland isles, the Hebrides, and northern parts of Scotland. See Plate LIX. fig. 12. The latter term points out the founders, who at the same time bestowed on them their natal name of borg, a defence or castle, a Suedo-Gothic word; and the Highlanders universally apply to these places the Celtic name *dun*, signifying a hill defended by a tower, which plainly points out their use. They are confined to the countries once subject to the crown of Norway. With few exceptions, they are built within sight of the sea, and one or more within sight of the other; so that on a signal by fire, flag, or trumpet, they could give notice of approaching danger, and yield a mutual succour.

DUN, a river in Yorkshire.

DUNAMUND, or **DIAMINTZ**, a town of Riga.

DUNBAR, a royal borough of Scotland, in East Lothian, equidistant from Edinburgh and Berwick upon Tweed, being 27 miles from each.

DUNBARTON, the chieftown of Lenox or Dunbartonshire in Scotland, 58 miles W. of Edinburgh. Lon. 4. 30 W. Lat. 56. 0. N.

DUNBLANE, a town of Scotland 30 miles N. of Edinburgh.

DUNCANNON, a town and fort of Ireland, in Wexford, six miles E. of Waterford.

DUNCAN'S BAY, lies on the N. coast of Jamaica. Lon. 77. 23. W. Lat. 18. 31. N.

DUNDALK, a town of Ireland, in the county of Louth, about 40 miles from Dublin.

DUNDEE, a town of Scotland, in Angus-shire, 40 miles N. of Edinburgh. Lon. 3. 3. W. Lat. 56. 27. N.

DUNEBOURG, a town of Livonia, on the Dwina, 90 miles S. E. of Riga. Lon. 27. 0. E. Lat. 59. 8. N.

DUNEGEL, a fertile island of Ireland, on Baltimore bay, on the coast of Cork.

DUNFERMLINE, a borough of Scotland, in Fifeshire, 15 miles N. W. of Edinburgh. Lon. 3. 27. W. Lat. 55. 12. N.

DUNG. See **HUSBANDRY**.

DUNGALA, **DONGALA**, or **DONKALA**, a kingdom of Africa, in Nubia, seated on both sides of the Nile, but chiefly on the W.

DUNGALA, or **DONGALA**, the capital of the above kingdom. Lon. 30. 35. E. Lat. 21. 0. N.

DUNGANNON, a town of Ireland, the capital of Tyrone, in Ulster. Lon. 6. 39. W. Lat. 54. 38. N.

DUNGARVAN, or **DUNGARVON**, a town of Ireland, in the county of Waterford, 22 miles S. W. of Waterford.

DUNGARVAN BAY, on the coast of Waterford.

DUNGENSESS, a cape on the coast of Kent, eight miles S. by W. of Romney. Lon. 1. 4. E. Lat. 50. 52. N.

DUNGENSESS POINT, a cape in the eastern entrance of the straits of Magellan. Lon. 68. 28. W. Lat. 52. 28. S.

DUNGEON, in fortification, the highest part of a castle built after the ancient mode; serving as a watch-tower, or place of observation; and also for the retreat of a garrison, in case of necessity, so that they may capitulate with greater advantage.

DUNG MEERS, in husbandry, places where soils and dungs

are mixed and digested together. These consist of pits, prepared at the bottom with stone and clay, that they may hold water, on the moisture of the dung. They ought to be so situated, that the sinks and drips of the houses and barns may run into them. Into these are cast refuse fodder, litter, dung, weeds, &c. where they lie and rot together, till the farmer have occasion for them.

DUNKELD, a town of Scotland, in Perthshire, 15 miles N. W. from Perth.

DUNKIRK, a maritime town of France, in the department of the North, 22 miles S. W. of Ostend. Lon. 2. 28. E. Lat. 51. 2. N.

DUNLEER, a town of Ireland, in Louth; seven miles N. of Drogheda, and 30 of Dublin.

DUNMANUS BAY, a bay of the Atlantic, on the S. W. coast of Ireland, in the county of Cork; about 14 miles in length, and from one to three broad: S. of Bantry bay; affording a safe harbour. The mouth of this bay lies in Lon. 9. 30. W. Lat. 51. 20. N.

DUNMORE HEAD, a cape on the W. coast of Ireland, in the county of Kerry. This cape is the most western point in Europe. Lon. 10. 20. W. Lat. 52. 6. N.

DUNMOW, GREAT, a town of Essex, 13 miles N. of Chelmsford, and 40 N. E. of London.

DUNNET HEAD, an extensive promontory on the W. coast of Caithness.

DUNOOSE, a cape on the S. E. coast of the isle of Wight; 51 miles W. of Beachy head. Lon. 1. 11. W. Lat. 50. 33. N.

DUNOIS, a late territory of France in the province of Orleans, and district of Beauce; included in the department of Eure and Loire.

DUNSE, a town of Scotland, in the county of Merse. Lon. 2. 5. W. Lat. 55. 42. N.

DUNS, JOHN, commonly called **DUNS SCOTUS**, a famous Franciscan divine, was born at Dunstane in Northumberland. He was educated at Oxford, from whence he went to Paris, where he acquired a great reputation as a disputant, and was called the "subtile doctor." He opposed the notions of Aquinas, which produced two parties, the Thomists and the Scotists. He died at Cologne in 1308. He was a voluminous writer; his works making 12 vols. folio; as published at Lyons by Luke Wadding, in 1639.

DUNSTABLE, a town in Bedfordshire, 34 miles N. W. of London. Lon. 0. 29. W. Lat. 51. 59. N.

DUNSTAN, Sr. archbishop of Canterbury, was born in 925, in the reign of Athelstan, who gave him lands at Glastonbury, where he founded a monastery. King Edgar made him bishop of Worcester, and in 959 archbishop of Canterbury. The pope confirmed the appointment, and made him his legate. Dunstan extended the papal power in a most arbitrary manner, though opposed by the English clergy, for which he deprived many of their benefices, and placed monks in their room. On the death of Edgar in 975, he placed his son Edward on the throne, who being a minor, Dunstan assumed the regency. Under his successor Ethelred, however, he lost his influence and died of grief in 988.

DUNSTER, a town in Somersetshire; 20 miles N. W. of Taunton. Lon. 3. 41. W. Lat. 51. 13. N.

DUNUM, a Celtic term, denoting a hill or eminence, which often concurs to form the names of towns, to signify their high situation, places of strength or citadels, hills or eminences, being adapted to such structures. See **DUN**.

DUNUM, in ancient geography, a town of Ireland, mentioned by Ptolemy, and supposed to be Down or Down-Patrick. See **DOWN**.

DUNWICH, a town in Suffolk, most of which is destroyed by the encroachments of the sea, and not one church left of eight. It is 30 miles N. E. of Ipswich. Lon. 1. 55. E. Lat. 52. 21. N.

DUO, in music, a song or composition, to be performed in two parts only, one sung, the other played on an instrument, or by two voices. Also when two voices sing different parts, as accompanied with a third, which is a thorough bass. It is seldom that unisons and octaves are used in duos, except at the beginning and end.

DUODECIMA, in music, is the twelfth or the fifth doubled.

DUODENUM, the first of the small guts, so called from its length, which is about twelve fingers breadth. It has its origin at the pilorus, or right orifice of the stomach. See **ANATOMY**.

DUODI, [from *duo*, two, and *dies*, a day, Lat.] the second day of the decade, in the new French distribution of time.

DUPIN, LEWIS ELLIS, a learned doctor of the Sorbonne, and one

one of the greatest critics of his time, especially in ecclesiastical matters, was born at Paris, in 1657. When he published the first volume of his *Bibliothèque Universelle des Auteurs Ecclesiastiques*, in 1686, the liberty, with which he treated some ecclesiastical writers, gave such offence, that M. de Harlay, archbishop of Paris, obliged Dupin to retract many propositions, and suppressed the work. He was nevertheless suffered to continue it, by altering the title from *Bibliothèque Universelle*, to *Bibliothèque Nouvelle*. This great undertaking, continued in several successive volumes, though sufficient to occupy the life of an ordinary man, did not hinder M. Dupin from obliging the world with several other works. He was a man of prodigious reading; and had an easy happy way of writing, with an uncommon talent at analysing the works of an author; which makes his *Ecclesiastical Bibliothèque* so valuable. He was professor of philosophy in the royal college; but was banished some time from the chair to Chatelleraut, on account of the famous *Cas de Conscience*; but was restored, and died in 1719.

DUPE RATIO, among mathematicians, denotes the ratio of 2 to 1. Thus the ratio of 8 to 4 is dupe. Sub-dupe ratio, is just the reverse, or as 1 to 2. Such is 4 to 8, or 6 to 12.

DUPLICATE PROPORTION, or **RATIO**, is a ratio compounded of two ratios: thus, the duplicate ratio of a to b , is the ratio of aa to bb , or of the square of a to the square of b . Hence the duplicate ratio ought to be well distinguished from double. In a series of geometrical proportionals, the first term to the third is said to be in a duplicate ratio of the first to the second: thus in 2, 4, 8, 16, &c. the ratio of 2 to 8 is duplicate of that of 2 to 4, or as the square of 2 to the square of 4. Duplicate ratio is therefore the proportion of squares, as triplicate is of cubes, &c. and the ratio of 2 to 8 is said to be compounded of that of 2 to 4, and of 4 to 8.

DUPLICATE, among lawyers, denotes a copy of any deed, writing, or account. It is also used for the second letters patent, granted by the lord chancellor, in a case wherein he had before done the same.

DUPLICATION, in general, signifies the doubling of any thing, or multiplying of it by 2: also the folding of any thing back again on itself. The duplication of a cube is a problem famous in antiquity: it was proposed by the oracle at Delphos, as a means to stop the plague, to double Apollon's altar, which was cubical. The difficulty of the problem consists in this, to find the side of a cube that shall be double in solidity to a given cube; which is only to be solved by finding two mean proportionals between the side of the given cube and double that side. Thus, if the given side be represented by a , its double by b , and the side sought by y ; we shall have $aa:yy::y:b$; and making $z = \frac{yy}{a}$, it will be $a:z::y:b$. So that y , the side of the cube sought, is the second of two mean proportionals between a and b .

DUPLICATURE, among anatomists, a term used to denote the folds of any membrane, or vessel: thus we say, the duplicatures of the intestines, peritonæum, &c.

DUPONDIUS, in antiquity, a weight of two pounds, or a money of the value of two asses. See *As*. As the *as* at first weighed a just pondo or libra, the dupondius then weighed two; and hence the name.

DUQUELLA, a fertile province of Morocco in Africa; 75 miles long and 60 broad.

DURA MATER, one of the membranes which surround the brain. See *ANATOMY*.

DURAMPOUR, a town of Hindostan, in the country of Guzerat, 45 miles S. E. of Surat.

DURANGO, a town of N. America, in the province of New Biscay. Lon. 105. 0. W. Lat. 24. 50. N.

DURANTA, in botany, a genus of the angiospermia order, and didynamia class of plants; natural order, Personate. Calyx quinquefid, superior; berry tetraspermous; seeds bilocular. It has three species, shrubs, with quadrangular branches.

DURATION. See *METAPHYSICS*.

DURATION, as marked by certain periods and measures, is what we most properly call time. See *TIME*.

DURATION of ACTION, according to Aristotle, is confined to a natural day in tragedy; but the epopea, according to the same critic, has no fixed time.

DURAZZO, a sea-port town of European Turkey, in Albania,

anciently named Epidamnus and Dyrrachium. It is 88 miles S. S. E. of Ragusa. Lon. 19. 19. E. Lat. 41. 54. N.

DURBUY, a town of France, in the department of Ourte, and late duchy of Luxemburg, 20 miles S. of Liege. Lat. 50. 18. N.

DURBUY, a late county of Luxemburg, now annexed to France.

DURCKHEIM, town of Germany, in the circle of the Upper Rhine, now included in the department of Mont Tonnerre; 12 miles N. E. of Newstadt.

DURESS, in law, is where a man is kept in prison, or restrained of his liberty, contrary to the order of law; or threatened to be killed, maimed, or beaten; and if such person so in prison, or in fear of such threats, make any specialty or obligation by reason thereof, such deed is void in law; and in any action brought upon such specialty, the party may plead that it was made by duress, and so he may avoid the action. Cowel.

DURHAM, a county of England, commonly called the Bishopric of Durham. It is bounded on the N. by Northumberland, from which it is separated by the Tyne, on the N. E.; on the E. by the German ocean; on the S. and S. W. by Yorkshire and the Tees; and on the W. by Cumberland and Westmoreland. Before the arrival of the Romans it was included in the British principality, of the Brigantes, and after their arrival made part of the province of Maxima Caesariensis. During the Heptarchy, it made part of the kingdom of Northumberland. It is now included in the northern circuit, in the province of York; and is a diocese and principality under the government of its own bishop, being a county palatine, the second in rank, and the richest in England. It extends 47 miles in length from E. to W. and 37 from N. to S. It is 107 miles in circumference, and contains 410,000 square acres, or 758 square miles.

DURHAM, the capital of the above county, remarkable for the salubrity of its air, and the abundance and cheapness of its provisions. It was built about 70 years before the Norman conquest, on occasion of bringing hither the body of St. Cuthbert. It lies 14 miles S. of Newcastle. Lon. 1. 27. W. Lat. 54. 50. N.

DURHAM, a river of the United States, which falls into the Piscataqua.

DURHAM, a town and township of Connecticut in New-Haven county. It is 22 miles S. W. of Hartford.

DURHAM, a town of New Hampshire, in Stafford county. On the top of a hill in this town is a rock, computed to weigh 60 or 70 tons, so exactly poised on another rock, as to be easily moved by one's finger. Its situation appears to be natural. Lon. 70. 54. W. Lat. 43. 5. N.

DURIO, a genus of the class and order polyadelphia polyandria. The calyx is five-cleft; corolla five-petaled; style one; stamina in five bodies; pome five-celled. There is one species, a tree of the East Indies.

DURNESS, a town of Scotland 46 miles N. N. W. of Dornoch.

DUROCORNIVUM, an ancient town of Britain; now called Cirencester. Ptolemy called it Corinium.

DUROCORTORA, or **DUROCORTORUM**, an ancient town of the Rhemi, in Belgica; now called Rheims.

DUROIA, a genus of the monogynia order, and hexandria class of plants. Calyx above is cylindrical and loped; border six-parted; no filaments; pome hispid. It has one species, a tree of Surinam.

DUOTRIGES, an ancient British nation, seated in Dorsetshire. Their name is derived from the two British words *Dur* water, and *Trigo* to dwell; and they got it from the situation of their country, which lies along the sea coast. It is not certain whether the Duotriges formed an independent state under a prince of their own, or were united with their neighbours the Damnonii; as they were reduced by Vespasian under the dominion of the Romans, at the same time, and with the same ease, and never revolted.

DURSEY, an island about 2 miles long, and half a mile broad, situated near the S. W. coast of Ireland.

DURSLEY, a town of Gloucestershire, celebrated for its manufacture of broad cloth. It is 15 miles S. of Gloucester. Lon. 2. 23. W. Lat. 51. 40. N.

DURSTOLORG, the son of Hungus, and the 73d king of the Picts, according to Dr. Anderson. (*Royal Geneal.*) He was murdered by his brother Eogan, who thus paved the way for the union

union of the Scots and Picts under Kenneth II. about A. D. 844

DURSTUS, or **DURST**, the son of Erp, king of the Picts, began to reign A. D. 406 according to Dr. Anderson; and after fighting many battles, (the Dr. says no less than 100, and that he lived 100 years!) died A. D. 451. In his reign the gospel was first preached to the Picts by St. Ninian. *Royal Geneal.*

DUSDHRUK, a town of Arabia, in Yemen. Lon. 44. 20. E. Lat. 13. 50. N.

DUSKY BAY, a bay on the S. W. coast of the island Tavaipoenamunoo, the most western one of New Zealand. It is reckoned by Captain Cook to be the most proper place in New Zealand for the procuring of refreshments. Lon. 166. 18. E. Lat. 45. 40. S.

DUSSELDORF, or **DUSSELDORP**, a strong town of Germany, in Westphalia, 21 miles N. N. W. of Cologne. Lon. 6. 52. E. Lat. 51. 12. N.

DUTCH, the people of the late United Provinces, now called Batavia, and Holland.

DUTCHES COUNTY, a county of New York, on the E. side of Hudson River.

DUTCHY, [*duche*, Fr.] A territory which gives title to a duke, or has a duke for its sovereign.

DUTCHY COURT, a court wherein all matters appertaining to the dutchy of Lancaster are decided by the decree of the chancellor of that court. The origin of this court was in Henry the IV.'s time, who obtained the crown by deposition of Richard II. and having the dutchy of Lancaster, by descent, in right of his mother, became seised thereof as king, not as duke: So that all the liberties, franchises, and jurisdictions of the said county passed from the king, by his great seal, and not by livery or attornment, as the earldom of March, and other possessions, which descended to him by other ancestors than the king's, did. Henry IV. by authority of parliament, severed the possessions, liberties, &c. of the said dutchy from the crown: but Edward IV. restored them to their former nature. The officers belonging to this court are, a chancellor, attorney general, receiver general, clerk of the court, and messenger; besides assistants; as attorneys in the exchequer, and chancery, and four counsellors.

DUTY, in a moral sense. See **MORAL PHILOSOPHY**.

DUTY, in the military art, is the exercise of those functions that belong to a soldier: with this distinction, that mounting guard and the like, where there is no enemy directly to be engaged, is called duty; but marching to meet and fight an enemy is called going on service.

DUTY, in polity and commerce, signifies the impost laid on merchandizes, at importation or exportation, commonly called the duties of customs; also the taxes of excise, stamp duties, &c. See **CUSTOM**, **EXCISE**, &c. The principles on which all duties and customs should be laid on foreign merchandizes which are imported into these kingdoms, are such as tend to cement a mutual friendship and traffic between one nation and another; and therefore due care should be taken in the laying of them, that they may answer so good an end, and be reciprocal in both countries. They should be so laid as to make the exports of this nation at least equal to our imports from those nations with which we trade, so that a balance in money should not be issued out of Great Britain, to pay for the goods and merchandizes of other countries: to the end that no greater number of our landholders and manufacturers should be deprived of their revenues arising from the product of the lands, and the labour of the people, by foreign importations, than are maintained by exportations to such countries. These are the rational principles on which our treaties of commerce with other countries ought to be grounded.

DUUMVIRATE, the office or dignity of the duumviri. See the next article. The duumvirate lasted till A. U. C. 388, when it was changed into a decemvirate. See **DECEMVIRI**.

DUUMVIRI, in Roman antiquity, a general appellation given to magistrates, commissioners, and officers, where two were joined together in the same functions: such as,

1. **DUUMVIRI CAPIALES**, the judges in criminal causes. From their sentence it was lawful to appeal to the people, who alone had the power of condemning a citizen to death.

2. **DUUMVIRI MUNICIPALES**, two magistrates in some cities of the empire, answering to what the consuls were at Rome.

3. **DUUMVIRI NAVALES**, two commissaries of the fleet, first created at the request of M. Decius, tribune of the people, in the time of the war with the Samnites. Their duty consisted in giving orders for the fitting out of ships, giving commissions of marine officers, &c.

4. **DUUMVIRI SACRORUM**, two magistrates created by Tarquin II. for performing the sacrifices, and keeping the Sibyl's books.

DUX. See **DUKE**.

DUYIVELAND, **DUYVELAND**, or **DIVELAND**, an island of Batavia or Holland, in the department of the Meuse, in Zealand.

DWAL, in heraldry, the herb nightshade, used by such as blazon with flowers and herbs, instead of metals and colours, for sable or black.

DWARF, in general, an appellation given to things greatly inferior in size to that which is usual in their several kinds: thus there are dwarfs of the human species, dwarf-dogs, dwarf-trees, &c. The Romans were passionately fond of dwarfs, whom they called nani or nanæ, inasmuch that they often used artificial methods to prevent the growth of boys designed for dwarfs, by inclosing them in boxes, or by the use of tight bandages. Augustus's niece, Julia, was extremely fond of a dwarf called Sonopas, who was only two feet and a hand breadth high. We have many other accounts of human dwarfs, but most of them deformed in some way or other, besides the smallness of their size. Many relations also concerning dwarfs we must consider as fabulous, as well as those concerning giants. The following, however, which we have reason to believe authentic, is very remarkable. Jeffery Hudson, the famous English dwarf, was born at Oakham in Rutlandshire, in 1619; and about the age of seven or eight being then but eighteen inches high, was retained in the service of the duke of Buckingham who resided at Burleigh on the hill. Soon after the marriage of Charles I. the king and queen being entertained at Burleigh, little Jeffery was served up to table in a cold pye, and presented by the duchess to the queen, who kept him as her dwarf. From seven till thirty, he never grew taller; but after thirty he shot up to three feet nine inches, and there fixed. Jeffery became a considerable part of the entertainment of the court. Sir William Davenant wrote a poem called "Jeffreidos," on a battle between him and a turkey-cock; and in 1638, was published a very small book, called the "New Year's Gift," presented at court by the lady Parvula to the lord Minimus (commonly called Little Jeffery) her majesty's servant, written by Microphilus, with a little print of Jeffery prefixed. Before this period, Jeffery was employed on a negotiation of great importance: he was sent to France to fetch a midwife for the queen; and on his return with this gentlewoman, and her majesty's dancing master, and many rich presents to the queen from her mother Mary de Medicis, he was taken by the Dunkirkers. Jeffery, thus made of consequence, grew to think himself really so. He had borne with little temper the teasing of the courtiers and domestics, and had many squabbles with the king's gigantic porter. At last, being provoked by Mr. Crofts, a young gentleman of family, a challenge ensued: and Mr. Crofts coming to the rendezvous armed only with a quirt, the little creature was so enraged, that a real duel ensued; and the appointment being on horseback with pistols, to put them more on a level, Jeffery at the first fire, shot his antagonist dead. This happened in France, whither he had attended his mistress during the troubles. He was again taken prisoner by a Turkish rover, and sold into Barbary. He probably did not remain long in slavery: for at the beginning of the civil war, he was made a captain in the royal army; and in 1644 attended the queen to France, where he remained till the Restoration. At last, upon suspicion of his being privy to the Popish plot, he was taken up in 1682, and confined in the Gatehouse of Westminster, where he ended his life in the 63d year of his age.

DWARF-TREES, a kind of diminutive fruit-trees, frequently planted in the borders of gardens, and so denominated from their low stature. Dwarf-trees were formerly in great request, but have been much neglected since the introduction of espaliers. The method of propagating dwarf-pears, which have been found to succeed better than any other dwarfs, is as follows: They are to be grafted on a quince-stock, about six inches above the ground; and, as soon as the bud has sprouted so far as to have four eyes, it

is to be stopped, in order that lateral branches may shoot forth. Two years after budding, the trees will be ready to be transplanted to the spot where they are to remain. They should be set at the distance of 25 or 30 feet square, and the intermediate space may be sown or planted with culinary herbs, while the trees are young; but such herbs are not to be placed too near their roots, which would thus be obstructed in their growth. Stakes are next to be driven around the tree, to which the branches of it are to be nailed with list, while young; being trained in an horizontal direction, and no branches being afterwards permitted to intersect each other: in shortening the roots, the uppermost eye should always be left outwards. The summer and autumn pears thrive most luxuriantly, when planted in this manner, but the winter pears do not succeed. Apples are also sometimes cultivated as dwarfs; for which purpose they are generally grafted on paradise stocks. These do not spread their branches so widely as pears, and therefore require to be set only eight feet apart. Some gardeners also rear

dwarf-apricots and plums, which, however, being less hardy than either apples or pears, seldom thrive when set according to this method.

DWINA, a province of Russia, in the government of Archangel; bounded on the E. by the province of Condinski, on the S. by Usting, on the W. by Kargapol, and on the N. by the White Sea. Archangel is the capital.

DWINA, the name of two large rivers, one of which rises in Lithuania, and, dividing Livonia from Courland, falls into the Baltic Sea a little below Riga; the other gives name to the province of Dwina in Russia, discharging itself into the White Sea a little below Archangel.

DYE, in architecture, any square body, as the trunk or notched part of a pedestal: or it is the middle of a pedestal, or that part included between the base and the corniche; so called because it is often made in the form of a cube or dye.

DYEING.

DYEING is the art of developing and extracting the colouring particles of any substance whatever, and of uniting and fixing them afterwards upon cloths, stuffs, or any other matters, so as apparently to constitute but one body. The object of this art, therefore, consists in depriving one body of its colouring principle, in order to fix it upon another in a durable manner; and the series of manipulations which are necessary to produce this effect, constitutes the art itself. The word, however, in its most common acceptation, is generally restricted to the art of tinging silk, wool, cotton, and linen with different colours: and in this sense the art of dyeing is practised as a trade, by those who do not meddle with any of the other branches, as staining of leather, &c.

GENERAL HISTORY OF THE ART.

The origin of the art of dyeing, or of imparting to different materials employed for the fabrication of garments and furniture, those beautiful colours which are afforded by many articles of the vegetable, animal, and mineral kingdoms, appears to have been of high antiquity. As most of these materials are, of themselves, either of dark and disagreeable colours, or else devoid of all colour, it is probable that, even in the very earliest ages, the love of ornament, which is natural to mankind, would induce them to stain their vestments with various colouring ingredients, especially with vegetable juices. The ancients also obtained from the coccus, now known by the name of kermes, a colour which was almost as highly esteemed as the purple, and which was sometimes mixed with it. According to Pliny, the Egyptians had discovered a mode of dyeing, somewhat resembling that which we use for colouring printed linens; the stuffs, probably after having been impregnated with different mordants, were immersed in vats, where they received various colours. And Mr. Delaval is of opinion, that they were possessed not only of the art of dyeing, but even of that of printing on cloths. The Phœnicians seem to have a strong claim to the invention of this art, and they held a decided pre-eminence in it for many ages: their purple and scarlet cloths were sought after by every civilized nation; and the city of Tyre, enriched by its commerce, increased to an amazing extent. But her career was stopped by the vanity and folly of the eastern emperors; under whose dominion this opulent city had unfortunately fallen. Desirous of monopolizing the wearing of the beautiful cloths of Tyre, these misjudging tyrants issued most severe edicts, prohibiting any one from appearing in the Tyrian blue, purple, or scarlet, except themselves, and their great officers of state. To this injudicious restriction is to be attributed the destruction of the Tyrian dyes. For under the impolitic restraint imposed on the consumption of the Phœnician cloths, the manufacturers and dyers were no longer able to carry on their trade; it grew languid, sickened, and expired: and, with the trade, the art itself also perished. Among the Greeks the knowledge of dyeing must have

been very imperfect, and little assisted by science; for the art of dyeing linen appears not to have been known in Greece before Alexander's invasion of India, where, according to Pliny, they dyed the sails of his vessels of different colours. The Greeks seem to have borrowed this art from the Indians. This last country seems to have been the nursery of the arts and sciences, which were afterwards spread and perfected among other nations. Accidents, which had a tendency to improve the art, could not fail to be multiplied rapidly, in a country rich in natural productions, which requires little labour for the support of its inhabitants, and the population of which was favoured by the bounty of nature, and the simplicity of manners, till it was opposed by the tyranny of succeeding conquerors. But religious prejudices, and the unalterable division in casts, soon shackled industry; the arts became stationary; and it would seem, that the knowledge of dyeing cotton in that country (for silk was then unknown, or at least very scarce) was as far advanced in the time of Alexander, as it is at the present period. The very beautiful colours, which are observable in some Indian linens, would lead one to suppose, that the art of dyeing had there attained a high degree of perfection; but we find by the description which Beaulieu, at the request of Dufay gave of some operations performed under his own eye, that the Indian processes are so complicated, tedious and imperfect, that they would be impracticable in any other country, on account of the great difference in the price which is paid for labour. It is unquestionably true, that European industry has far surpassed them in correctness of design, variety of shade, and facility of execution; and if we are inferior to them with respect to the liveliness of some colours, it is only to be attributed to the superior quality of some of their dyes, or perhaps to the length and multiplicity of their operations and processes. Dufay, Hellot, Macquer, and Berthollet have rendered essential services to this art. Dufay appears to have been the first who obtained just notions of the colouring particles, and shewed how they are naturally disposed to adhere more or less firmly to the filaments which receive them; and has very justly remarked, that without this disposition, stuffs would never assume any colour but that of the bath, and would always divide the colouring particles equally with it: whereas the liquor of the bath sometimes becomes as limpid as water, giving off all the colouring particles to the stuff; which (says he) seems to indicate that the ingredients have less attraction for the water than for the particles of the wool. Berthollet's treatise on dyeing is one of the best epitomes on the subject; and chemistry, and the arts of dyeing, and of bleaching, have been much indebted to his labours. A translation of this work by Mr. Hamilton was published in 1793, 2 vols. 8vo. Also Chaptal, D'Apligny, D'Anbournay, and Hauffman, in France, have published treatises on the art of dyeing, which have much contributed to its improvement. In Sweden, Scheffer's work on the subject; is accompanied with notes by the celebrated Bergman. In Germany

many experiments in different processes of dyeing have been published by Beckmann, Poerner, Vogler, and Francheville. In England two very valuable essays on dyeing have been written by Delaval and Henry; to which may be added, the excellent treatise on the philosophy of permanent colours, by Dr. Bancroft.

THEORY OF DYEING.

Sir Torbern Bergman seems to have been the first, who referred the phenomena of dyeing entirely to chemical principles. Having dyed some wool and some silk in a solution of indigo, in very dilute sulphuric acid, he explains the effects he observed in the operation, by attributing them to the precipitation, occasioned by the blue particles having a stronger attraction for the particles of the wool and silk, than for those of the acidulated water; he remarks, that this attraction of the wool is so strong, as to deprive the liquor entirely of the colouring particles; but that the weaker attraction of the silk can only diminish the proportion of these particles in the bath: and he shews, that both the durability of the colour, and the degree of intensity it is capable of acquiring, depend on these different attractions. This is, in fact, the true light in which the phenomena of dyeing should be viewed; they are real chemical phenomena, which ought to be analysed in the same way as all those dependant on the actions which bodies exert, in consequence of their peculiar nature. It is evident, that the colouring particles of bodies possess chemical properties, that distinguish them from all other substances; and that they have attractions peculiar to themselves, by means of which they unite with acids, alkalies, metallic oxides, or calces, and some earths, principally alumine or pure clay. They frequently precipitate oxides and alumine, from the acids which held them in solution; at other times they unite with the salts and form supra compounds, or compounds of more than two ingredients, which combine with the wool, silk, cotton, or linen. And with these, their union is rendered much more close by means of alumine, or metallic oxide, than it would be without their intervention. The difference in the attractions of the colouring particles for wool, silk, and cotton, is sometimes so great, that they will not unite with one of these substances, while they combine very readily with another: thus, cotton receives no colour in a bath which dyes wool scarlet. Dufay got a piece of stuff made, the warp of which was wool and the weft cotton, which went through the process of fulling, that he might be certain, that the wool and the cotton received exactly the same preparation; but the wool took the scarlet dye, and the cotton remained white. It is this difference of attraction, which renders it necessary to vary the preparation and the process, according to the nature of the substance which is intended to be dyed of a particular colour. And these considerations ought to determine the means to be pursued for the improvement of the art of dyeing. It is highly proper to endeavour to ascertain, what are the constituent principles of the colouring particles. And in this inquiry, the most essential circumstances are, to determine the affinities of a colouring substance, first, with the substances which may be employed as menstrua; 2dly, with those which may by their combinations modify the colour, increase its brilliancy, and help to strengthen its union with the stuff to be dyed; 3dly, with the different agents which may change the colour, and principally with the external agents—air and light. The qualities of the uncombined colouring particles are modified when they unite with a substance; and if this compound unites with a stuff, it undergoes new modifications. Thus the properties of the colouring particles of cochineal are modified, by being combined with the oxide of tin, and those of the substance resulting from this combination, are again modified by their union with the wool or silk; so that the knowledge we may acquire, by the examination of colouring substances in their separate states, can only inform us respecting the preparations that may be made of them: that which we acquire respecting their combinations with substances which serve to fix them, or to increase their beauty, may inform us what processes in dyeing ought to be preferred or tried; but it is only by direct experiment made with the different substances employed in dyeing, that we can confirm our conjectures, and properly establish the process. These facts shew, that the changes produced by acids and alkalies on many vegetable colours, such as the chemists employ, in order to discover the nature of different substances, are owing to the combinations, which take place between these co-

louring particles, and the acids and alkalies. The compounds resulting from these may be compared to neutral salts, which possess qualities different from those of their component parts, but in which one of these parts may be in excess, and its qualities consequently predominant. This state of combination is observable between the colouring particles of cochineal and acidulous tartrate of potash, or cream of tartar; by evaporating slowly a solution of this salt in a decoction of cochineal, crystals are formed, which retain a fine ruby colour, much more bright and intense than that of the liquor which formed them. There are also some acids, particularly the nitric, which, after having combined with the colouring particles, change the colour which they at first produced, make it yellow, and destroy it. They then act by means of one of their principles, the oxygen, or vital air. Blue colours are not the only ones which become red by the addition of acids, and green by that of alkalies; most red colours, as that of the rose, for instance, are heightened by acids, and made green by alkalies; and some green colours, such as that of the green decoction of burdock, according to the experiments of Mr. Nose, and the green juice of buckthorn, as is evident from the trials of Mr. Becker, are reddened by acids. This property, which is common to most of the ordinary colours of vegetables, seems to prove, that there is a great analogy between their colouring particles; and it is not without foundation, that Linnaeus supposed, that the red in vegetables was owing to an acid, and indicated its presence; but there are also many vegetables which contain acid in a disengaged state, without their possessing a red colour. It is therefore evident, that the colouring particles have attractions for acids, alkalies, earths, and metallic oxides, which constitute a part of their chemical properties; and in consequence of which, their colours are more or less varied: therefore these particles form, with the stuff on which they are fixed, a compound which retains only some of their original properties: they are also modified by their union with alumine, or pure clay, metallic oxides, and some other substances; as are also those new compounds, when they are further combined with the stuff: all these modifications are analogous to what is observed in other chemical combinations.

OF MORDANTS.

Mordant is a term that appears to have been first introduced by the French dyers; and is applied to those substances that serve as intermedia between the colouring particles, and the stuff to be dyed, either for the purpose of facilitating, or of modifying their combination. Basis would seem to be a more appropriate term. Mordants deserve the greatest attention; as by their means colours are varied, brightened, made to strike, and rendered more durable. We shall therefore examine the nature of the action of the principal bases or mordants, and endeavour to determine how their attractions serve to unite the colouring particles with the stuff, and how they affect the qualities of the colours. A basis or mordant is not always a simple agent, for new combinations are sometimes formed by the ingredients that compose it; so that the substances employed are not the immediate agents, but the compounds which they have formed. Sometimes the mordant is fixed with the colouring particles, and sometimes the stuff is impregnated with it; on other occasions, both these modes are united; and we may dye successively with liquors containing different substances, the last of which only can act on the particles with which the stuff is impregnated. The principal substances employed as mordants are, aluminous salts, lime, metallic oxides, some astringent substances, and animal matters. The art of printing linen affords many processes, in which it is easy to observe the effects of mordants: therefore, to elucidate this subject, we shall mention a few examples. The basis employed for linens intended to receive different shades of red, is prepared by dissolving in 8lb. of hot water, 3lb. of alum, and 1lb. of acetite of lead, or sugar of lead, to which 2oz. of potash, and afterwards 2oz. of powdered chalk are added. The alum is decomposed by the acetite of lead, because the oxide or calx of lead combines with the sulphuric or vitriolic acid, and forms an insoluble salt which is precipitated; the base of the alum, alumine, at the same time combines with the acetic acid, or vinegar, and produces an acetite of alumine; and the chalk and potash answer the purpose of saturating the excess of acid. One of the advantages, which result from the formation of the acetite of alumine, is, that the alumine is retained in it by a much weaker attraction than in the alum;

alum; so that it more easily quits its menstruum, to combine with the stuff and colouring particles. Another advantage is, that the acid liquor, from which the alumine is separated, has much less action on the colour when it consists of the acetous, than when it consists of a stronger acid, such as the sulphuric. In short, the acetite of alumine not having the property of crystallizing, the mordant, which is thickened with starch or gum, to prepare it for being applied to the block on which the design is engraved, does not curdle, as it would if it contained alum capable of crystallizing. By attending to the operation performed upon a piece of linen cloth, we find, that when it has been impregnated by the mordant, in the manner determined by the design, it is put into a bath of madder; the whole of the cloth becomes coloured, but the tinge is deeper in those parts which have received the mordant; there the colouring particles have combined with the alumine and the cotton, so that a triple compound has been formed, and the acetous acid separated from its basis is carried off in the bath. Thus the colouring particles, combined with the alumine and the stuff, are much more difficultly affected by external agents, than when they are in a separate state, or combined only with the stuff, without any intermediate bond of union: and on this property the operations, to which the cloth is afterwards subjected, are founded: after it has been maddered, it is boiled with bran, and spread upon the grass; and these operations are alternately repeated until the ground becomes white. The colouring particles, which have not united with the alumine, are altered in their composition, dissolved, and separated, while those that have combined with it remain, and are preserved, without alteration; and thus, the design alone remains coloured. It seems that this destruction of the colouring particles, by exposure on the grass, and boiling with bran, is accomplished in the same manner as that of the colouring particles of flax, and admits of the same explanation. The only difference consists in substituting bran for alkalies, because they would dissolve a part of the colouring matter, which is fixed by the alumine, and would change its colour; instead of which, the bran, having a much weaker action on this substance, affects only the colouring particles, which, by the action of the air, have been disposed more easily to solution. If, however, instead of the mordant, a solution of iron be employed, the same phenomena takes place; the colouring particles decompose the solution of iron, and form a triple compound with the stuff; but, instead of red, we get from the madder brown colours of different shades, down even to black: and, by uniting these two mordants, alum and iron, we have mixed colours, inclining to red on the one hand, and to black on the other, such as mordoré and puce colour. Other colours are also procured by substituting dyers weed for madder; and by means of these two colouring substances, indigo, and the two mordants above mentioned, we obtain most of the different shades that are observable in stuffs which are printed. The substances which compose a mordant are sometimes incapable of decomposing each other solely by their own attractions; but the attraction of the stuff for one of their constituent parts brings about a decomposition and new combinations; and sometimes this effect is not produced or completed without the aid of the attraction of the colouring particles. This appears to be the case in the mixture of alum and tartar, one of the most common mordants employed in the dyeing of wool. The attraction of alumine for animal substances, is not merely indicated by uncertain appearances, nor supposed for the purpose of being employed in explanations, but is proved by direct experiment. M. Berthollet united them together, by mixing an animal substance with a solution of alum; a double exchange took place, the alkali entered into combination with the acid of the alum, and the alumine, combining with the animal substance, was precipitated. He also proved the attraction of alumine for animal substances by another experiment; having mixed a solution of glue with a solution of alum, he precipitated the alumine by an alkali, and the glue with which it had combined fell down along with it. This compound has the appearance of a semi-transparent jelly, and grows dry with difficulty. Thus, in the preceding experiments, the alkali precipitated the alumine combined with the animal substance, from the uncrystallizable residuë of the alum which had been boiled with the wool. The attraction of alumine for most colouring substances, may also be shewn by direct experiment. If a solution of a colouring substance be mixed with a solution of alum, a precipitation sometimes takes place; but if to the liquor

we add an alkali, which decomposes the alum, and separates the alumine, the colouring particles are then precipitated, combined with the alumine, and the liquor remains clear: this compound has got the name of lake. In this experiment, too much alkali must not be added, because alkalies are capable of dissolving lakes in general. No experiment has, however, yet shewn, that alumine attracts any vegetable substance except the colouring particles: its attraction for them seems much weaker than that which it has for animal substances; hence the acetite of alumine is a better basis for cotton and linen than alum is, and upon this depend the different means employed to increase the fixity of the colouring particles of madder in the dyeing of these substances. The oxides or calces of metals have so great an attraction for many colouring substances, that they quit the acids in which they were dissolved, and are precipitated in combination with them. On the other hand, all metallic oxides have the property of uniting with animal substances; and these different compounds may be formed by mixing an alkali saturated with an animal substance, with metallic solutions. It is not surprising, therefore, that metallic oxides should serve as a bond of union between the colouring particles and animal substances; but, besides the attraction of the oxides for the colouring particles, and for animal substances, their solutions in acids possess qualities which render them more or less fit to act as mordants: thus, those oxides which easily part with their acids, such as that of tin, are capable of combining with animal substances, without the aid of colouring particles; it is sufficient to impregnate the wool or the silk with a solution of tin, although they be afterwards carefully washed, which is not the case with other metallic solutions. Some metallic substances afford, in combination, only a white and colourless basis; and some by the admixture of their own colour, modify that which is proper to the colouring particles; but in many metallic oxides, the colour varies according to the proportion of oxygen they contain, and the proportion of this is easily liable to change. Upon these circumstances their properties in dyeing chiefly depend. The greater or less disposition of the stuff to unite with the colouring particles, must frequently occasion considerable differences in the mode of employing the mordant: thus, when this disposition is strong, the mordant may be mixed with the colouring substance; the compound then formed unites with the stuff immediately: but if it be weak, the compound formed by the colouring particles, and the substance employed as an intermedium, may separate, and be precipitated, before it can be attached to the stuff. To prevent this inconvenience, we must begin by attaching to the stuff the substance which is to serve as the medium of union, between it and the colouring particles. But to judge of the effects of mordants, and of the most advantageous manner of employing them, we must pay attention, first, to the combinations which may be produced, either by the action of the substances which compose them, or by that of the colouring particles and the stuff; 2dly, to the circumstances which may concur in bringing about these combinations more or less quickly, or in rendering them more or less complete; 3dly, to the action that the liquor in which the stuff is immersed may have, either on its colour or texture; and in order to foresee what that action may be, it is necessary to know the proportions of the principles, which enter into the composition of the mordant, and what will be left in an uncombined state in the fluids.

OF THE ACTION OF DIFFERENT SUBSTANCES ON COLOURS.

The colouring particles have been hitherto considered only as substances capable of forming different combinations, by which their properties are modified; but they may be altered in their composition, either by other external agents, or by the substance with which they unite. We shall begin with an examination of the changes produced by external agents, because they are more easily ascertained. The stability of a colour consists in its power of resisting the action of vegetable acids, alkalies, soap, and more especially that of the air or light; but this power varies exceedingly, according to the nature of the colour and the species of the stuff; for the same durability is not required in the colours of silk as in those of wool. There is not much obscurity in the action of water, acids, alkalies, or soap: it is a solution brought about by these agents; and it appears that a small quantity of acid, or of alkali, sometimes unites with the compound which gives the colour; because the colour is not destroyed, but only changed, and

may be restored by taking away this acid, *e. g.* by chalk and ammoniac, or volatile alkali. But this is not the case with respect to the action of air and light. The action of the air on colouring matter is derived principally from the oxygen contained in the atmosphere. M. Berthollet observes, that the air combining with them, renders them weaker and paler, and by degrees occasions a slight combustion, by means of which the hydrogen which entered into their composition is destroyed; they change to a yellow, red, or fawn colour; their attraction for the stuff seems to diminish; they separate from it, and are carried off by water: all these effects vary, and take place more or less readily, and more or less completely, according to the nature of the colouring particles; or rather, from the nature of the properties which they possess, in the state of combination into which they have gone. The alterations which occur in the colours, produced the union of the colouring particles with metallic oxides, are effects compounded of the change which takes place in the colouring particles, and of that which is undergone by the metallic oxide. The light of the sun considerably accelerates the distinction of colours. It ought, therefore, if this theory be well founded, to favour the combination of oxygen, and the combustion thereby induced. M. Sennebie, who has given many interesting observations on the effects of light on different substances, and particularly on their colours, attributes these effects to a direct combination of light with the substances. And the effects of light on the colour of wood have long ago been noticed; it preserves its natural appearance while kept in the dark, but when ever it is exposed to the light, it becomes yellow, brown, or of other shades. M. Sennebie has remarked the varieties which occur in this particular, in different kinds of wood, and has found that the changes are proportioned to the brightness of the light, and that they take place even under water, but that wetted wood underwent these changes less quickly than that which was dry; that several folds of ribband were required to defend the wood completely, that a single leaf of black paper was sufficient, but that when paper of any other colour was substituted, the change was not prevented; a single covering of white paper was insufficient, but two intercepted the action of the rays of light. M. Sennebie has also extended his experiments to a great number of vegetable substances, in a manner that may serve to illustrate different phenomena of vegetation. If a well made solution of the green parts of vegetables in alcohol, which has a fine green colour, be exposed to the light of the sun, it very soon acquires an olive hue, and loses its colour in a few minutes. If the light be weak, the effect is much more slow; and in perfect darkness, the colour remains without alteration, or if any change does take place, it requires a great length of time. An alkali restores the green colour; but if the change of colour in the liquor has been completed, the alkali has no effect. No change of colour takes place in azotic gas, nor in a bottle which is exactly full. A bottle half full of this green solution was inverted over mercury, by M. Berthollet, and exposed to the light of the sun; when the colour was discharged, the mercury was found to have risen in the bottle, and consequently oxygen had been absorbed, having united with the colouring matter. Light, therefore, acts by favouring the absorption of oxygen, and the combustion of the colouring matter; at first, the marks of combustion are not evident; the liquor retains only a slight yellow tinge; but by the assistance of heat, the combustion is completed, the liquor becomes brown, and leaves a black residuum. If the vessel which holds the liquor contain no oxygenous gas, the light has no effect on the colouring matter; azotic gas in this situation does not suffer any diminution. The observation, that ribbands, or a single leaf of white paper, do not prevent the action of light, deserves attention, as it shews that light can pass through coverings which appear to be opaque, and exert its force at some way within. Beccaria and Sennebie have compared the effects of light on ribbands of various colours; but the differences they have observed are rather to be attributed to the nature of the colouring matters than to the colours; for a ribband dyed with Brasil wood will lose its colour much sooner than one dyed with cochineal, though the shade should be exactly the same in each. On the whole, it is evident that colouring substances resist the action of the air more or less, according as they are more or less disposed to unite with oxygen, and thereby to suffer more or less quickly a smaller or greater degree of combustion. Light favours this effect, which in many cases is not produced without its assistance; but the colouring matter, in its sepa-

rate state, is much more prone to this combustion than when united to a substance, such as alumine, which may either defend it by its own power of resisting combustion, or by attracting it strongly, weaken its action on other substances, which is the chief effect of mordants. This last compound acquires still greater durability, when it is capable of combining intimately with the stuff upon which it is deposited. Thus the colouring matter of cochineal dissolves easily in water, and its colour is quickly changed by the air; but when united to the oxide of tin, it becomes much brighter, and almost insoluble in water, though it is still easily affected by the air, and by oxygenated muriatic acid; it resists the action of these better, however, when it has formed a triple compound with a woollen stuff. But still it must not be inferred, that all yellow colours are owing to the carbonic part of the colouring substance; very different compounds are capable of producing the same colour; thus, indigo is very different from the blue of our flowers, from that of oxide of copper, and from that of Prussian blue.

OF ASTRINGENTS.

Astringents deserve particular attention, not only from their great use in dyeing, but as possessing a property common to many vegetables. Our ideas respecting this property have been extremely vague; some slight resemblance in taste has frequently been the only circumstance attended to, and, under the name of astringents, alum, as well as many vegetables of very different properties, have been confounded together in the arts, as well as in medicine. Almost every substance, which renders a solution of iron black, has been considered as astringent. This effect has been supposed to be owing to one identical principle, existing in all the substances which produce it, and on which the title astringent has been bestowed. It is still considered as a particular acid; to which the name of gallic acid is given, from galls, in which it is found to be predominant. The gall-nut is an excrescence found on the young branches of the oak, and produced by the puncture of an insect. Different kinds of the gall-nut are met with, some inclining to white, yellow, green, brown, or red; others ash-coloured or blackish. They also differ greatly in magnitude, and are either round or irregular, heavy or light, smooth or covered with protuberances. Those which are small, blackish, knotted, and heavy, are the best; and are known by the name of Aleppo galls. These astringent substances are almost totally soluble in water by long ebullition. Sixteen drams afforded Neumann fourteen of extract; from the remaining two drams, only four grains could be abstracted by alcohol. And the same quantity treated first with alcohol, and then with water, afforded twelve drams and two scruples of spirituous extract, and four scruples of watery extract; the residuum weighed half a scruple more than the preceding experiment. In the spirituous extract the taste is more strong and disagreeable than in the watery extract. If the astringent property were owing to an individual principle, which was always the same, distributed in different vegetables, the precipitates obtained by their means, from a solution of iron, would constantly form the same compounds, and exhibit the same appearances and properties; but the precipitate produced by galls is of a blackish blue; that by logwood has a different shade of blue; that by oak is of a fawn colour, or blackish brown; that by quinquina a blackish green. They fall down with different attendant circumstances, and when fixed on stuffs, are discharged by alum and tartar, some much more easily than others; and probably, by multiplying experiments, many other remarkable differences may be discovered in the properties of these different precipitates. Astringents form with iron different species of compounds, and consequently do not derive their properties from one principle; but there must be a property common to different substances, to enable them to act in an uniform manner on solutions of iron, and to produce precipitates more or less black, and thus appearing of the same nature, and this common property is called the astringent principle. But, notwithstanding chemists have considered the astringent principle as always the same, experience has taught us, that all astringent substances were not equally proper for producing a beautiful and durable black: it is of importance to determine which of them may be employed with the greatest success: it is, however, very difficult to make comparative experiments on this subject with perfect accuracy, because some substances require much longer boiling than others to extract their astringency; because a difference

ence in their coarseness or fineness, when subjected to ebullition, is sufficient to produce differences in the results; and because the colouring particles have a greater or less disposition to combine with the stuff, according to the proportion of sulphate of iron that has been made use of. Solutions of iron in different acids may produce differences in the results, according to the state of oxygenation of the iron in them, according as the proportion of that metal is greater or less, and according to the strong or weak action, which the different acids, when disengaged, are capable of exerting on the newly formed compound. And, in the dyeing of a stuff, considerable alterations may arise from its greater or less attraction for the colouring particles. We shall now consider the astringent principle in regard to its property of combining with vegetable and animal substances, particularly the latter. Silk acquires by galling, which is an operation that consists in macerating a stuff in a decoction of some astringent substance, a weight which cannot be taken from it, or diminished beyond a certain degree by repeated washing; after which operation, the stuff, when put into a solution of iron, is dyed black, because the astringent principle, decomposing the sulphate of iron, forms a triple compound with the oxide of iron and the stuff which is dyed. A gall-stuffed is likewise capable of combining with other colouring particles, the colours of which acquire fixity, if they do not naturally possess it; so that the astringent communicates its durability to the triple compound, or perhaps the more complex one which is formed; but by this union the colour generally becomes of a deeper shade. The astringent principle, by combining with animal substances, renders them incapable of corruption, and tends to render their texture more compact; and in this the art of tanning consists. To account for the colours, which proceed from the union of the colouring particles with the basis which a mordant gives them, we must attend to the proportion in which the colouring particles unite to that basis; thus the solution of tin, which produces a very copious precipitate with a solution of colouring particles, and which thereby proves that the oxide of tin enters in a large proportion into the precipitate, has a much greater influence on the colour of the precipitate, by the whiteness of its basis, than the solution of zinc, or that of allum, which generally produce much less copious precipitates. The precipitates produced by these two last substances retain very nearly the natural tint which the colouring particles afforded. It is, therefore, necessary to distinguish, in the action of mordants, the combinations that may take place by their means, between the colouring particles, the stuff, and the intermedium; the proportions of the colouring substances and intermedium; the modification of colour, which may arise from the mixture of the colour of the colouring particles, and of that of the basis to which they are united; and the changes which the colouring particles may suffer, from the combustion that may be produced by the substance that is employed as an intermedium. It is evident also, that astringents do not derive their characteristic property from an acid, or from any other individual and uniform principle, but from the property which they possess, of uniting with the oxide of iron, of reducing it to the state of a black oxide, and of acquiring themselves a dark colour, by the combustion they thereby experience. Galls readily undergo a slight combustion, which gives them a deep brown colour; but this combustion, which requires but a small quantity of oxygen, soon ceases without their properties being in any degree injured. But galls owe their stability to the large proportion of charcoal they contain; and as they have the property of combining with some vegetable substances, with several colouring matters, and particularly with animal substances, they serve as intermedia for them, and impart to them that stability which they possess in so very high a degree. In the opinion of Dr. Bancroft, an able writer on dyeing, M. Berthollet, in ascribing the decays of vegetable and animal colouring matters in general, to effects or changes similar to those of combustion, has gone much further than is warrantable by facts. It cannot, he thinks, be his intention, that we should apply the term of combustion to alterations which result from a simple addition of oxygen, to colouring matters, without a destruction or separation of any of their component parts; though many of the decays and extinctions of these colours evidently arise only from such simple additions of oxygen. The nitric, sulphuric, and other acids, containing oxygen, have the power not only of weakening, but of extinguishing, for a time, the colours of many tinted matters; not by any effect which can

properly be denominated a combustion, but rather by a change in their several attractions for particular rays of light; but none of their parts being destroyed, or carried away, the addition of an alkali, or of calcareous carbonate, will generally undo such alteration, and restore the original colour, by decomposing and neutralizing the acid or oxygen, which had caused the alteration. Dr. Bancroft also observes, that until further discoveries shall have been made, we are only authorised to conclude, that the permanent colours of natural bodies do not depend upon their thicknesses, sizes, or the densities of their several parts or particles, but upon certain affinities or attractions (chemical or physical) by which they are disposed to absorb and conceal some of the rays of light, and to reflect or transmit other rays, giving the sensations or perceptions of their respective colours; that the contact of light greatly contributes towards producing these affinities or attractions; but it only does this (as far as we yet know) either by promoting a combination or a separation of the basis of vital air in the different coloured or colouring substances. But though most of the changes of colour, in permanently coloured bodies, evidently depend on changes in their respective portions of oxygen, he is far from thinking that this cause operates exclusively in all cases, or that chemical knowledge is yet far enough advanced, to justify even an attempt towards a complete hypothesis respecting these most abstruse and most interesting phenomena. It may not be improper here to add that the most permanent dyes we have, are cochineal and gum-lac, for fine red and scarlet colours; indigo and woad, for blue; and, when mixed with different proportions of cochineal, or gum-lac, for purple and violet colours. Dyers-weed, and some other vegetables, for yellow; and madder for coarse reds, purples, and blacks. The fading colours are far more numerous, and include Brazil-wood, log-wood, red-wood, fustic, turmeric root, anatto, archil, &c. For further information on the theory of dyeing we refer to the works of the authors above-mentioned, and particularly to Berthollet's treatise, as being the most complete one as yet offered to the public on this subject.

OF THE PRACTICE OF DYEING.

The whole of the operative part of dyeing depends on the application of certain colours, which the workmen call primitive, and which are five in number, namely, blue, red, yellow, fawn, or root-colour, and black. Each of these furnishes a variety of intermediate shades, both according to the nature of the ingredients, and the acid or alkaline substances with which they are mixed. Two only of these five colours, should be prepared with ingredients producing no colour of themselves: but which, by their peculiar acidity, and the fineness of the earth they contain, dispose the pores of the substance to receive the dye. The colours which more particularly require such auxiliary process, are red and yellow, together with those derived from them. Black is obtained by a particular preparation; but blue and fawn colour require none, at least for wool; it being only necessary to scour and soak this substance well; then to immerse it in the dyeing vat, stirring it well about, and permitting it to remain for a longer or shorter time, in proportion as the colour is intended to be more or less deep. The ingredients used in dyeing blue consist of pastel, woad, and indigo.

1. PASTEL, [*Isatis Tinctoria*,] is prepared by gathering it when ripe, suffering it to rot, and then working it up into balls for drying; which weigh in general from 150 to 200 pounds, and resemble a collection of small dry lumps of earth, intermixed with the fibres of plants. In order to extract the colour, it is necessary to provide large wooden vats, from 12 to 16 feet in diameter, and 6 or 7 feet high, or of a magnitude proportioned to the quantity intended to be used. The preparation of the blue-vat is the most difficult process in the art of dyeing; and the practical directions given by those who understand it, are either defective, or mis-stated. The copper-cauldron should be placed as near to the vat as possible, and filled with pond-water: to which, if it be not sufficiently putrid, may be added two or three pounds of hay, together with eight pounds of brown madder, or of the bark of the root. The fire should be lighted about three o'clock in the morning, and the mixture boil for an hour and a half, or two hours, when the liquor is, by means of a spout conveyed into the vat, in which a peck of wheaten bran is previously infused. The pastel-balls are next to be put in, separately, while the liquor is running into the vat, in order that they may be the more easily broken

and stirred with the rake, which is a semi-circular wooden instrument, having a long handle. The mixture is occasionally agitated, till the vat has received all the hot liquor; and, as soon as the vessel is nearly half full, it should be covered with a lid, somewhat larger than its own circumference. A cloth should be likewise thrown over it, in order to confine the heat; after which the whole should be suffered to subside for four hours; when it ought to be uncovered, in order to give it air, and to mix it thoroughly. No lime, as is generally though falsely directed by dyers, should be put into the vat, but a small air-hole left on the top: the stirring and agitation may once more be repeated, at the expiration of three or four hours. If the ingredients, after these operations, be not yet ready and come to, that is, if the blue does not rise to the surface, but continues to foam, it will then be necessary, after working the mixture well, to let it stand an hour and a half longer; care being taken during that time to observe it minutely, in case it should cast blue. The vat is then to be filled up with water, and a sufficient quantity of indigo, dissolved in a ley of pot-ash, pure water, bran and madder. The vat being again covered, at the end of three hours a pattern is to be immersed in the liquor for a similar space of time, when it is to be taken out, to inspect the state of the vat. This pattern, when first taken out, should be of a green colour, but instantly turn blue; if the green be bright and good, the vat is to be stirred again, and then covered up, with the addition of a few handfuls of bran. Three hours after, the same operation is to be repeated, with the addition of more bran, if necessary, when it is to be covered up for an hour and a half longer; and, as soon as it subsides, another specimen is to be immersed in it for an hour, when it must be examined, to ascertain the state of the pastel. If the former be of a good green, when taken out, and turn suddenly to a deep blue, on being exposed to the air, another pattern is to be put in, to discover the effect of the vat; which, if the colour be sufficiently high, is to be filled with hot water, or (which is preferable, if it can be procured) with the liquor of an old madder-vat, and then stirred again. Now the vat is to be once more covered for an hour; after which the stuffs to be dyed should be immersed.

Woad is the next article in the making of a blue colour: the mode of preparing it differs in no respect from the preceding one, just described, excepting that it is weaker, and yields less colour.

INDIGO is the last ingredient in dyeing blues. The vat is about 5 feet high, 2 feet in diameter, and some what narrower towards the bottom, being surrounded by a wall, and having a vacancy for the embers. A vat of this size requires from 2 to 5, or even 6 lbs. of indigo; and this operation is conducted as follows: 1. About 15 gallons of river water are put into a copper to boil for about half an hour, together with 2 lbs. of pot-ash, 2 oz. of madder, and a handful of bran. 2. Immerse 2 lbs. of indigo in a pail of cold water, in order to separate the solid from the volatile particles, which will immediately rise to the surface. The watery liquor is then poured off, and the indigo, settled at the bottom of the pail, should be triturated in an iron mortar, with the addition of a small quantity of hot water, that ought to be shaken from side to side; and the floating particles of indigo, which are those most finely pounded, must be poured into another vessel. In this manner, the indigo remaining in the mortar is continually reduced, fresh water being repeatedly added, till the whole is pulverized so finely as to rise to the surface. The liquor which had, during the above stated preparation, been boiling in the copper, is now poured into the vat, together with the indigo, when the whole is well stirred with a rake, the vat closely covered, and surrounded with embers. If this operation commence in the afternoon, the embers must be renewed in the evening, and also in the morning and evening of the following day, in the course of which it should be twice gently stirred. Similar measures ought to be pursued on the third day, in order to preserve an uniform heat, and intimately mix the ingredients. A brassy scum will then be perceived to rise to the surface, in several detached parts: by continuing the heat on the fourth day, the scum becomes more coherent; and the froth, occasioned by stirring the liquor, appears blue, while the latter is of a deep green. As soon as it assumes this appearance, the vat should be filled, for which purpose a fresh liquor must be prepared, by putting 5 gallons of water into a copper, together with a pound of pot-ash, and half an oz. of madder.

When these ingredients have boiled half an hour, the decoction is poured into the vat, the whole well stirred, and if it produce much froth, it will be in a proper state for working the next day. This may likewise be ascertained by the brassy or scaly crust, which floats on the surface of the liquor; and, farther, if on blowing, or stirring, the latter with the hand, it assume a deep green colour, while the surface appears of a brownish blue. After the vats have been thus prepared, the dyeing of woollen or silken stuffs is very easy; no other process being required, than immersing them in warm water, wringing, and then steeping them in the vat for a longer or shorter time, according to the deepness of the colour intended to be imparted. The stuffs should be occasionally opened, that is, taken out of the vat, wrung over it, and exposed to the air for a minute or two, till it become blue: for it must be observed, that, in all the solutions of indigo, or other dyeing materials above described, the blue colour is produced only by exposure to the air, and the stuff, on being first drawn out of the liquor, always appears green, and will retain that tinge, unless it be exposed to the air. In dyeing blue, therefore, it is necessary to let the colour thus change previously to a second immersion, that the shade may be the better distinguished, as dark blues require to be repeatedly dipped. The method of dyeing cotton or linen blue, varies so little from that already described, as to render any farther directions unnecessary. When silk is to be dyed blue, there is generally a greater portion of indigo added.

For the **TURKEY BLUE**, which is the deepest, a very strong archil bath is first given; and for the **ROYAL BLUE**, one of the same kind, but weaker. Other blues are dyed without any ground being previously given. There is however a blue made as deep as the royal blue, for the ground of which cochineal is used instead of archil, in order to render it more permanent, whence the title *bleu fin* has been given it. A blue of little durability may be given to silk by means of verdegris and logwood; but it might be made more lasting, by first giving it a lighter shade than is intended in a bath of this kind, afterwards dipping it in an archil bath, and in the vat after that.

When **RAW SILK** is to be dyed blue, that should be chosen which is naturally white. It should be thoroughly soaked in water, and afterwards put into the vat in separate hanks, in the same manner as the scoured silk. In general, raw silk takes the dye more readily, and, if possible, the scoured silk is put into the vat before it. If raw silk require archil, or the other ingredients abovementioned, it is to be treated in the same manner already described.

2. The next of the primitive colours to be considered is **RED**, of which there are many shades and varieties; but the principal are scarlet, crimson, and madder-red. The process to be adopted for obtaining these colours, essentially differs from that of blues; as the former require a peculiar preparation of the stuffs to be dyed, on the exactness of which, the goodness of the colour in a great measure depends. These preparatory ingredients consist of alum, tartar, aqua-fortis, or a solution of tin in this acid. Galls and alkaline salts are also sometimes added, though they do not materially contribute to the colour. There are three kinds of scarlet, namely, those dyed with kermes, with cochineal, and with gum-lac. The first of these, called Venetian scarlet, is the most permanent, but the least bright; it is also apt to be less spotted than the others; but on account of the difficulty of procuring the insects which afford the colour, it is very seldom, if ever, used in this country. The second kind of scarlet, namely, that dyed with cochineal, is less permanent than the Venetian scarlet, though the drug is procured at a more reasonable price. It is, however, very difficult to dye the true cochineal scarlet: the success of this operation equally depends upon the choice of the material, the water employed, and the method of preparing a solution of tin, which is the only ingredient by which that delicate colour can be produced. To eight ounces of spirit of nitre an equal quantity of river-water is to be added; in this mixture are to be gradually dissolved half an ounce of the purest and whitest sal-ammoniac, and two drams of purified salt-petre. An ounce of tin, reduced to grains, by being dropped into cold water while melting, is next to be added drop by drop to the liquor thus prepared; the first being perfectly dissolved before a second is introduced. The solution resembles that of gold, and, if fine tin be employed, will be perfectly transparent, without any dust or sediment. With this

this liquor are to be mixed such proportions of cochineal as may be thought proper, and the stuffs dyed in the colour will acquire a most beautiful scarlet. The scarlet produced by gum lac, though not so bright as cochineal, is more permanent; the best lac is that which is of a blackish brown colour on the outside, and white within. The process of preparing this colour is very difficult; but the best method, we believe, is that of previously mixing the gum with comfrey, or other mucilaginous roots. These should be dried, finely pulverized, afterwards boiled for fifteen minutes in the proportion of half a dram to a quart of water, then strained through a linen cloth while hot, poured upon levigated gum-lac, and passed through a hair sieve. The whole is then digested in a moderate heat for twelve hours; and the gum remaining at the bottom should be stirred seven or eight times. The liquor thus impregnated with a fine crimson colour, is afterwards poured into a vessel, sufficiently capacious to hold four times the quantity, and filled up with cold water. On adding a small proportion of a strong solution of alum, the coloured mucilage subsides; and, should any tinge remain in the liquor; it may be precipitated by gradual additions of alum, till it become perfectly colourless. As soon as the crimson mucilage has entirely subsided, the clear water must be carefully decanted, the remainder filtered, and the fluid parts suffered to evaporate. If the whole of the colour should not be extracted by the first operation, it ought to be repeated, till the residuum changes to a pale straw-colour. In order to dye scarlet with this extract of gum-lac, the requisite proportion of the latter dried and pulverized, is to be put into an earthen or block-tin vessel; a little hot water poured upon it; and, when it is well moistened, a proper quantity of the composition added; the whole being stirred with a glass pestle. By this means the powder, which before was of a dark, dusky, purple, acquires an exceedingly bright scarlet colour. A solution of the crystals of tartar is then to be poured into the liquor, and as soon as it begins to boil, the cloth is to be repeatedly immersed in it, according to the common method. The remainder of the operation is to be performed in the same manner as if cochineal had been employed.

CRIMSON is the colour produced by cochineal, with alum and tartar only, without any solution of tin. For this dye, two ounces and a half of alum, with an ounce and a half of white tartar, are to be taken, for every pound of wool; and being put into a cauldron with a proper quantity of water, the solution should boil before the stuff is dipped. The wool is then immersed into the boiling liquor, where it continues two hours; after which it is to be taken out, wrung gently, rinsed in water, and put into a bag. A fresh liquor is next prepared for the dye, in which an ounce of finely-powdered cochineal is used for every pound of wool: when this decoction boils, the stuff is immersed, and managed in the manner already directed for scarlet. For producing the finest crimson dye, however, the wool is again to be dipped in a weak lixivium, made of equal parts of sal-ammoniac and pearl ashes. The preparation of the ingredients for madder-red is always with alum and tartar, the proportions of which are by no means ascertained even by dyers. The more general practice is, to put 5 ounces of alum and one of red tartar to every pound of worsted, a twelfth part of acid water being likewise added, and the wool boiled for two hours in this solution, in which worsted is to be kept for a week; but cloth will be sufficiently saturated in four days. A fresh liquor is then prepared for dyeing this wool; and when the water is nearly boiling, half a pound of the finest madder is to be thrown in for every pound of wool; being carefully stirred and well-mixed in the copper, previously to immersing the stuff, which is to be kept in the liquor for an hour; during which the latter must not boil, lest it should tarnish the colour.

The third primitive colour is YELLOW, for obtaining which there are ten different ingredients; but four of these only yield a good and permanent dye, namely, dyers'-weed, or, as the dyers call it, weld, savory, dyers', green-weed, and fenu-greek. The first of these, namely, weld, in general affords the truest yellow, and is therefore preferred to all the others. Savory and dyers' green-weed, being naturally somewhat green, are more advantageously employed for dyeing that colour; and the last yields different shades of yellow. In order to dye worsted and stuffs yellow, they undergo the usual preparation with tartar and alum, of the latter 4 ounces are allowed to every pound of wool, or 25lbs. to every 100; of the former, one ounce is sufficient for yellow; after dis-

solving both, the wool is boiled in the same manner as in the preceding colour. A fresh liquor is next to be made for the welding or yellowing, in the proportion of 5 or 6lbs. of dyers'-weed to every pound of stuff. Some inclose the drug in a clean woollen bag, to prevent it from mixing with the cloth to be dyed; and, in order to keep the bag down in the copper, they lay a cross of heavy wood over it. Others boil the weld in the liquor, till the water has imbibed all its colour, and the drug sinks to the bottom, when the stuff is suspended in a net; others, again, take the weld out, as soon as it is boiled. According to the shade required, other vegetables are occasionally mixed with that drug. By varying the proportions of the salts employed, as well as the quantity of colouring ingredients, and the time of boiling, different shades may be produced.

The fourth primitive colour is that denominated by dyers, the FAWN, or root colour. It is a kind of brown, and the process for dyeing it is widely different from those just described; the wool merely requiring a simple immersion in water, as already directed for blue. The materials employed consist of the green shell of the walnut, the root of the walnut tree, the bark of alder, santal or saunders-wood, sumach, and soot. The green walnut-shells are collected, when the nuts are thoroughly ripe; they are put into tubs or casks, which are afterwards filled with water, and are thus preserved till the succeeding year. Santal, or saunders-wood, is much inferior to walnut-shells; because, if used in too large a quantity, it stiffens, and consequently injures the wool. It is in general mixed with galls, sumach, and alder-bark, without which its colour could not be extracted: and though it yields very little with alum and tartar, it is nevertheless used in large quantities, on account of the solidity of its colour, which is naturally a yellow-reddish brown. The best of the different ingredients employed in dyeing fawn-colours, is the bark or rind of the walnut-tree. Its shades are uncommonly fine; its colours solid; and it renders the wool dyed in it flexible and soft. A cauldron half full of water is placed over the fire; and as soon as it grows warm, bark is added in proportion to the quantity of stuffs intended to be dyed, and the lightness or depth of the shades required. It is then boiled for about a quarter of an hour, when the cloths, being previously moistened with warm water, are immersed, frequently turned, and well stirred, till they have sufficiently imbibed the colour. They are aired, dried, and dressed in the usual manner. Next to the rind or bark, the root of the walnut-tree is the best dye for a fawn-colour: it also affords a variety of shades, similar to those produced by the bark, for which it is frequently substituted. The root, however, requires a different process: a cauldron is filled about three parts full of river-water, into which the root is immersed, after being tied up in a bag. When the liquor is very hot, the wool or stuff is plunged into it, repeatedly turned, and occasionally aired. The lighter stuffs are next to be dipped, till the colour, is completely extracted. During this operation, proper care should be taken to prevent the liquor from boiling, as in such case the first immersed would imbibe the whole of the colour. The process of dyeing with the bark of alder, is nearly the same as that pursued with walnut-roots: the boiling of it is at first not very material, as this drug very freely communicates its colour. It is chiefly used for worsted, imparting shades darkened with copperas; and for wool that is not required to be very dark, as it equally withstands the effects of the sun and rain. Sumach possesses nearly the same properties as the bark or rind of the walnut-tree; its colour is not so deep, somewhat inclining to green, but is solid and permanent. Where dark colours are required, sumach is frequently substituted for nut-galls, in which case a greater proportion becomes necessary. These different substances, however, are not unfrequently mingled together, and, as they are of a similar nature, and differ only in degree, it is easy to obtain various shades. With respect to the method of compounding the different ingredients with pulverized saunders-wood; 4lbs. of the latter are to be put into a copper, with half a pound of powdered nut-galls, 12lbs. of alder-bark, and 10lbs. of sumach. The whole is to be boiled, when a small portion of water should be added, to check the boiling: after immersing the cloth, stirring, and turning it repeatedly, it is aired, and washed in river-water. The quantities of these ingredients may be increased, or diminished, according to the depth of the shade required. The last substance employed in dyeing the fawn-colour, is soot, which is not only less solid

solid than the others, but also hardens, and imparts a very disagreeable smell to the wool, or stuff, dyed in it: it is therefore seldom, if ever used, unless the other ingredients cannot easily be procured.

The fifth, and last, of the primitive colours, is **BLACK**, which includes a great variety of shades. In order to impart a good black to woollen stuffs, they should be first dyed of as deep a blue as possible, which is called the ground, and is to be performed in the manner already directed. As soon as the cloth is taken out of the vat, it ought to be well washed in river-water, and afterward scoured at the fulling-mill. Next, the dyeing process is performed as follows: for every cwt. of cloth, 10lbs. of logwood cut into chips, and an equal quantity of Aleppo gall-nuts pulverized and inclosed in a bag, are to be put into a cauldron of a moderate size, where the whole is boiled for twelve hours in a sufficient quantity of water. A third part of this liquor is then to be poured into another cauldron, with 2lbs. of verdigrease, when the cloth is to be immersed for two hours, being repeatedly turned and stirred, the liquor in the mean time boiling very slowly, or rather, gently simmering. At the expiration of that time, the stuff is to be taken out, and the second part (being another third) of the liquor added to the first third, together with 8lbs. of copperas. The fire beneath the cauldron is then to be diminished, and the copperas left for half an hour to dissolve; the liquor being gradually cooling: after which the cloth is to be immersed for another hour, repeatedly turned as before, then removed and cooled. The remainder of the liquor is next to be mixed with the first two-thirds; and the bag carefully expressed; when fifteen or twenty pounds of sumach are to be added, together with two pounds of copperas. The whole is then made to boil; and, a small quantity of water being added to cool, the stuff is again immersed for two hours; at the end of which time it is to be taken out, cooled, and steeped in the dye for an hour longer, being frequently turned. The cloth is then to be carried to the fulling-mill, and well scoured, till the water runs from it perfectly colourless. As soon as this operation is performed, a fresh liquor should be prepared with the necessary quantity of dyers'-weed, which is only once to be boiled, and when cool, the cloth dipped into it. This last decoction softens the texture, and renders the colour a most beautiful black. Few dyers, however, take so much pains; for they are satisfied with dipping the cloth, when blue, in a decoction of nut-galls and boiling the whole for two hours. The stuff is then washed, and after adding some copperas and logwood to the liquor, the cloth is again immersed for two hours, at the end of which it is washed, scoured, dried, and pressed.

For dyeing silk black, different operations are necessary; as boiling the silk, galling it, the preparation of the bath, the operation of dyeing, and softening the black. The gummy substance, which silk in its natural state contains, does not increase the strength of the silk, which is then called raw: but renders it more liable to wear out, from the stiffness it imparts to it: and though raw silk takes a black colour with more facility, than silk which has been scoured or divested of its gum, that black is much less perfect, and resists the reactives calculated to dissolve the colouring matter, in a much less forcible manner. To cleanse silk intended to be dyed black, it is commonly boiled four or five hours with a fifth of its weight of white soap, after which it is beetled and washed carefully. For galling the silk, nearly three-fourths of its weight of galls are boiled for three or four hours: but Aleppo galls being dear, a greater or less portion of white galls, or even of an inferior kind, called berry or apple galls, is mixed with them. The proportion commonly used in France is two parts of Aleppo galls to eight or ten of berry-galls. After the boiling, the liquor is left at rest about two hours, that the galls may subside: the silk is put into the bath, and left there from 12 to 36 hours: it is then taken out and washed in a running stream. As silk is capable of combining with more or less of the astringent principle, its weight receives a considerable augmentation, not from the weight of the astringent principle alone, but also from that of the colouring matter, which fixes in it, in proportion to the quantity of the astringent principle combined with it. The processes for dyeing it are therefore varied, according as the operator is desirous of rendering the silk of a greater or less weight. And this difference constitutes the distinction between a light and heavy black. A pound of silk loses nearly one-fourth of its weight in the boiling

when complete; and recovers in the light black, and the galling which precedes it, $1\frac{1}{2}$ or 2 ounces; so that the original pound is reduced to about 14 ounces, but in the heavy black this same pound is increased in weight to 20 or 22 ounces, or even more; so that the buyer, deceived by the low price at which it is offered him, pays in every pound for several ounces of a substance which is not merely useless, but is even injurious to the beauty of the colour, and the strength of the stuff. The black which is much overcharged is never of a fine colour; it is therefore generally employed for the woof, and covered with a warp of a fine black. The difference in the process for obtaining heavy black consists in leaving the silk a longer time in the gall liquor, in repeating the galling and dipping of the silk in the dye oftener; leaving it in this also a considerable while. The first galling is also commonly performed with galls which had been already used, fresh ones being taken from the second. But this method is sufficient to give so great a surcharge as is necessary in some blacks. For this purpose the silk is galled raw, and afterwards rendered supple by wringing with the pin. A vat is preserved by the silk-dyers for the black; and its composition, greatly overcharged, varies in different dye-houses. These vats have commonly been set for many years, and when the black dye is exhausted, it is renewed by what is called a brevet. When the grounds which accumulate in them become too considerable in quantity, they are taken out; so that after a time nothing remains of several of the ingredients which composed the original bath, but those which are not used in the brevet.

To dye **RAW SILK**, it must be galled cold, in the gall bath which has already been used for scouring silk; and for this purpose, silk with the natural yellow hue is preferred. If it be wished to preserve a part of the gum of the silk, and afterwards soften it, the galling should be performed in a warm bath, as usual: but when it is intended to preserve the whole of the gum, and the elasticity which it communicates to the silk, the galling is performed cold. If the gall liquor be weak, the silk must remain in it several days. Silk, thus prepared and washed, readily takes the black dye; and the rinsings, to which sulphate of iron may be added, are sufficient to communicate it. This dyeing is performed cold; but it requires more or less time according to the strength of the rinsings. Sometimes three or four days are necessary; after which it is washed, giving it one or two beetlings, and that it may not be softened, it is dried without being wrung. But raw silk may be dyed more speedily, by turning or shaking it over in the cold bath after galling, and airing it, repeating these operations a few times; after which it must be washed and dried. Dr. Lewis remarks, that though white silk may be dyed a good black, without using either logwood or verdigris, the addition of those two ingredients contributes greatly to improve the colour both in silk and in wool. But as the great use of galls in dyeing silk black renders it very expensive, it is of consequence to find some method of diminishing their quantity. M. Angles proposes the following process: When the silk has been carefully boiled and washed in the river, it is to be immersed in a strong decoction of green walnut peels, and left in it till the colour of the bath is exhausted. It is then taken out, slightly wrung with the pin, dried, and washed in the river. The decoction of walnut-peels is made by boiling a full quarter of an hour, when it is taken from the fire, and suffered to subside before dipping the silk, which has been previously immersed in warm-water. A blue ground is next given by means of logwood and verdigris. For every pound of silk, an ounce of verdigris is dissolved in cold water; the silk is left in this solution two hours; it is there dipped in a strong decoction of logwood, wrung out slightly, and dried before it is washed at the river. For light blacks, galling may be altogether omitted; but to a heavy black, half a pound of galls must be employed for every pound of silk intended to be dyed. To prepare the bath, 2 lb. of galls and 3 of sumach are macerated in 25 gallons of water over a slow fire, for 12 hours. After straining, 3 lb. of sulphate of iron, and as much gum Arabic are dissolved in it. In this solution the silk is dipped at two different times, leaving it, in two hours each time, taking care to air it after the first dipping, and to dry it before giving the second fire, when it is to be again aired and dried: it is then beetled twice at the river; after which a third fire is given it, in the same manner as before, except that it is left in the bath four or five hours. When drained and dried, it is again beetled

beetled twice at the river. The heat during the operation must not exceed 122 degrees of Fahrenheit's thermometer; and before the last two fires, an addition of half a pound of sulphate of iron and as much gum Arabic is to be made. For removing the harshness that silk acquires from the black dye, M. Angles thinks that the decoction of weld should be preferred to that of a solution of soap; and says, that if silk be dyed blue with indigo previous to its being dipped for black, it will take only a mealy black, but that a velvety black will be obtained, if it be prepared with logwood and verdegis; and that green walnut-peels soften the silk. Though a fine black may be procured from green walnut-peels, and the bath above described, he notwithstanding adds logwood and verdegis, that he may not be obliged to use a large quantity of sulphate of iron, which weakens the silk too much. He thinks that galls only serve to give the silk weight, and that sumach is adequate to the dye. Linen and cotton do not easily take a black of any intensity that will resist soap; therefore to dye them black, a solution of iron is used, which is kept in a cask called the black cask. This solution is prepared with vinegar, small beer, or small wine made from the grapes, after they have been pressed, by adding water to them, which is soured with rye meal, to procure an acid liquid at a low price. Pieces of old iron are thrown into this liquor, which is never used in less than six weeks or two months. To this bath astringents are frequently added, particularly the decoction of alder bark, which of itself has the property of dissolving the oxide of iron in a pretty large proportion.

OF DYEING COMPOUND COLOURS.

Compound colours are produced by mixing together two simple ones; or, which is the same thing, by dyeing cloth first one simple colour, and then another. These colours vary to infinity, according to the proportions of the ingredients employed. They may be arranged under the following classes: Mixtures of, 1. Blue and yellow; 2. Blue and red; 3. Yellow and red; 4. Black and other colours.

Mixture of Blue and Yellow.—This forms green; which is distinguished by dyers into a variety of shades, according to the depth of the shade, or the prevalence of either of the component

parts. Thus we have sea-green, grass-green, pea-green, &c. Wool, silk, and linen, are usually dyed green by giving them first a blue colour, and afterwards dyeing them yellow; because, when the yellow is first given, several inconveniences follow: the yellow partly separates again in the blue vat, and communicates a green colour to it, and thus renders it useless for every other purpose, except dyeing green. And of the usual processes for dyeing blue and yellow may be followed, taking care to proportion the depth of the shades to that of the green required. When sulphate of indigo is employed, it is usual to mix all the ingredients together, and to dye the cloth at once; this produces what is known by the name of Saxon or English green.

Mixtures of Blue and Red.—These form different shades of violet, purple, and lilac. Wool is generally first dyed blue, and afterwards scarlet, in the usual manner. By means of cochineal mixed with sulphate of indigo, the process may be performed at once. Silk is first dyed crimson, by means of cochineal, and then dipped into the indigo vat. Cotton and linen are first dyed blue, then galled, and soaked in a decoction of logwood; but a more permanent colour is given by means of oxide of iron.

Mixtures of Yellow and Red.—These produce orange. When blue is combined with red and yellow on cloth, the resulting colour is olive. Wool may be dyed orange, by first dyeing it scarlet, and then yellow. When it is dyed first with madder, the result is cinnamon-colour. Silk is dyed orange by means of carthamus; a cinnamon-colour by logwood, Brazil-wood, and fustic, mixed together. Cotton and linen receive a cinnamon-colour by means of weld and madder; and an olive-colour, by being passed through a blue, yellow, and then a madder-bath.

Mixtures of Black with other Colours.—These constitute greys, drabs, and browns. If cloth is previously combined with brown oxide of iron, and afterwards dyed yellow with quercitron bark, the result will be a drab of different shades, according to the proportion of mordant employed. When the proportion is small, the colour inclines to olive or yellow; on the contrary, the drab may be deepened or saddened, as the dyers term it, by mixing a little sumach with the bark. See CALICO-PRINTING.

DYERS. By stat. 3 and 4 Ed. VI. c. 2, no dyer may dye any cloth with orchil, or with brazil, to make a false colour in cloth, wool, &c. on penalty of 20s. By stat. 23 Eliz. c. 9, dyers are to fix a seal of lead to cloths, with the letter M, to shew that they are well maddered, &c. or forfeit 3s. 4d. per yard. By stat. 23 Geo. III. c. 15, several penalties are inflicted on dyers who dye any cloths deceitfully, and not woaded throughout with indigo and madder. Dyeing blue with logwood, to forfeit 20l. Dyers in London are subject to the inspection of the dyers' company, who appoint searchers. In other places, these are appointed by the justices, and opposing the searchers incur a penalty of 10l.

DYER'S WEED, or WELD. See RESEDA.

DYEING, or STAINING OF PAPER, WOOD, IVORY, MARBLE, &c. See IVORY, MARBLE, PAPER, WOOD, &c.

DYEING OF HATS. See HATS.

DYEING OF LEATHER. See LEATHER.

DYKE-REEVE, in old statutes, an officer who had the care of the dikes, in the fens.

DYLE, one of the departments of France, formed out of the late Austrian Netherlands, and comprehending a great part of the province of Brabant. The chief city is Brussels.

DYLE, a river in the late Austrian Netherlands, which gives name to the department. It rises about 22 miles S. E. of Brussels, and falls into the Scheldt, at Ruplemond.

DYMEL, a river of Germany, in Westphalia.

DYMUDE. See DIXMUDE.

DYNA, an Indian coin, worth about 30s.

DYNAMICS [from *δυναμις*, Gr. power,] the science of moving powers, particularly of bodies which act mutually on each other. See MECHANICS.

DYNASTY, [from *δυναστευω*, Gr. a sovereign,] among ancient

historians, signifies a race or succession of kings of the same family. Such were the dynasties of Egypt. The Egyptians reckon 30 dynasties within the space of 36,525 years; but the most of chronologers look upon them as fabulous. And it is certain, that these dynasties were not continually successive, but many of them collateral and cotemporary.

DYRRACHIUM, in ancient geography, a town on the coast of Illyricum, before called Epidamnus, or Epidamnus, an inauspicious name, changed by the Romans to Dyrrachium; a name taken from the peninsula on which it stood.

DYSACOYA, [from *δυσ*, difficulty, and *ακουω*, to hear,] dullness of hearing.

DYSÆ, in the Saxon mythology, inferior goddesses, messengers of Woden, whose province it was to convey the souls of such as died in battle to his abode, called Valhall, i. e. the hall of slaughter; where they were to drink with him and their other gods, cerevisia, a kind of malt liquor, in the skulls of their enemies. The Dysæ conveyed those who died a natural death to Hela, the goddess of hell, where they were tormented with hunger, thirst, and every kind of evil.

DYSESTHESIA, [from *δυσ*, difficult, and *αίσθησις*, sensation,] a difficulty or defect in sensation. See MEDICINE.

DYSART, a borough in Scotland, on the N. shore of the Frith of Forth, 11 miles N. of Edinburgh. Lon. 3. 6. W. Lat. 56. 9. N.

DYSCINESIA, [from *δυσ*, and *κίνησις*, motion,] a difficulty of moving. See MEDICINE.

DYSCRASY, [*δυσκρασία*,] an unequal mixture of elements in the blood or nervous juice; a distemperature, when some humour or quality abounds in the body.

DYSECCEA. See MEDICINE.

DYSENTERIC FEVER. See MEDICINE.

DYSENTERY,

DYSENTERY, [from *δυσεντερία*,] a looseness, wherein very ill humours flow off by stool, and are also sometimes attended with blood. See **MEDICINE**.

DYSEPULOTICA, [from *δυσ*, *επι*, and *υλη*, a scar,] large incurable ulcers.

DYSNOMY, [from *δυσ* and *νομος*, law,] the enacting of bad laws.

DYSOPIA, [from *δυσ* and *ωφ*, an eye,] depraved vision. See **MEDICINE**.

DYSOREXIA, or **DYSOREXY**, [from *δυσ* and *ορεξις*, appetite,] a want of appetite. See **MEDICINE**.

DYSPEPSY, [*δυσπεψία*,] a difficulty of digestion, or bad fermentation in the stomach or guts. See **MEDICINE**.

DYSPHONY, [*δυσφωνία*,] a difficulty in speaking, occasioned by an ill disposition of the organs.

DYSPNOEA, [*δυσπνοία*,] a difficulty of breathing; straitness of breath. See **MEDICINE**.

DYSTHANATOS, [from *δυσ* and *θανάτος*, death,] among ancient physicians, is used to signify either a disease that occasions a slow painful death, or a person dying in such a lingering manner.

DYSTHERAPEUTA, [from *δυσ* and *θεραπεύω*, to heal,] diseases difficult to be cured.

DYSTOCHIA, [from *δυσ* and *τινω*, to bring forth,] difficult labour.

DYSURY, [*δυσουρία*,] a difficulty in making urine. See **MEDICINE**.

DYTISCUS, the **WATER BEETLE**, in zoology, a genus of the class and order insectæ coleoptera. Antennæ slender, setaceous; hind feet hairy, and formed for swimming. Nearly 200 species,

distinguished by their antennæ, the colour of the elytra, &c. The larvæ of the dytiscus are often met with in water. They are oblong, and have six scaly feet. Their body consists of eleven segments. The head is large with four filiform antennæ and a strong pair of jaws. The last segments of their body have rows of hairs on the sides; and the abdomen is terminated by two spines charged with the like hairs, forming a kind of plumes. These larvæ are frequently of a greenish variegated brown: they are lively, active, and extremely voracious; they devour and feed upon other water insects, and often tear and destroy each other. The perfect insect is little inferior to its larvæ in voraciousness, but it can only exercise its cruelty on the young larvæ; the perfect larvæ, like himself, being sheltered by a kind of scaly cuirass with which they are armed. This creature must be touched cautiously; for besides its power of giving a severe gripe with its jaws it has under the thorax, a long sharp spine, which it will drive into one's fingers by the effort it makes to move backwards. See Plate XXXVII.

DYVOUR, or **BARE-MAN**, in Scots law, a person who, being involved in debt, and unable to pay, to avoid imprisonment, makes cession of his effects in favour of his creditors; and does his devoir and duty to them, proclaiming himself bare-man and indigent, and becoming debt-bound to them of all he has. The word is used in the same sense as Bankrupt: see that article; and **LAW**.

DZURA, a Tartarian village of Russian Siberia, in the government of Irkutsch.

DZWINGROD, a town of Poland, in the palatinate of Kamieniec, 20 miles S. W. of Kaminiec.

E.

E Has two sounds; long, as scène, and short as men. It also has the peculiar quality of lengthening the foregoing vowel, as, gâp, gâpe; tûn, tûne. Yet it sometimes occurs final, where the foregoing vowel is not lengthened; as gone, knowledge, give. Anciently almost every word ended with *e*, as for can, canne; for year, yeare; for great, greate, &c. It is probable, that this *e* final had at first a soft sound, like the female *e* of the French; and that afterward, it was in poetry either mute or vocal, as the verse required, till at last it became universally silent.—*Ea* has the sound of *e* long: the *e* is commonly lengthened, rather by the immediate addition of *a* than by the apposition of *e* to the end of the word; as mēn, mēan; nēt, nēat. **E** is the fifth letter of the Alphabet, in the modern languages, and in many of the ancient. Its form is derived from the old character *𐤅* in the ancient Hebrew and Phœnician alphabets, inverted by the Greeks to this position **E**, and not from the Hebrew He, ה. From the same origin is also derived the Saxon *e*, which is the first letter in that alphabet that differs from the Latin one. It is sounded by a narrower opening of the larynx than the letter **A**; but the other parts of the mouth are nearly in the same position as when sounding that letter. The sound of *e* is obscure in the last syllable of participles ending with en, as bounden, chosen, frozen, &c. as well as in some nouns; such as haven, oxen, &c. and it is silent, or not sounded in a great number of words. The Greek language has a short **E** called *Epсилon*, and a long one called *Eta*; which differ, in form, as well as in sound, thus *E*, ε, and *H*, η. The Latin has a long and short *e*, but the Romans made no distinction of figure or name, but considered both sounds as one letter. In the French language, *e* has at least five different sounds besides being often silent. **E** in the calendar is the fifth dominical letter; and in music denotes the tone *E la mi*. As an Abbreviation, **E** is used in sea charts to distinguish all the easterly points; thus, **E** denotes East; **E**. by S.

East by South; **E**. by N. East by North; &c. **E**. is also used for Earl; as well as for *est*; thus *i. e. id est*, "that is." As a Numeral, **E** was used in the barbarous ages for 250. As a word, **E** was used in several ancient languages, with various significations. Thus in the Greek both **E** and **H** are words, and in Latin **E** is used both as a verb and preposition; but in English it does not constitute a word by itself.

EA, in the Saxon language, like **EAU** in the French, and **AA** in the Danish, signifies water, whence it makes part of the names of some rivers, lakes, &c.

EACHARD, **LAURENCE**, an eminent English historian of the 18th century. He was the son of a clergyman, and was educated at Cambridge, and presented to the living of Welton and Elskington in Lincolnshire, where he spent above twenty years, and distinguished himself by his writings, especially his *History of England*, which was attacked by Dr. Calamy and by Mr. Oldmixon. His "*General Ecclesiastical History, from the Nativity of Christ to the first establishment of Christianity by Human Laws, under the emperor Constantine the Great*," had passed through several editions. He was installed archdeacon of Stowe and prebend of Lincoln in 1712. He died in 1730.

EAD, [*ad ed*,] in the compound, and **eadig** in the simple names, denotes happiness, or blessedness.—Thus *Eadward* is a happy preserver; *Eadulph*, happy assistance; *Eadgar*, happy power; and *Ead* may also in some cases be derived from the Saxon *eath*, which signifies easy, gentle, mild.

EADISH, or **EDDISH**, [*Sax. Edisc*,] the latter grass, that grows after the corn is cut.

EAGLE, [*aigle*, French; *aquila*, Lat. *caller*, Erse,] in ornithology. See **FALCO**.

EAGLE, in antiquity, was born by way of ensign by several nations. The first who seem to have assumed the eagle are the Persians.

Persians; according to Xenophon. It was afterwards assumed by the Romans; who after a great variety of standards, at last fixed on the eagle, in the second year of the consulate of C. Marius. Till that time, they had used indifferently wolves, leopards, and eagles, according to the humour of the commander. The Roman eagles, were not painted on a cloth or flag; but were figures in relieve, of silver or gold, born on the tops of pikes; the wings being displayed, and frequently a thunderbolt in their talons. Under the eagle on the pike, were piled bucklers, and sometimes crowns. This we learn from the medals. Constantine is said to have first introduced the eagle with two heads, to intimate, that though the empire seemed divided, it was yet only one body.

EAGLE, in architecture, is a figure of that bird anciently used as an attribute, or cognizance of Jupiter, in the capital and friezes of the columns of temples consecrated to that god.

EAGLE, in astronomy, a constellation of the northern hemisphere, having its right wing contiguous to the equinoctial. See **AQUILA**, and **ASTRONOMY**.

EAGLE, in heraldry, is accounted one of the most noble bearings in armoury; and ought to be given to none but such as greatly excel in generosity and courage, or who have done singular services to their sovereigns; in which cases they may be allowed a whole eagle; or an eagle naissant, or only the head or other parts thereof, in proportion to their exploits.

EAGLE, **BLACK**, an order of knighthood, instituted in 1701, by the elector of Brandenburg, on his being crowned king of Prussia. The knights wear an orange-coloured ribbon, to which is suspended a black eagle.

EAGLE, **WHITE**, a Polish order of knighthood, instituted in 1325 by Uladislaus V. on marrying his son Casimir with a daughter of the great duke of Lithuania. The knights were distinguished by a gold chain, which they wore on the stomach, whereon hung a silver eagle crowned.

EAGLESTONE. See **ÆTITÆ**.

EAGLETS, in heraldry, several eagles on the same escutcheon.

EAHEINOMAUWE, an island in the S. Pacific Ocean, the most northern, as well as the most fertile of the two large islands, of which New Zealand consists. It was believed by the gentlemen who accompanied captain Cook, in his first voyage, that all kinds of European grain, as well as garden plants and fruit, would flourish here in the greatest abundance and perfection; and from the vegetables found it was concluded, that the winters are not more severe than those of England; and it was known by experience, that the summer was not hotter, though the heat was more equal. Here are no quadrupeds except dogs and rats; and the latter are so scarce, that they escaped the notice of many on board. The birds are not numerous. The gannet is the only one of the European kind that was observed. The insects are equally scarce; but the sea makes abundant recompence for this scarcity of land animals; every creek swarms with fish, equally delicious with those in this country. The forests are of vast extent; and filled with excellent timber trees, the largest, straightest, and cleanest; that captain Cook had ever seen.

EALDERMAN, or **EALDORMAN**, among the Saxons, was of the same import with earl among the Danes. It was also used for an elder, senator, or statesman; whence the title Alderman.

EAOOA, **EAOOWE**, or **MIDDLEBURG**, one of the Friendly islands in the South Pacific ocean, which abounds with groves of fruit and other trees, interspersed with tracts covered with grass. It was first discovered by Tasman who called it Middleburg. Lon. 174. 30. W. Lat. 21. 24. S.

EAR. See **ANATOMY**, and **ZOOTOMY**.

EAR, in botany, the same with spica. The flowers and seeds of wheat, rye, barley, lavender, &c. grow in ears. The stem of the ear means its tube or straw; the knot of the ear, the lobes or cells wherein the grains are inclosed, &c.

EAR, in music, the power of judging of harmony. See **MUSIC**. In music we seem universally to acknowledge a kind of internal sense, distinct from the external one of hearing; which we call a good ear. And the like distinction we should probably acknowledge in regard to our other senses, were our ideas of the differences equally clear. Something like this is universally acknowledged with regard to a critical and accurate perception and judgement of the objects of sight; though by a familiar metaphor,

these sensations are transferred to a sense that has no connection with them. Thus a greater capacity of perceiving the beauties of painting, architecture, &c. is called a fine taste, when it should rather be stiled a fine sight.

EARL, [*eorl*, Sax. *coryl*, Erse,] a title of nobility, anciently the highest of this nation, now the third. An earl ranks between a marquis and a viscount. The title is so ancient, that its original can scarcely be traced out. This, however, is certain, that among the Saxons they were called ealdormen, quasi elder men, signifying the same with senior or senator among the Romans; and also schiremen, because they had each the civil government of a division or shire. On the irruption of the Danes they changed their names to eorles, which, according to Camden, signified the same in their language. In Latin they are called comites (a title first used in the empire,) from being the king's companions and associates. After the Norman conquest they were for some time called counts, from the French; but they did not long retain that name, though their shires are thence called counties, and their wives countesses, to this day. It is now become a mere title; they have nothing to do with the government of the county; which is now entirely devolved on the sheriff, the earl's deputy, or vicecomes. In writs, commissions, and other formal instruments, the king, when he mentions any peer of the degree of an earl, usually styles him "trusty and well-beloved cousin;" an appellation as ancient as the reign of Henry IV.; who being either by his wife, mother, or sisters, actually related or allied to every earl in the kingdom, artfully acknowledged that connection in all his letters and other public acts: whence the usage has descended to his successors, though the reason has long ago failed. An earl is created by cincture of sword, mantle of state put upon him by the king himself, a cap and a coronet put upon his head, and a charter in his hand.

EARL MARSHAL. See **MARSHAL**.

EARNEST, a part of the price paid in advance to bind parties to the performance of a verbal agreement. The party is then obliged to abide by his bargain, and is not discharged upon forfeiting his earnest, but may be sued for the whole money stipulated, and damages; and by the statute of frauds 29, c. c. 3, no contract for sale of goods not to be delivered immediately to the value of 10l. or more, is valid, unless contract be made by the parties, or those lawfully authorized by them, or earnest is given.

EAR-PICK, an instrument of ivory, silver, or other metal, somewhat in form of a probe, sharp at one end, and hollow at the other, for cleansing the ear.

EAR-RING, in the sea language, is that part of the bolt-rope which at the four corners of the sail is left open, in the shape of a ring. The two uppermost parts are put over the ends of the yard-arms, and so the sail is made fast to the yard; and into the lowermost ear-rings, the sheets and tacks are seized or bent at the clew.

EARSE LANGUAGE. See **GAELIC**.

EARTH, in astronomy, geography, and geology, the globe which we inhabit, being one of the primary planets. See **ASTRONOMY**, **GEOGRAPHY**, and **GEOLOGY**.

EARTH, MOTIONS, REVOLUTIONS, VELOCITY, DENSITY, &c. OF THE. See **ASTRONOMY**.

EARTH, FIGURE OF THE. The ancients had various opinions as to the figure of the earth: some, as Anaximander and Leucippus, held it cylindrical, or in the form of a drum: but the most general opinion was, that it was flat; that the visible horizon was the bounds of the earth, and the ocean the bounds of the horizon; that the heavens and earth above this ocean were the whole visible universe: and that all beneath the ocean was Hades. Of this opinion were some of the Christian fathers, as Lactantius, St. Augustine, &c. Such of the ancients however as understood any thing of astronomy, and especially the doctrine of eclipses, must have been acquainted with the round figure of the earth; as the ancient Babylonian astronomers, who had calculated eclipses long before the time of Alexander, and Thales the Grecian, who predicted an eclipse of the sun. It is now indeed agreed on all hands, that the form of this terraqueous fabric is globular, or very nearly so. See **ASTRONOMY**. The round figure of the earth is evident from the eclipses of the sun and moon; in all of which the earth's shadow always appears circular upon the face of the moon, what way soever it be projected, whether E. W. N. or S.; and howso-

ever its diameter vary, according to the greater or less distance from the earth. The spherical figure of the earth is also evinced from the rising and setting of the sun, moon, and stars; all which happen sooner to those who live to the E. and later to those living to the W. and that more or less so, according to the distance. So also, going or sailing to the N. the north pole and northern stars become more elevated, and the south pole and southern stars more depressed; the elevation northerly increasing equally with the depression southerly; and either of them proportionably to the distance gone. The same thing happens in going to the S. Besides, the oblique ascensions, descensions, emersions, and amplitudes of the rising and setting of the sun and stars in every latitude, are agreeable to the earth's spherical form: all which could not happen if it were of any other figure. The roundness of the earth is further confirmed by its having been often sailed round: the first time was in 1519, when Ferd. Magellan made the tour of the whole globe in 124 days. In 1557 Sir Francis Drake performed the same in 1056 days; in 1586, Sir Thomas Cavendish performed it in 777 days; Simon Cordes, of Rotterdam, in 1590, in 1575 days; in 1598, Oliver Noort, a Hollander, in 1077 days; Van Schouten, in 1615, in 749 days; Jac. Heremites and John Huygens, in 1623, in 802 days; and many others have since performed the same navigation, particularly Anson, Bougainville, and Cook; sometimes sailing round by the E. sometimes by the W. till at length they arrived again in Europe, from whence they set out; and in the course of their voyage, observed that all the phenomena, both of the heavens and the earth, correspond to, and prove this spherical figure. The natural cause of this sphericity of the globe is, according to Sir Isaac Newton, the great principle of attraction, with which the Creator has endued all the matter in the universe; and by which all bodies, and all the parts of bodies, mutually attract one another. This is also the cause of the sphericity of the drops of rain, quicksilver, &c. The inequality of the surface of the earth, by mountains and valleys, is nothing considerable: the highest eminence being scarce proportionably equivalent to the minutest protuberance on the surface of an orange. It differs however, from a perfect sphere, its shape being that of an oblate spheroid, so that the axis from pole to pole is less than the equatorial diameter. What gave the first occasion to the discovery of this figure of the earth, were the observations of some French and English philosophers in the East Indies, and other parts, who found that pendulums, the nearer they came to the equator, performed their vibrations slower: from whence it follows, that the velocity of the descent of bodies by gravity, is less in countries nearer to the equator; and consequently that those parts are farther removed from the centre of the earth, or from the common centre of gravity. See the History of the Royal Academy of Sciences, by Du Hamel; p. 110, 156, 206; and l'Hist. de l'Acad. Roy. 1700 and 1701.—This circumstance put Huygens and Newton upon finding out the cause, which they attributed to the revolution of the earth about its axis. If the earth were in a fluid state, its rotation round its axis would necessarily make it put on such a figure, because the centrifugal force being greatest towards the equator, the fluid would there rise and swell most; and that its figure really should be so now, seems necessary, to keep the sea in the equinoctial regions from overflowing the earth about those parts. See this curious subject well treated by Huygens, in his discourse *De Causa Gravitatis*, p. 154, where he states the ratio of the polar diameter to that of the equator, as 577 to 578. And Newton, in his *Principia*, first published in 1686, demonstrates, from the theory of gravity, that the figure of the earth must be that of an oblate spheroid, generated by the rotation of an ellipse about its shortest diameter, provided all the parts of the earth were of an uniform density throughout; and that the proportion of the polar to the equatorial diameter of the earth, would be that of 689 to 692, or nearly that of 229, to 230, or as .9956522 to one. This proportion of the two diameters was calculated by Newton in the following manner: Having found that the centrifugal force at the equator is one 289th of gravity, he assumes, as an hypothesis, that the axis of the earth is to the diameter of the equator as 100 to 101, and thence determines what must be the centrifugal force at the equator to give the earth such a form; and finds it to be four 505ths of gravity: then, by proportion, if a centrifugal force equal to four 505ths of gravity would make the earth higher at the equator than at the poles by one hundredth of the whole height at the poles,

a centrifugal force that is one 289th of gravity will make it higher by a proportional excess, which by calculation is one 229th of the height at the poles; and thus he discovered, that the diameter at the equator is to the diameter at the poles, or the axis, as 230 to 229. But this computation supposes the earth to be every where of an uniform density; whereas if the earth is more dense near the centre, then bodies at the poles will be more attracted by this additional matter being nearer; and therefore the excess of the semidiameter of the equator, above the semi-axis, will be different. According to this proportion between the two diameters, Newton farther computes, from the different measures of a degree, that the equatorial diameter will exceed the polar by 34 miles and one-fifth. Nevertheless, Messrs. Cassini, both father and son, the one in 1701, and the other in 1713, attempted to prove, in the *Memoirs of the Royal Academy of Sciences*, that the earth was an oblong spheroid: and in 1718 M. Cassini again undertook, from observations, to shew that, on the contrary, the longest diameter passes through the poles; which gave occasion for Mr. John Bernoulli, in his "*Essai d'une Nouvelle Physique Celeste*," printed at Paris in 1735, to triumph over the British philosopher, apprehending that these observations would invalidate what Newton had demonstrated. And in 1720, M. De Mairan advanced arguments supposed to be strengthened by geometrical demonstrations, farther to confirm the assertions of Cassini. But in 1735, two companies of mathematicians were employed, one for a northern, and another for a southern expedition, the result of whose observations and measurement plainly proved that the earth was flattened at the poles. The proportion of the equatorial diameter to the polar, as stated by the gentlemen employed on the northern expedition for measuring a degree of the meridian, is as 1 to 0.9891; by the Spanish mathematicians as 266 to 265, or as 1 to 0.99624; by M. Bouguer as 179 to 178, or as 1 to 0.99441. As to all conclusions, however, deduced from the length of pendulums in different places, it is to be observed, that they proceed upon the supposition of the uniform density of the earth, which is a very improbable circumstance; as justly observed by Dr. Horsley in his letter to Capt. Phipps: "You finish your article, he concludes, relating to the pendulum with saying, 'that these observations give a figure of the earth nearer to Sir Isaac Newton's computation, than any others that have hitherto been made;' and then you state the several figures given, as you imagine, by former observations, and by your own. Now it is very true, that if the meridians be ellipses, or if the figure of the earth be that of a spheroid generated by the revolution of an ellipse, turning on its shorter axis, the particular figure, or the ellipticity of the generating ellipse, which your observations give, is nearer to what Sir Isaac Newton saith it should be, if the globe were homogeneous, than any that can be derived from former observations. But yet it is not what you imagine. Taking the gain of the pendulum in latitude $79^{\circ} 50'$ exactly as you state it, the difference between the equatorial and the polar diameter is about as much less than the Newtonian computation makes it, and the hypothesis of homogeneity would require, as you reckon it, to be greater. The proportion of 212 to 211 should indeed, according to your observations, be the proportion of the force that acts upon the pendulum at the poles, to the force acting upon it at the equator. But this is by no means the same with the proportion of the equatorial diameter to the polar. If the globe were homogeneous, the equatorial diameter would exceed the polar by one 230th of the length of the latter: and the polar force would also exceed the equatorial by the like part. But if the difference between the polar and equatorial force be greater than one 230th, (which may be the case in an heterogeneous globe, and seems to be the case in ours), then the difference of the diameters should, according to theory, be less than one 230th, and vice versa. I confess this is by no means obvious at first sight; so far otherwise, that the mistake, which you have fallen into, was once very general. Many of the best mathematicians were misled by too implicit a reliance upon the authority of Newton, who had certainly confined his investigations to the homogeneous spheroid, and had thought about the heterogeneous only in a loose and general way. The late Mr. Clairault was the first who set the matter right, in his elegant and subtle treatise on the figure of the earth. That work hath now been many years in the hands of mathematicians, among whom I imagine there are none, who have considered the subject attentively, that do not acquiesce in

the author's conclusions. In the second part of that treatise, it is proved, that putting P for the polar force, Π for the equatorial; δ for the true ellipticity of the earth's figure, and ϵ for the ellipticity of the homogeneous spheroid.

$$\frac{P - \Pi}{\Pi} = 2\epsilon - \delta; \text{ therefore } \delta = 2\epsilon - \frac{P - \Pi}{\Pi}$$

and therefore, according to your observation, $\delta = \frac{P - \Pi}{\Pi}$. This is the just conclusion from your observations of the pendulum, taking it for granted, that the meridians are ellipses: which is an hypothesis, upon which all the reasonings of theory have hitherto proceeded. But plausible as it may seem, I must say, that there is much reason from experiment to call it in question. If it were true, the increment of the force which actuates the pendulum, as we approach the poles, should be as the square of the sine of the latitude, or, which is the same thing, the decrement, as we approach the equator, should be as the square of the cosine of the latitude. But whoever takes the pains to compare together such of the observations of the pendulum in different latitudes, as seem to have been made with the greatest care, will find that the increments and decrements do by no means follow these proportions; and in those which I have examined, I find a regularity in the deviation which little resembles the mere error of observation. The unavoidable conclusion is, that the true figure of the meridians is not elliptical. If the meridians are not ellipses, the difference of the diameters may indeed, or it may not, be proportional to the difference between the polar and the equatorial force; but it is quite an uncertainty, what relation subsists between the one quantity and the other; our whole theory, except so far as it relates to the homogeneous spheroid, is built upon false assumptions, and there is no saying what figure of the earth any observations of the pendulum give." Dr. Horsley then lays down the following table, which shews the different results of observations made in different latitudes; in which the first three columns contain the names of the observers, the places of observation, and the latitude of each; the fourth column shews the quantity of $P - \Pi$ in such parts as Π is 100000, as deduced from comparing the length of the pendulum at each place of observation, with the length of the equatorial pendulum as termed by M. Bouguer, upon the supposition that the increments and decrements of force, as the latitude is increased or lowered, observe the proportion which theory assigns. Only the second and the last value of $P - \Pi$ are concluded from comparisons with the pendulum at Greenwich and at London, not at the equator. The fifth column shews the value of δ corresponding to every value of $P - \Pi$, according to Clairaut's theorem:

Observers.	Places.	Lat.	$P - \Pi$	δ
Bouguer.....	Equator.....	0° 0'		
Bouguer.....	Porto Bello.....	9 34	741.8	$\frac{1}{741.8}$
Green.....	Otaheite.....	17 29	563.2	$\frac{1}{563.2}$
Bouguer.....	San Domingo.....	18 27	591.0	$\frac{1}{591.0}$
Abbé de la Caille	Cape of Good Hope	33 55	731.5	$\frac{1}{731.5}$
.....	Paris.....	48 50	585.1	$\frac{1}{585.1}$
The Academicians	Pello.....	66 48	565.9	$\frac{1}{565.9}$
Captain Phipps.....	.....	79 50	471.2	$\frac{1}{471.2}$

"By this table it appears, that the observations in the middle parts of the globe, setting aside the single one at the Cape, are as consistent as could reasonably be expected; and they represent the ellipticity of the earth as about one 340th. But when we come within ten degrees of the equator, it should seem that the force of gravity suddenly becomes much less, and within the like distance of the poles much greater than it could be in such a spheroid." The following problem communicated by Dr. Leatherland to Dr. Pemberton, and published by Mr. Robertson, serves to find the proportion between the axis and the equatorial diameter, from measures of a degree of the meridian in two different latitudes supposing the earth an oblate spheroid. Let $APap$ (Plate LIX. fig. 15) be an ellipse representing a section of the earth through the axis Pp ; the equatorial diameter, or the greater axis of the ellipse, being Aa ; let E and F be two places, where the measure of a degree has been taken; these measures are proportional to the radii of curvature in the ellipse at those places; and if CQ , CR , be conjugates to the diameters whose vertices are E and F , CQ will be to CR in the subtriplicate ratio of the radius of curvature at E to

that at F , by cor. 1, prop. 4, part 6, of Milnes's Conic Sections, and therefore in a given ratio to one another; also the angles QCP , RCP , are the latitudes of E and F : these angles are therefore given, as well as the ratio of CQ to CR . Let QV and RS be drawn parallel to Pp , and QYW to Aa ; then from the property of the ellipse there is given the ratio of $VC^2 - ZC^2$ to $RZ^2 - QV^2$, this ratio being the same with the ratio of CA^2 to CP^2 ; therefore the ratio of CA to CP is given. Hence, if the sine and cosine of the greater latitude be each augmented in the subtriplicate ratio of the measure of the degree in the greater latitude to that in the less, then the difference of the squares of the augmented sine, and the sine of the less latitude, will be to the difference of the squares of the cosine of the less latitude, and the augmented cosine, in the duplicate ratio of the equatorial to the polar diameter. For Cq being taken in CQ equal to CR , and qu drawn parallel to QV , Cu and uq , CZ and ZR , will be the sines and cosines of the respective latitudes to the same radius; and CV , VQ , will be the augmentations of Cu and Cq in the ratio named. Hence, to find the ratio between the two axes of the earth, let E denote the greater, and F the less of the two latitudes, M and N the respective measures taken in each; and

let P denote $\sqrt{\frac{M}{N}}$: then

$$\frac{\cos^2 F - P^2 \times \cos^2 E}{P^2 \times \sin^2 E - \sin^2 F} = \frac{\text{less axis}}{\text{greater axis}}$$

It also appears from the above problem, that when one of the degrees measured is at the equator, the cosine of the latitude of the other being augmented in the subtriplicate ratio of the degrees, the tangent of the latitude will be to the tangent answering to the augmented cosine, in the ratio of the greater axis to the less. For, supposing E the place out of the equator, then, if the semi-circle $Plmnp$ be described, and IC joined, and me drawn parallel to aC : Co is the cosine of the latitude to the radius CP , and CY that cosine augmented in the ratio before named; YQ being to YI , that is, Ce to Cn or CP , as the tangent of the angle YCQ , the latitude of the point E to the tangent of the angle YCI belonging to the augmented cosine. Thus, if M represent the measure in a latitude denoted by E , and N the measure at the equator, let A denote an angle whose measure is

$$\cos. E \times \sqrt{\frac{M}{N}} \text{ Then } \frac{\tan. A}{\tan. E} = \frac{\text{less axis}}{\text{greater axis}}$$

But M , or the length of a degree, obtained by actual mensuration in different latitudes, is known from the following table:

Names.	Latit.	Value of M , toises
Maupertuis, &c.....	66 20	$M = 57438$
Cassini and } {	49 22	$M = 57074$
La Caille } {	45 00	$M = 57050$
Boscovich.....	43 00	$M = 56972$
De la Caille.....	33 18	$M = 57037$
Juan and Ulloa.....	{ at the }	$M = 56768$
Bouguer.....	{ equa- }	$M = 56753$
Condamine.....	{ tor. }	$M = 56749$

Now, by comparing the 1st with each of the following ones; the 2d with each of the following; and in like manner the 3d, 4th, and 5th, with each of the following; there will be obtained 25 results, each shewing the relation of the axes or diameters; the arithmetical means of all of which will give that ratio as 1 to 0.9951989. If the measures of the latitude of $49^\circ 22'$, and of 45° , which fall within the meridian-line drawn through France, and which have been re-examined and corrected since the northern and southern expedition, be compared with those of Maupertuis and his associates in the north, and that of Bouguer at the equator, there will result six different values of the ratio of the two axes; the arithmetical mean of all which is that of 1 to 0.9953467, which may be considered as the ratio of the greater axis to the less; which is as 230 to 228.92974, or 215 to 214, or very near the ratio as assigned by Newton. Now, the magnitude, as well as the figure of the earth, that is, the polar and equatorial diameters, may be deduced from the foregoing problems. For, as half the latus rectum of the greater axis Aa is the radius of curvature at A , it is given in magnitude from the degree measured there, and thence

thence the axes themselves are given. Thus, the circular arc whose length is equal to the radius being $57^{\circ}29'578$ degrees, if this number be multiplied by 56750 toises, the measure of a degree at the equator, as Bouguer has stated it, the product will be the radius of curvature there, or half the *latus rectum* of the greater axis; and this is to half the less axis in the ratio of the less axis to the greater, that is, as 0.9953467 to 1; whence the two axes are 6533820 and 6564366 toises, or 7913 and 7950 English miles; and the differences between the two axes about 37 miles. See Robertson's Navigation, vol. ii. p. 206, &c. Suite des Mem. de l'Acad. 1718, p. 247, and Maclaurin's Fluxions, vol. ii. book 1. chap. 14. And very nearly the same ratio is deduced from the lengths of pendulums vibrating in the same time, in different latitudes; provided it be again allowed, that the meridians are real ellipses, or the earth a true spheroid, which, however, can only take place in the case of an uniform gravity in all parts of the earth. Thus, in the new Petersburg Acts, for 1788 and 1789, are accounts and calculations of experiments relative to this subject, by M. KRAFT. These experiments were made at different times and in various parts of the Russian empire. This gentleman has collected and compared them, and drawn the proper conclusions from them: thus, he infers, that the length x of a pendulum that swings seconds in any given latitude λ , and in a temperature of 10 degrees of Reaumur's thermometer, may be determined by this equation: $x = 439.178 + 2.321 \sin^2 \lambda$, lines of a French foot, or $x = 39.0045 + 0.206 \sin^2 \lambda$, in English inches, in the temperature of 53 of Fahrenheit's thermometer. This expression nearly agrees, not only with all the experiments made on the pendulum in Russia, but also with those of Mr. Graham in England, and those of Mr. Lyons in $79^{\circ} 50'$ north latitude, where he found its length to be 431.38 lines. It also shews the augmentation of gravity from the equator to the parallel of a given latitude λ : for, putting g for the gravity under the equator, G for that under the pole, and y for that under the latitude λ , Mr. KRAFT finds $y = (1 + 0.0052848 \sin^2 \lambda) g$; and therefore $G = 1.0052848 g$. From this proportion of gravity under different latitudes, the same author infers, that, in case the earth is a homogeneous ellipsoid, its oblateness must be one 191, instead of one 230th; which ought to be the result of this hypothesis; but on the supposition, that the earth is a heterogeneous ellipsoid, he finds its oblateness, as deduced from these experiments, to be one 297th; which agrees with that resulting from the measurement of some of the degrees of the meridian. This confirms an observation of M. de la Place, that if the hypothesis of the earth's homogeneity be given up, then the theory, the measurement of degrees of latitude, and experiments with the pendulum, all agree in their result with respect to the oblateness of the earth. See Memoires de l'Acad. 1783, p. 17. In the Philos. Trans. for 1791, p. 236, Mr. DALBY has given some calculations on measured degrees of the meridian, from whence he infers, that those degrees measured in middle latitudes, will answer nearly to an ellipsoid whose axes are in the ratio assigned by Newton, viz. that of 230 to 229. And as to the deviations of some of the others, viz. towards the poles and equator, he thinks they are caused by the errors in the observed celestial arcs.

EARTH, THE MAGNETISM OF THE. The notion of the magnetism of the earth was started by Gilbert; and Boyle supposes magnetic effluvia moved from one pole to the other. Vol. i. p. 285, 290. Dr. Knight also thinks that the earth may be considered as a great loadstone, whose magnetical parts are disposed in a very strong irregular manner; and that the S. pole of the earth is analogous to the N. pole in magnets, that is, the pole by which the magnetical stream enters. He observes, that all the phenomena attending the direction of the needle, in different parts of the earth, in a great measure correspond with what happens to the needle, when placed upon a large terrella; if we make allowances for the different dispositions of the magnetical parts, with respect to each other, and consider the S. pole of the earth as a N. pole with regard to magnetism. See MAGNETISM. See also Dr. Knight's Attempt to demonstrate, that all the phenomena in nature may be explained by Attraction and Repulsion, prop. 87.

EARTH, MAGNITUDE OF THE. See GEOGRAPHY and ASTRONOMY.

EARTH, THE STRUCTURE OF. The substances of which the earth is composed, are neither disposed in a regular series, according to their specific gravities, nor yet thrown together in total disorder, as if by accident or chance. Human industry has hitherto

been able to penetrate but a very little way into the bowels of the earth, and we can but know little of its interior parts. The depth of the earth, from the surface to the centre, is nearly four thousand miles; and yet the deepest mine in Europe, that at Cotteberg, in Hungary, is not more than one thousand yards deep; "the greatest depth, therefore," says an excellent writer, "to which avarice has ever yet penetrated, may be compared to the puncture made in the body of an elephant, by the proboscis of a gnat." See GEOLOGY.

EARTHS, in chemistry, every body which possesses the following properties is so denominated. 1. Insoluble in water, or nearly so; or at least becoming insoluble when combined with carbonic acid. 2. Little or no taste or smell; especially when combined with carbonic acid. 3. Fixed, incombustible, and incapable, while pure of being altered by the fire. 4. A specific gravity not exceeding 4.9. 5. When pure, capable of assuming the form of a white powder. 6. Not altered when heated with combustibles. The earths at present known, are nine in number, namely,

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| 1. Barytes. | 6. Yttria. |
| 2. Strontian. | 7. Glucina. |
| 3. Lime. | 8. Zirconia. |
| 4. Magnesia. | 9. Silica. |
| 5. Alumina. | |

Which see under their respective names. Every one of the above characteristics is not, perhaps, rigorously applicable to each of these bodies; but all of them possess a sufficient number of common properties to render it useful to arrange them under one class. The discoveries which the illustrious professor, Mr. Davy, has lately made respecting the composition of the alkalies, led him to suspect that the earths are similar compounds; and from accurate experiments which he has made, it seems exceedingly probable that the earths are composed of oxygen, and a metallic base.

EARTH NUTS, or GROUND NUTS. See ARACHIS.

EARTH NUTS, or PIG NUTS. See BUNIUM.

EARTH PUCERONS. See PUCERON.

EARTHQUAKE, a sudden and violent concussion of the earth, generally accompanied with strange noises under ground, or in the air; often destroying whole cities at once, throwing down rocks, altering the course of rivers, and producing the most terrible devastations. Though there is hardly any country known, in which shocks of an earthquake have not at some time or other been felt, yet there are some much more subject to them than others. Northern countries, in general, are less subject to earthquakes than those situated near the equator, or in the southern latitudes; but this does not hold universally. The islands of Japan, which are situated pretty far north, are nevertheless exceedingly liable to these dreadful convulsions. Islands, in general, are also more subject to them than continents; but neither does this hold without exceptions. Particular parts of continents, and particular islands, are more subject to them than others lying in the neighbourhood, and differing little from them in external appearance. Portugal is more subject to earthquakes than Spain, and the latter much more than France; Mexico and Peru more than the other countries of America, and Jamaica more than the other Caribbee islands. Earthquakes are frequent, though not often violent, in Italy; but in Sicily they are often terribly destructive. Asia Minor has been remarkably subject to them from the remotest antiquity; and the city of Antioch in particular has suffered more from earthquakes than any other in that country. The same phenomena are said also to occur very frequently in the extremities of Asia, even in very high latitudes. Although no natural phenomenon is more calculated to impress the human mind with terror, and consequently to be well remembered and taken notice of, than an earthquake; yet the philosophy of them is but lately arrived at any degree of perfection; and even at this day, the history of earthquakes is very incomplete. The destruction occasioned by them engrosses the mind too much to admit of philosophical speculations at the time they happen: the same thing prevents the attentive consideration of the alterations, that take place in the atmosphere after the earthquake is over, and which might probably throw some light on the causes which produced it; and the suddenness of its coming on prevents an exact attention to those slight appearances in the earth or air, which, if carefully observed, might serve as warnings to avoid the destruction. From the observations that have been made, however, the following phenomena may be deduced, and reckoned pretty certain. 1. Where there

there are any volcanoes or burning mountains, an earthquake may reasonably be expected more frequently than in other countries. 2. If the volcano has been long quiet, a violent earthquake is to be feared, and vice versa. But to this there are many exceptions. 3. Earthquakes are generally preceded by long droughts; but they do not always come on as soon as the drought ceases. 4. They are also preceded by electrical appearances in the air; such as the *aurora borealis*, falling stars, &c.: but this does not hold universally. 5. A short time before the shock, the sea swells up and makes a great noise: fountains are troubled, and send forth muddy water; and the beasts seem frightened, as if sensible of an approaching calamity. 6. The air at the time of the shock is generally calm and serene; but afterwards commonly becomes obscure and cloudy. 7. The shock comes on with a rumbling noise, sometimes like that of carriages; sometimes a rushing noise like wind, and sometimes explosions like the firing of cannon are heard. Sometimes the ground heaves perpendicularly upwards, and sometimes rolls from side to side. Sometimes the shock begins with a perpendicular heave, after which the other kind of motion commences. A single shock is but of very short duration, the longest scarcely lasting a minute; but they frequently succeed each other at short intervals for a considerable length of time. 8. During the shock, chasms are made in the earth; from which sometimes flames, but oftener great quantities of water, are discharged. Flame and smoke are also emitted from places of the earth where no chasms can be perceived. Sometimes these chasms are but small; but, in violent earthquakes, they are often so large, that whole cities sink down into them at once. 9. The water of the ocean is affected even more than the dry land. The sea swells up to a prodigious height; much more than we could suppose it raised by the mere elevation of its bottom by the shock. Sometimes it is divided to a considerable depth; and great quantities of air, flames, and smoke, are discharged from it. The like irregular agitations happen to the waters of ponds, lakes, and even rivers. 10. The shock is felt at sea as well as on land. Ships are affected by a sudden stroke, as if they had run aground or struck upon a rock. 11. The effects of earthquakes are not confined to one particular district or country, but often extend to very distant regions; though no earthquake has yet been known extensive enough to affect the whole globe at one time. In those places also where the shock is not felt on dry land, the irregular agitation of the waters above-mentioned is perceived very remarkably. All these positions are verified by the account of those earthquakes which has been particularly described by witnesses of the best character. A terrible earthquake happened at Calabria, in 1638, which affords an exception to the second general position above laid down. In Italy, there had been an eruption of Mount Vesuvius five years before; and in Sicily there had been an eruption of *Ætna* only two years before this earthquake. The event, however, plainly shewed, that the cause of the earthquake, whatever it was, had a connection not only with Mount *Ætna*, which lies in the neighbourhood, but also with the volcano of Stromboli, which is 60 miles distant. "On the 24th of March (says Kircher) we lunched in a small boat from the harbour of Messina in Sicily, and arrived the same day at the promontory of Pelorus. Our destination was for the city of Euphemia in Calabria; but on account of the weather, we were obliged to continue three days at Pelorus. At length, wearied with the delay, we resolved to prosecute our voyage; and although the sea seemed more than usually agitated, yet we ventured forward. The gulph of Charybdis, which we approached, seemed whirled round in such a manner as to form a vast hollow, verging to a point in the centre. Proceeding onward, and turning my eyes to Mount *Ætna*, I saw it cast forth large volumes of smoke, of mountainous size, which entirely covered the island, and blotted out even the shores from my view. This, together with the dreadful noise, and the sulphureous stench, which was strongly perceived, filled me with apprehensions that some more dreadful calamity was impending. The sea itself seemed to wear a very unusual appearance; those who have seen a lake in a violent shower of rain all covered over with bubbles, will have some idea of its agitations. My surprise was still increased by the calmness and serenity of the weather; not a breeze, not a cloud, which might be supposed to put all nature thus into motion. I therefore warned my companions, that an earthquake was approaching; and, after some time, making for the shore with all possible diligence, we landed at Tropæa. But we had scarce arrived at

the Jesuits college in that city, when our ears were stunned with a horrid sound, resembling that of an infinite number of chariots driven fiercely forward, the wheels rattling and the thongs cracking. Soon after this, a most dreadful earthquake ensued; so that the whole track upon which we stood seemed to vibrate, as if we were in the scale of a balance that continued waving. This motion, however, soon grew more violent; and being no longer able to keep my legs, I was thrown prostrate upon the ground. After some time, finding that I remained unhurt amidst the general concussion, I resolved to venture for safety; and running as fast as I could, reached the shore. I did not search long here, till I found the boat in which I had landed, and my companions also. Leaving this seat of desolation, we prosecuted our voyage along the coast; and the next day came to Rochetta, where we landed, although the earth still continued in violent agitations. But we were scarce arrived at our inn, when we were once more obliged to return to our boat; and in about half an hour we saw the greatest part of the town, and the inn in which we had set up, dashed to the ground, and burying all its inhabitants beneath its ruins. Proceeding onward in our little vessel, we at length landed at Lopicium, a castle midway between Tropæa and Euphemia, the city to which we were bound. Here, wherever I turned my eyes, nothing but scenes of ruin and horror appeared; towns and castles levelled to the ground; Stromboli, though at 60 miles distance, belching forth flames in an unusual manner, and with a noise which I could distinctly hear. But my attention was quickly turned from more remote to contiguous danger. The rumbling sound of an approaching earthquake, which by this time we were grown acquainted with, alarmed us for the consequences. It every moment seemed to grow louder, and to approach more near. The place on which we stood began to shake most dreadfully; so that, being unable to stand, my companions and I caught hold of whatever shrub grew next us, and supported ourselves in that manner. After some time, the violent paroxysm ceasing, we again stood up, in order to prosecute our voyage to Euphemia, which lay within sight. In the mean time, while we were preparing for this purpose, I turned my eyes toward the city; but could see only a frightfully dark cloud, that seemed to rest upon the place. This the more surprised us, as the weather was so very serene. We waited, therefore, till the cloud was passed; then turning to look for the city, it was totally sunk; and nothing but a dismal and putrid lake was to be seen where it stood." In 1693 an earthquake happened in Sicily, which may justly be accounted one of the most terrible, of which we have any account. It shook the whole island; and even Naples, and Malta shared in the shock. It was impossible for any body in this country to keep on their legs on the tottering earth; nay, those that lay on the ground were tossed from side to side as on a rilling billow: high walls leaped from their foundations several paces, &c. The mischief it did is amazing; almost all the buildings in the countries were thrown down; 54 cities and towns, besides an incredible number of villages, were either destroyed or greatly damaged. Catania, one of the most famous, ancient, and flourishing cities in the kingdom, had the greatest share in the tragedy. Anthony Serrovita, being on his way thither, at the distance of a few miles, observed a black cloud like night hovering over the city; when there arose from the mouth of Mont Gibello great spires of flame, which spread all around. The sea all of a sudden began to roar and rise in billows; and there was a blow, as if all the artillery in the world had been at once discharged. The birds flew about, the cattle ran crying, and the horses stopped short, trembling; so that he and his companions were forced to alight. They were no sooner off, but they were lifted from the ground above two palms; when looking towards Catania, he with amazement saw nothing but a thick cloud of dust in the air. Of that magnificent city, there was not the least footstep to be seen. S. Bonajutus assures us, that of 18,900 inhabitants, 18,000 perished therein. The great earthquake, however, which happened on the 1st of Nov. 1755, affords the clearest example of all the phenomena above-mentioned, having been felt violently in many places both on land and at sea, and extended its effects to the waters in many other places where the shock was not perceived. At Lisbon in Portugal its effects were most severe. In 1750, there had been a sensible trembling of the earth felt in this city: for four years afterwards, there had been an excessive drought; insomuch that some springs, formerly very plentiful of water, were dried, and totally lost. The predominant winds

winds were N. and N. E. accompanied with various, though very small, tremors of the earth. The year 1755 proved very wet and rainy: the summer cooler than usual; and for 40 days before the earthquake, the weather was clear, but not remarkably so. The 31st of October, the sun was obscured, with a remarkable gloominess in the atmosphere. On the 1st of Nov. early in the morning, a thick fog arose, which was soon dissipated by the heat of the sun; no wind was stirring; the sea was calm; and the weather was as warm as in June or July in Britain. At 35 minutes after 9, without the least warning, except a rumbling noise, like the artificial thunder in our theatres, a most dreadful earthquake shook, by quick but short vibrations, the foundations of all the city, so that many buildings instantly fell. Then, with a pause scarce perceptible, the nature of the motion was changed, and the houses were tossed from side to side, with a motion like that of a waggon violently driven over rough stones. This second shock laid almost the whole city in ruins, with a prodigious slaughter of the people. The earthquake lasted in all about six minutes. At the moment of its beginning, some persons on the river, near a mile from the city, heard their boat make a noise as if it had run aground, though they were then in deep water; and at the same time they saw the houses falling on both sides of the river. The bed of the river Tagus was in many places raised to its surface. Ships were driven from their anchors, and jostled together with great violence; nor did their masters know whether they were afloat or aground. A large new quay sunk to an unfathomable depth, with several hundreds of people upon it; nor was one of the dead ever found. The bar was at first seen dry from shore to shore: but suddenly the sea came rolling in like a mountain; and about Belem Castle the water rose fifty feet almost in an instant. About noon there was another shock; when the walls of several houses that yet remained opened from top to bottom more than a quarter of a yard, and afterwards closed again so exactly that scarce any mark of the injury was left. The number of people who perished in this dreadful catastrophe is said, according to the lowest calculation, to amount to more than sixty thousand; and though the damage in other respects cannot be computed, yet some idea may be formed of it, when we consider, that this extensive and opulent city was so reduced as to present nothing but a vast heap of ruins; that the rich and poor were put upon a level; some thousands of families which, the day before had been easy in their circumstances, were now scattered about in the fields, wanting every convenience of life, and finding none able to relieve them. This was not the only place at which the shock was experienced. This earthquake was very general. St. Ube's, a sea-port near Lisbon, was entirely swallowed up, by the repeated shocks and the vast surf of the sea. The same earthquake was felt over all Spain, except in Catalonia, Arragon, and Valencia. In many places the sea was agitated in an unusual manner rising six feet every fifteen minutes, and then falling so as sometimes to leave the bottom dry. The earthquake was felt almost as severely in Africa as it had been in Europe. Great part of Algiers was destroyed. At Arzila (a town in Fez), 10 A.M. the sea suddenly rose with such impetuosity, that it lifted up a vessel in the bay, and dropped it with such force on the land, that it was broke to pieces; and a boat was found two musket shot within land from the sea. At Fez and Mequinez, great numbers of houses fell, and multitudes of people were buried in the ruins. At Morocco, by the falling of houses many people lost their lives: and about eight leagues from the city the earth opened and swallowed up a village with all the inhabitants, who were known by the name of the Sons of Besumba, to the number of about eight or ten thousand persons, together with all their cattle, &c. and soon after the earth closed again in the same manner as before. In the city of Funchal, in the island of Madeira, a shock of this earthquake was first perceived at 38 minutes past 9 A. M. It commenced with a rumbling noise in the air, like that of empty carriages passing hastily over a stone pavement. The observers felt the floor immediately after move with a tremulous motion, vibrating very quickly. The shock continued more than a minute; during which space, the vibrations, though continual, were weakened and increased in force twice very sensibly. The increase after the first remission of the shock was the most intense. The noise in the air accompanied the shock during the whole of its continuance, and lasted some seconds after the motion of the earth had ceased; dying away like a peal of distant thunder rolling through the air. At three quarters past eleven, the sea, which was quite calm, it being a fine

day, and no wind stirring, retired suddenly some paces; then rising with a great swell without the least noise, and as suddenly advancing overflowed the shore, and entered the city. It rose 15 feet perpendicular above the high water mark, although the tide, which flows there 7 feet, was then at half ebb. Such were the phenomena with which this remarkable earthquake was attended in those places where it was violent. The effects of it, however, reached to an immense distance; and were perceived chiefly by the agitations of the waters, or some slight motion of the earth. The utmost boundaries of this earthquake to the south are unknown; the barbarity of the African nations rendering it impossible to procure any intelligence from them, except where the effects were dreadful. On the north, however, we are assured that it reached as far as Norway and Sweden. In the former, the waters of several rivers and lakes were violently agitated. In the latter, shocks were felt in several provinces, and all the rivers and lakes were strongly agitated, especially in Dalecarlia. The river Dala suddenly overflowed its banks, and as suddenly retired. At the same time a lake three miles distant, which had no communication with it, bubbled up with great violence. At Fahlum, a town in Dalecarlia, several strong shocks were felt. Shocks of this great earthquake were felt in several places of France; particularly at Bayonne, Bourdeaux, and Lyons: and commotions of the waters were observed at Angoulesme, Bleville, Havre de Grace, &c. In many places of Germany its effects were very perceptible. Throughout the duchy of Holstein, the waters were violently agitated, particularly those of the Elbe and Trave. In Brandenburg, the water of a lake, called Libsec, ebbed and flowed six times in half an hour, with a dreadful noise, the weather being then perfectly calm. The same agitation was observed in the waters of the lakes called Muplgast and Netzo; but at this last place they also emitted an intolerable stench. In Holland the agitations were more remarkable. At Amsterdam, about 11 A. M. the air being perfectly calm, the waters were suddenly agitated in their canals, so that several boats broke loose; chandeliers were observed to vibrate in the churches; but no motion of the earth, or concussion of any building, was observed. At Haerlem, in the forenoon, for near four minutes together, not only the water in the rivers, canals, &c. but also all kinds of fluids in smaller quantities, as in coolers, tubs, backs, &c. were surprisingly agitated, and dashed over the sides, though no motion was perceptible in the vessels themselves. Round the island of Corsica, the sea was violently agitated, and most of the rivers of the island overflowed their banks. In the city of Milan, and throughout the Milanese, shocks were felt. At Turin there was felt a very violent shock. In Switzerland, many rivers turned suddenly muddy without rain. The lake of Neufchatel swelled near two feet above its natural level for a few hours. An agitation was also perceived in the water of the lake of Zurich. At the island of Antigua, there was such a sea without the bar as had not been known in the memory of man; and after it, all the water at the wharfs, which used to be six feet deep, was not two inches. At Barbadoes, about 2 P.M. the sea ebbed and flowed in a surprising manner; ran over the wharfs and streets into the houses, and continued thus ebbing and flowing till ten at night. The agitation of the waters was perceived in great numbers of places in Great Britain. At Barlborough in Derbyshire, between 11 and 12 A. M. in a boat-house on the W. side of a large body of water called Pibley dam, was heard a surprising and terrible noise; a large swell of water came in a current from the S. and rose two feet on the sloped damhead at the N. end of the water. It then subsided; but returned immediately, though with less violence. The water was thus agitated for three quarters of an hour; growing gradually weaker and weaker every time, till it entirely ceased. At Bushbridge in Surrey, at half an hour after ten in the morning, the weather being remarkably still, without the least wind, in a canal near 700 feet long, and 58 feet broad, with a small spring constantly running through it, a very unusual noise was heard at the E. end, and the water there observed to be in great agitation. It rose in a heap in the middle, between two and three feet above its usual level, and extending lengthways about 30 yards. After this, the heap vibrated towards the N. side of the canal with great force, and flowed above eight feet over the grass walk on that side. On its return back into the canal, it again rose in the middle, and then heeled with yet greater force to the south side, and flowed over its grass walk. During this latter motion, the bottom on the north side was left dry for several feet.

This appearance lasted for about a quarter of an hour, after which the water became smooth and quiet as before. During the whole time, the sand at the bottom was thrown up and mixed with water; and there was a continual noise like that of water turning a mill. At Cobham, in Surrey, between ten and eleven o'clock, while a man was watering a horse at a pond fed by springs, the water suddenly ran away from him, and moved toward the south, with such swiftness, that the bottom of the pond was left bare. It returned again with such impetuosity, that the man leaped backwards to secure himself from its sudden approach. The ducks were alarmed at the first agitation, and instantly flew all out of the pond. At Dunstall, in Suffolk, the water of a pond rose gradually for several minutes in the form of a pyramid, and fell down like a water-spout. Other ponds in the neighbourhood had a smooth flux and reflux from one end to the other, and in several other parts of the kingdom effects equally surprising were observed. At Loch Lomond, in Scotland, about half an hour after 9 A. M. all of a sudden, without the least gust of wind, the water rose against its banks with great rapidity, but immediately subsided, till it was as low as any person then present had ever seen it in the greatest summer drought. Instantly it returned towards the sides, and in five minutes rose again as high as before. The agitation continued at the same rate till 15 minutes after 10 A. M. taking 5 minutes to rise, and as many to subside. From 15 minutes after 10 till 11 the height of every rise came somewhat short of that immediately preceding, still taking 5 minutes to flow, and as many to ebb, till the water was entirely settled. The greatest perpendicular height of this swell was two feet four inches. A still more remarkable phenomenon attending the earthquake in this lake was, that a large stone lying at some distance from shore, but in such shallow water that it could easily be seen, was forced out of its place in the lake upon dry land, leaving a deep furrow in the ground all along the way in which it had moved. In Loch-Ness, about half an hour after nine, a very great agitation was observed in the water. At Kinsale, in Ireland, between 2 and 5 P. M. the weather being very calm, and the tide near full, a large body of water poured suddenly into the harbour with such rapidity, that it broke the cables of two sloops, each moored with two anchors, and of several boats lying near the town. But just at the time that a great deal of mischief was apprehended by all the vessels running foul of each other, an eddy whirled them round several times, and then hurried them back again with the same rapidity as before. This was several times repeated; and while the current rushed up at one side of the harbour, it poured down with equal violence at the other. A vessel that lay all this time in the pool did not seem to be any ways affected by it; nor was the violence of the currents much perceived in the deeper parts of the harbour, but raged with most violence on the flats. From different accounts it appeared that the water was affected in a similar manner all along the coast of Ireland, west of Kinsale. These are the most striking phenomena with which the earthquake of Nov. 1, 1755, was attended on the surface of the earth. Those which happened below ground cannot be known but by the changes observed in springs, &c. which were in many places very remarkable. At Colares, on the afternoon of the 31st Oct. the water of a fountain was greatly decreased: on the morning of the 1st of Nov. it ran very muddy; and, after the earthquake, returned to its usual state both as to quantity and clearness. On the hills numbers of rocks were split; and there were several rents in the ground, but none considerable. In some places where formerly there had been no water, springs burst forth, which continued to run. Some of the largest mountains in Portugal were impetuously shaken as it were from their foundation; most of them opened at their summits, split and rent in a wonderful manner, and huge masses of them were thrown down into the subjacent valleys. From the rock Alvidar, near the hill Fojo, a kind of parapet was broken off, which was thrown up from its foundation in the sea. At Varge, on the river Macaas, during the earthquake, many springs of water burst forth, some spouted up, eighteen or twenty feet, throwing up sand of various colours, which remained on the ground. A mountainous point, seven or eight leagues from St. Ube's, cleft asunder, and threw off several vast masses of rock. In Barbary, a large hill was rent in two; the two halves fell different ways, and buried two large towns. A remarkable change was observed on the medicinal waters of Troplitz, a village in Bohemia famous for its baths. These waters were discovered in 1762;

from which time the principal spring of them had constantly thrown out hot water in the same quantity, and of the same quality. On the morning of the earthquake, between 11 and 12 A. M. the principal spring cast forth such a quantity of water, that in half an hour all the baths ran over. About half an hour before this, the spring had flowed turbid and muddy; then having stopped entirely for a minute, it broke forth again with prodigious violence, driving before it a considerable quantity of reddish ochre. After this it became clear, and flowed as pure as before. It still continues to do so; but the water is in greater quantity, and hotter, than before the earthquake. At Angoulesme in France, a subterraneous noise like thunder was heard; and presently after the earth opened, and discharged a torrent of water mixed with red sand. Most of the springs in the neighbourhood sunk in such a manner, that for some time they were thought to be quite dry. In Britain, no considerable alteration was observed in the earth, except that, near the lead mine in Derbyshire, a cleft was observed about a foot deep, six inches wide, and 150 yards in length. The earthquakes, which in 1783 ruined a great part of Italy and Sicily, though much more confined in their extent, than that of 1755, seem to have been not at all inferior in violence. Sir William Hamilton, who wrote a particular account of their effects, informs us, that "if, on a map of Italy, and with your compass on the scale of Italian miles you measure off 22, and then fixing the central point in the city of Oppido, form a circle (the radii of which will be 22 miles, you will include all the towns, villages, &c. that have been utterly ruined, and the spots where the greatest mortality happened, and where there have been the most visible alterations on the face of the earth: then extend your compass on the same scale to 72 miles, preserving the same centre, and form another circle, you will include the whole country that has any mark of having been affected by the earthquake." A circumstance was remarked, in which this earthquake differed from others, viz. that of two towns situated at an equal distance from this centre, one on the hill, the other on the plain or in a bottom, the latter always suffered most. From the most authentic accounts received by the king of Sicily's secretary of state, it appeared that the part of Calabria which had been most affected by this calamity, was comprehended between 38° and 39° of lat. N. that the greatest force of the earthquake had been exerted from the foot of those mountains of the Apennines called Dijo, Sacro, and Caulene, extending W. to the Tyrrhene sea; that the towns, villages, and farm-houses, nearest these mountains, situated either on the hills or the plain, were totally ruined by the shock of the 5th Feb. about noon: that even the more distant towns had been greatly damaged by the subsequent shocks of the earthquakes, and effectually by those of the 7th, 26th, and 28th of Feb. and that of the 1st of March; that from the first shock of the 5th of Feb. the earth had been in a continual tremor; and that the motion of the earth had been either whirling like a vortex, horizontal, or by pulsations, or by beatings from the bottom upwards. This variety of motions increased the apprehensions of the miserable inhabitants, who expected every moment that the earth would open under their feet, and swallow them up. These phenomena had been attended with irregular and furious gusts of wind; and from all these causes, the face of that part of Calabria, comprehended between the 38° and 39° was entirely altered. The number of lives lost was estimated at 32,367; but Sir William Hamilton is of opinion, that, including strangers, it could not be less than 40,000. The fate of the inhabitants of Scilla was extremely affecting. On the first shock of the earthquake, Feb. 5th, they had fled along with their prince to the sea-shore, where they hoped for safety; but in the night a furious wave overflowed the land for three miles, sweeping off in its return the prince and 2473 of the inhabitants, who were at that time either on the strand, or in boats near the shore. Various theories have been invented to explain the phenomena of earthquakes. Till lately, the hypotheses of modern philosophers were much the same with those of the ancients. Anaxagoras supposed the cause of earthquakes to be subterraneous clouds bursting out into lightning, which shook the vaults that confined them. Others imagined, that the arches, which had been weakened by continual subterraneous fires, at length fell in. Others derived these double convulsions from the rarefied steam of waters, heated by some neighbouring fires, (a hypothesis lately revived by M. Dolomieu,) and some, among whom was Epicurus, and several of the Peripatetics, ascribed them to the ignition of certain inflammable

ble exhalations. This last hypothesis has been adopted by many of the most celebrated moderns, as Gassendus, Kircher, Schottus, Varenus, Des Cartes, Du Hamel, Honorius, Fabri, &c. The philosopher last mentioned, indeed supposed, that waters prodigiously rarefied by heat, might sometimes occasion earthquakes. The others supposed, that there are many and vast cavities under ground, which have a communication with one another: some of which abound with waters; others with vapours and exhalations, arising from inflammable substances, as nitre, bitumen, sulphur, &c. These combustible exhalations they supposed to be kindled by a subterraneous spark, or by some active flame gliding through a narrow fissure from without, or by the fermentation of some mixture; and when this happens, that they may necessarily produce pulses, tremors, and ruptures at the surface, according to the number and diversity of the cavities, and the quantity and activity of the inflammable matter. This hypothesis they illustrated by a variety of experiments, such as mixtures of iron filings and brimstone buried in the earth, gun-powder confined in pits, &c. by all which a shaking of the earth will be produced. Dr. Woodward suggests another hypothesis. He supposes that the subterraneous heat or fire, which is continually elevating water out of the abyss, which, according to him, occupies the centre of the earth, to furnish rain, dew, springs, and rivers, may be stopped in some particular part. When this obstruction happens, the heat causes a great swelling and commotion in the waters of the abyss; and at the same time, making the like effort against the superincumbent earth, that agitation and concussion of it is occasioned, which we call an earthquake. M. Amontons suggests a hypothesis entirely different from all these. According to the philosophical principles, which suppose the atmosphere to be about 45 miles high, and that the density of the air increases in proportion to the absolute height of the superincumbent column of fluid; it is shewn, that at the depth of 43,528 fathoms below the surface of the earth, air is but one-fourth lighter than mercury. Now, this depth of 43,528 fathoms is only a 74th part of the semi-diameter of the earth; and the vast sphere beyond this depth, in diameter 6,451,538 fathoms, may probably be only filled with air; which will be here greatly condensed, and much heavier than the heaviest bodies we know in nature. But it is found by experiment, that the more air is compressed, the more does the same degree of heat increase its spring, and the more capable does it render it of a violent effect; and that, for instance, the degree of heat of boiling water increases the spring of the air above what it has in its natural state, in our climate, by a quantity equal to a third of the weight wherewith it is pressed. Whence we may conclude, that a degree of heat, which on the surface of the earth will only have a moderate effect, may be capable of a very violent one below. And, as we are certain, that there are in nature, degrees of heat much greater than that of boiling water, it is possible there may be some, whose violence, further increased by the immense weight of the air, may be sufficient to break and overturn this solid orb of 43,528 fathoms; whose weight, compared to that of the included air, would be but a trifle. Though none of these hypotheses were sufficient for explaining the phenomena of earthquakes in a satisfactory manner, one or other of them continued to be adopted by almost all philosophers till 1749. In March 1749, an earthquake was felt at London and several other places in Britain. Dr. Stukely, who had been much engaged in electrical experiments, began to suspect, that phenomena of this kind ought to be attributed not to vapours or fermentations generated in the bowels of the earth, but to electricity. In a paper published by him on this subject, he rejects all the above hypotheses for the following reasons:—1. That there is no evidence of any remarkable cavernous structure of the earth; but that, on the contrary, there is reason to presume, that it is in a great measure solid, so as to leave little room for internal changes and fermentations within its substance; nor do coal-pits, when on fire, ever produce any thing resembling an earthquake. 2. In the earthquake at London, in March 1749, there was no such thing as fire, vapour, smoke, smell, or an eruption of any kind observed, though the shock affected a circuit of 30 miles in diameter. This consideration alone of the extent of surface shaken by an earthquake, he thought sufficient to overthrow the supposition of its being owing to the expansion of any subterraneous vapours. For, as small fire balls bursting in the air propagate a sulphureous smell to the distance of several miles, it cannot be supposed, that so im-

mense a force, acting instantaneously, on that compass of ground, should never break the surface of it, nor become discoverable either to the sight or the smell, besides that such fermentation would require a long time. That such an effect, therefore, should be produced instantaneously, can be accounted for by electricity only, which acknowledges no sensible transition of time, nor any bounds. 3. If vapours and subterraneous fermentations, explosions, and eruptions, were the cause of earthquakes, they would absolutely ruin the whole system of springs and fountains, wherever they had once been: which is contrary to fact; even when they have been frequently repeated. In the earthquake in Asia Minor, A. D. 17, which destroyed 13 great cities, and shook a mass of earth 300 miles in diameter, nothing suffered but the cities; neither the springs nor the face of the country being injured. 4. That any subterraneous power, sufficient to move 30 miles in diameter, must be lodged at least 15 or 20 miles below the surface; and therefore must move an inverted cone of solid earth, the base of which is 30 miles in diameter, and the axis 15 or 20; an effect impossible to any natural power whatever, except electricity. So in Asia Minor, such a cone must have been 300 miles in the diameter of the base, and 200 in the axis; which not all the gunpowder that has been made since the invention of it, much less any vapours generated so far below the surface, could possibly effect. 3. A subterraneous explosion will not account for the manner in which ships, far from land, and even fish, are affected during an earthquake. A subterraneous explosion would only produce a gradual swell, and not give so quick an impulse to the water as would make it feel like a stone. From these circumstances the Doctor concluded, that an earthquake was a shock of the same kind as those in electrical experiments. And this hypothesis was confirmed by the phenomena attending earthquakes; particularly those of 1749 and 1750, which gave rise to his publication. From these phenomena, he inferred, that if a non-electric cloud discharge its contents upon any part of the earth, in a highly electrical state, an earthquake must necessarily ensue. As the discharge from an excited tube produces a commotion in the human body, so the discharge of electric matter from many miles of solid earth must needs be an earthquake; and the snap from the contact, the horrid uncouth noise attending it. Dr. Stukely does not attempt to account for the manner in which the earth and air are put into a state of electricity proper for this purpose. The same hypothesis was advanced by Signior Beccaria, without knowing any thing of Dr. Stukely's discoveries. But this learned Italian imagined the electric matter to be lodged deep in the bowels of the earth, agreeably to his hypothesis concerning lightning. Now, as the quantity of electric matter in the simplest thunder-storms is so inconceivably great, that it is impossible to be contained by any cloud or number of clouds; and as, during the progress of a thunder-storm which he observed, though the lightning frequently struck to the earth, the same clouds were the next moment ready to make a still greater discharge; it was evident, that they must have received at one place, the moment a discharge was made from them in another. Let us suppose these clouds ever so great, if the lightning proceeded only from them, the quantity must be lessened by every discharge; and no recruits, that any new clouds might bring, can bear any proportion to the discharge which must ensue, from the collision of so great a number as combine to form a thunder-storm. It seems therefore most likely, that the electric matter is continually darting from the clouds in one place, while it is discharged from the earth in another; and, consequently, that the clouds serve as conductors of the electric fluid from those places of the earth which are overloaded with it, to those which are exhausted. This theory being admitted, he thinks earthquakes may be ascribed to the same cause. For if the equilibrium of the electric matter be lost in the bowels of the earth; so that the best method of restoring it shall be by the fluid bursting into the air, and traversing several miles of the atmosphere, to come at the place where it is wanted; it may be easily imagined, that violent concussions will be given to the earth by the sudden passage of so powerful an agent. This, he says, was confirmed by the flashes of light, resembling lightning, which have been frequently seen to rush from the top of Mount Vesuvius, when ashes, &c. have been carried out of it into the air, and scattered over a large tract of country. And it is well known that volcanoes have a near connection with earthquakes. Dr. Priestley, in his History of Electricity, observes upon these theories, that a

more probable hypothesis may be formed out of them both. "Suppose (says he) the electric matter to be accumulated in one part of the surface of the earth, and on account of the dryness of the season cannot easily diffuse itself; it may force its way into the higher regions of the air, forming clouds in its passage out of the vapours which float in the atmosphere, and occasion a sudden shower, which may further promote the passage of the fluid. The whole surface, thus unloaded, will receive a concussion, like any other conducting substance, on parting with, or receiving a quantity of the electric fluid. The rushing noise will likewise sweep over the whole extent of the country. And upon this supposition also the fluid in its discharge from the country, will naturally follow the course of the rivers, and also take the advantage of any eminences to facilitate its ascent into the higher regions of the air." The three last hypotheses, though somewhat differing, yet agree in the main; but if a particular solution of the phenomena is required, every one of them will be found deficient. The editors of the *Encyclopædia Britannica*, urge the following objections to them, and offer a much more plausible theory, a part of which we shall here quote. "If, according to Dr. Stukely's hypothesis, the electric matter is lodged only on the surface of the earth, or but a small depth below, how are we to account for those violent effects which often take place in the bowels of the earth? In the earthquake at Lisbon, a large quay sunk to any unfathomable depth. We are certain that the cause of the earthquake must have been below this depth, however great it was, and have opened the earth for an immense way downwards. At the same time a hill in Barbary clave asunder, and the two halves of it fell different ways. This shews, that the cause of the earthquake operated not on the surface of the hill, but on the solid foundation and contents of it; nor can it be explained by any superficial action whatever. From what the miners at Eyam bridge in Derbyshire observed, it is also evident, that the shock was felt at the depth of 396 feet below the surface of the ground, more than at the surface itself; and consequently there is all the reason in the world to think, that the cause lay at a depth vastly greater. Again, though the earthquake at London was supposed to begin with a black cloud and shower; yet in that of 1755, the effects of which were incomparably greater, the air was calm and serene almost in every place where it was felt. It does not appear, that there is at any time a considerable difference between the electricity of the atmosphere and that of the earth, or indeed that there can be so. For if the earth is electrified plus, and the atmosphere minus, there are innumerable points on the surface of the earth, which must be imperceptibly drawing off the superfluous electric matter into the air. The vapours also, with which the atmosphere abounds, would always be ready in the same service: and thus thunder and lightning might indeed sometimes be produced, but not earthquakes. But lastly neither the air nor the earth do always shew any remarkable signs of electricity before earthquakes happen. For, the summer before the earthquake at Manchester in 1777, there had scarce been any thunder, lightning, or other signs of electricity in the atmosphere, and vegetation had been extremely backward; and, according to the best accounts, the weather continued remarkably fine. For these reasons, Dr. Stukely's hypothesis seems not to be satisfactory. That of Signior Beccaria is not indeed liable to the above-mentioned objections; but seems highly improbable on another account. The atmosphere is known to be a substance through which the electric matter makes its way with the utmost difficulty. It is a vastly worse conductor than water or than moist earth. If therefore the equilibrium of this fluid is lost in the bowels of the earth, it is impossible to give a reason, why it should not rather go to the places where it is wanted through the earth itself, than through the atmosphere. Besides, if this were the case, the shock of an earthquake could only be felt at those places where the electric fluid issued from the earth, and where it entered. All the intermediate places, ought to be free from any shock, and to be sensible only of a violent concussion in the atmosphere; but of this we have no example in any history of earthquakes whatever. Dr. Priestley's hypothesis is liable to the same objections with that of Dr. Stukely; for any superficial operation will never account for those effects above-mentioned, which take place at great depths below the surface. His experiment cannot be admitted as any way conclusive with regard to the cause of earthquakes, because no quantity of electric fire is seen to pass over the earth and sea, like the flash attending the explosion of an electric battery; and the force of his

earthquake (being but just able to throw down a stick that could hardly stand by itself) seems by far too little. To give an explanation of the phenomena of earthquakes, which shall be free from the objections above-mentioned, and from all others, it will be necessary in the first place, to consider those parts of the system of nature, which seem to be most affected during the terrible phenomena we treat of. These are, the air, the solid earth, and the water. Of these the two former are electrics per se; the latter is a conductor, though a bad one. (See *ELECTRICITY*.) Hence it follows, 1. That in proportion to the quantity of earth which is mixed with any quantity of water, that mixture will approach nearer to the nature of an electric per se, and vice versa. 2. That whatever quantity of electricity is communicated to the solid earth, will be quickly taken off from it by the water which is mixed with it, in the same manner that the electric matter is carried off from an excited globe by a metallic conductor. 3. The whole earth is moist, and therefore in some degree a conductor. Nevertheless, as earth of all kinds, when perfectly dry, is found to be an electric capable of receiving a charge like glass, it is therefore possible, that the electric power of the earth may be excited to such a degree, that the moisture of the solid parts cannot easily contain the quantity of electricity communicated. 4. In this case, the earth must either give undoubted signs of its being excited in the same manner that other excited electrics are, or the electricity must be discharged somewhere else. 5. To receive any superfluous quantity of electric matter, that may be communicated to the solid earth, the waters of the ocean are always ready. These, being a much better conductor than earth, must be a principal mean of preserving the equilibrium of electricity in the different parts of the earth; and hence we see a natural reason why the waters of the ocean should cover so large a proportion of the globe, as they are known to do. See *OCEAN*. 6. Fire is also a conductor of electricity. Therefore, wherever a quantity of electric matter is collected in any part of the solid earth, if it can neither be conveniently received by the moisture which the earth naturally contains, nor by the ocean in its neighbourhood, it will discharge itself by any volcano that happens to be in an active state near the place where that collection of electric matter is. 7. The electric fluid being violently resisted by the superincumbent atmosphere, has always a tendency to discharge itself in those places where that resistance is least. The tops of high mountains, therefore, where the weight of the atmosphere is greatly diminished, will also afford a ready passage for the electric fluid, when it is collected in very great quantity in the bowels of the earth. 8. If, from some natural causes, the electric matter shall happen to be collected in the bowels of the earth in any particular place, and at the same time such obstacles are thrown in its way, that it can neither discharge itself into the ocean, nor into the atmosphere by the tops of high mountains, nor by the more open passages of volcanoes; the most terrible consequences must ensue: the matter being pent up, and the cause by which it is collected continuing still to act, its impulse becomes at last irresistible. It then flies against every obstacle with inconceivable violence. It breaks out in all those places where there is the least resistance, and therefore the shock is directed a great number of different ways at once. Houses, steeples, trees, &c. by their height take off somewhat of the pressure of the atmosphere; and therefore the electric matter flies against them very violently. The houses and other buildings being bad conductors, are thrown down; the trees affording a readier passage to the fluid are not hurt, though even they also are sometimes split. The height of the mountains renders them the objects of the destructive force of this fluid much more than any buildings whatever. Hence they are often rent, and rocks thrown from them. The water contained in the solid parts of the earth, being a conductor of electricity, becomes overloaded with it; and when it can receive no more, is forced to yield to the impulse of the rest, and therefore is thrown out of the earth in great quantities. For the same reason, the waters on the surface of the earth are most violently agitated. The small quantities contained in wells are thrown out at the tops of them: the rivers and lakes, which contain too great a quantity of water to be thrown off from the earth, rise in billows: the ocean itself, receiving more electric matter than can be immediately dispersed through the whole body of water, or evaporated into the atmosphere, retreats from the land, and is raised in vast mountains. The solid earth being unable either to conduct the fluid quietly to those parts where it is wanted, or to

retain it, is violently shaken or rent in multitudes of places; and this not only on the surface, but to great depths. The electricity being now in some measure discharged from the earth, the ocean rushes forward with fury to discharge in its turn the excess of electric matter it just before received from the earth. If there are volcanoes in the neighbourhood, the violent discharge of electricity manifests itself by setting them in a flame; and thus, till the equilibrium is restored all nature seems to be threatened with dissolution.—Even in those places where the force of the electric fluid is not able to shake the solid parts of the earth, it manifests its power by agitating the waters in the manner above described. Water being a much better conductor of electricity than earth, this subtle fluid, as soon as it can get out from the solid earth, flies to the water. The consequence is, that the water immediately swells up, and is attracted by whatever part of the earth has less electricity than itself. Hence those strange irregular motions of the waters in different places, so particularly observed at the time of the earthquake at Lisbon; and which it seems impossible to account for from any other cause than an immediate discharge of electric matter from the earth into them. 9. As it is impossible that any part of the earth can be electrified, without communicating a proportionable share of electricity to the animals that live upon it, it thence follows, that there can be no considerable commotion in the electric matter lodged in the bowels of the earth, without affecting that which is contained in the bodies of the animals. Hence the brutes, who seem to be more sensible of such commotions than we, run about, and shew signs of fear, before the earthquake comes on; and hence the giddiness, sickness, &c. which the human race are subject to, during the time of the shock, even though they do not feel it, as was the case at Gibraltar. 10. As the atmosphere hath a communication with the earth, it is scarcely to be supposed that the earth can, for any length of time, contain a considerable quantity of electric matter, without communicating to the atmosphere a proportionable quantity. Before an earthquake, therefore, we must suppose the electricity of the earth and air to be in perfect equilibrium. Hence the weather is serene, there is no wind, nor any other sign in the atmosphere, of the terrible catastrophe that is about to ensue. But the moment the discharge is made from the earth, the equilibrium between terrestrial and atmospheric electricity is broken; the air either begins to receive the fluid from the earth, or the earth from the air. As there is not then time for the collection of thunder clouds by which the electricity may be brought down in sudden flashes of lightning, the fluid breaks through the substance of the air itself with dismal and horrid noises, which always accompany an earthquake. That this is the case, seems highly probable from an experiment of M. de Romas, when, having brought down a vast quantity of electric matter from the clouds by means of a kite, he heard the noise it made in the air, like the continual blowing of a small forge bellows. In general, a considerable change of weather takes place at the time of an earthquake, though not always. In the earthquake which happened in England in 1777, there was no remarkable change of weather there; but, soon after, there was a great deal of thunder and lightning in the southern parts of Scotland: which seems to indicate, that the electric fluid discharged from the earth in England had taken its course northward, and produced the phenomena before mentioned in Scotland. The same observation may likewise be made with regard to 1789, when there were slight shocks of an earthquake both in England and Scotland. That in England was followed by an uncommon frequency of thunder and lightning in the southern parts of Scotland; by the progress of the electric matter northward after it was discharged into the atmosphere: but the shocks which happened in the northern part of Scotland (viz. about Crief and Comrie in Perthshire) were not followed by thunder to the southward; because the electric matter, though discharged into the atmosphere, cannot return to the south without first going north, and rising up into the higher regions." The Encyclopædists, however, acknowledge that, "in the earthquakes in Calabria in 1783, there were some circumstances which seem to militate against this theory. The most remarkable of these is their attacking the places situated on the plain, much more than those which stood on the higher grounds. In a memoir on this earthquake by M. Dolomieu, that author endeavours to exclude electricity from having any share in the matter: and ascribes the whole phenomena to steam occasioned by the rains of 1782—3, accumulated in caverns under Calabria, and heated by the fires of Etna. But not to mention other evi-

dences, a single circumstance, which M. Dolomieu himself mentions, is a sufficient proof of electricity being concerned; and that is the presentiment which animals had of its approach. "The presentiment of animals (says he) at the approach of earthquakes, is a singular phenomenon, and which cannot fail to surprise us so much the more, as we know not by what organs it is communicated to them. Every species of animals experience it, especially dogs, geese, and poultry. The howlings of the dogs in the streets of Messina were so loud, that orders were issued to kill them." Now, we know, that many animals have a presentiment of a change of weather; which may happen either from a change of the density of the atmosphere, or from some alteration in its electricity: but steam pent up in the bowels of the earth could affect no animal until it began to exert its effects. Sir William Hamilton likewise informs us, that geese seemed more affected by this cause when in the water than out of it; which may easily be explained upon electrical principles, but not at all, at least not without the most extravagant suppositions, by steam pent up in caverns nobody knows where. Again, it is evident, that M. Dolomieu's hypothesis is supported in the worst manner imaginable, viz. by arguing from things unknown to what we see; but the true method of argument always is from what we see to things unknown. By this error he has made choice of causes which cannot possibly answer the purpose. Let any quantity of water be poured into the focus of mount Etna; nay, let the sea itself break into it: the consequence could only have been what happened in 1755, viz. not an earthquake in Calabria, but a vast effusion of boiling water from the top of the mountain itself. Nature here made the experiment; and we have no reason to imagine that any other consequence would have followed, though it had been repeated ever so often. Our author seems also to have forgot, that aqueous steam is capable of condensation, and that when it is admitted into a cold place it instantly loses its expansive power. Let us suppose caverns upon caverns extended in any way he pleases: the greater their bulk, the more will he be embarrassed; for thus the steam would have room to circulate; and far from producing those dreadful convulsions, must have returned quietly into water, without being able to stir the earth in the least. It would appear indeed, that the power of aqueous steam is very much over-rated both by M. Dolomieu and other writers. As Nature, or rather the Author of Nature, does nothing in vain, it may not be improper to consider, what uses earthquakes may be supposed to answer in the general system. As they are the effects of the very highest natural power, it cannot be supposed, that they are produced merely for the purposes of destruction; and, on the other hand, as they certainly do a great deal of mischief, it seems as difficult to assign any benevolent purpose. It is thought, indeed, that earthquakes are the means by which Nature raises mountains and land from the bottom of the sea; but this can never be admitted. We have many instances of mountains being swallowed up and lost by earthquakes, but not a single well attested one of a mountain being raised by them; and even when volcanoes are taken into the account, by which some mountains and islands have certainly been raised, the balance appears against them, and more land appears to have been sunk by them than ever was raised. It seems most probable, therefore, that earthquakes are accidental, and that the mischief they do is only to prevent a greater evil. This we see takes place throughout the whole system of nature. Thunder and lightning, violent rains, storms of wind, &c. are all productive of much damage on certain occasions; but we by no means suppose these phenomena to take place merely for the destruction; and therefore we name such effects accidents. To the same account, on a larger scale, must we place earthquakes; and it only remains to consider, what are the disasters still more terrible than earthquakes, which we should have occasion to dread did they not interpose to prevent them. These evils are naturally to be dreaded from any general commotion of the electric fluid dispersed through the whole globe of earth. That it does pervade it to the centre, is what we can have no reason to doubt; but in the internal parts it seems to lie dormant, or to be employed in operations which never manifest themselves to us. Towards the surface it is set in motion by the light of the sun. This produces a constant current through the bowels of the earth from the equator towards the poles; for as the equatorial parts absorb more of the light than those farther S. or N. it must naturally be driven out in the northern and southern regions in proportion to the quantity absorbed at the equator.

equator. Earthquakes are the shocks occasioned by its passing in great quantity from one place where it is pressed and confined, to another from which it has a free passage; or from a part of the earth positively electrified, to one that is negatively so. Let us suppose, however, that such obstructions are thrown in its way, that it cannot get out of the earth by any passage. The consequence of this must very soon be, that the motion of the light acting upon the equatorial parts would be propagated through the whole globe; and this would be productive of consequences much more terrible than any we can conceive. We see that by setting it in motion in a small part of the atmosphere or of the earth, the most violent effects ensue; but should this tremendous fluid be obliged to put forth all its strength, the earth must be shaken from the centre. Instead of plantations and little hills removed from their places, as in Calabria, it is probable that the largest islands and continents would be detached from their bases, or perhaps an universal dissolution ensue. Happily, however, such an effect can never take place, because the electric matter always vents itself by the superficial parts; for the depths to which even the causes of earthquakes and volcanoes descend, are undoubtedly superficial in comparison of the vast thickness of the body of the earth itself. The great bulk of electric fluid therefore lies quietly in the central parts; and is never moved by the commotions of that which lies on the surface, any more than the water at the bottom of the ocean is moved by the storms which ruffle the upper part.

EARWIG, in zoology. See **FORFICULA**.

EASEL, among painters; the frame whereon the canvas is laid.

EASEL PIECES, such small pieces, either portraits or landscapes, as are painted on the easel; thus called to distinguish them from larger pictures drawn on walls, ceilings, &c.

EASEMENT, in law, a privilege or convenience which one neighbour has of another, whether by charter or prescription, without profit: such are a way through his lands, a sink, or the like. These, in many cases, may be claimed.

EASING, in the sea language, signifies the slackening of a rope or the like. Thus, to ease the bow-line or sheet, is to let them go slack; to ease the helm, is to let the ship go more large, more before the wind, or more larboard.

EASINGWOLD, a town in the N. Riding of Yorkshire; 13 miles N. N. W. of York. Lon. 1. 4. W. Lat. 54. 10. N.

EAST, [*east*, Saxon; *heos*, Erse,] one of the four cardinal points of the world; being that point of the horizon where the sun is seen to rise when in the equinoctial. In Italy, and throughout the Mediterranean, the east wind is called the levante: in Greek *ανατολη* and *απηνιωτης*, because it comes from the side of the sun, *επ' ηλιου*; in Latin, *eurus*.

EASTBOURN, a town of Sussex. It lies near Beachy Head, 16 miles S. E. of Lewes.

EASTER, called by the Greeks, *Πασχα*, and by the Latins *Pascha*, from *פסח*, a Hebrew word signifying passage, applied to the Jewish feast of the passover. It is called Easter in English, from the Saxon goddess Eostre, whose festival was held in April. The Asiatic churches kept their Easter upon the very same day that the Jews observed their passover, and others on the first Sunday after the first full moon in the new year. This controversy was determined in the council of Nice; when it was ordained that Easter should be kept upon one and the same day, which should always be Sunday, in all Christian churches in the world. See **CHRONOLOGY**.

EASTER ISLAND, an island in the South Sea, thought to have been first discovered in 1686, by one Davis an Englishman, who called it Davis's Land. It was next visited by Commodore Roggewein, a Dutchman, in 1722; who gave it the name of Easter Island. The island is extremely barren; and bears evident marks not only of a volcanic origin, but of having been not very long ago entirely ruined by an eruption. It is 36 miles in circumference. Lon. 109. 46. W. Lat. 27. 5. S.

EAST INDIES. See **HINDOSTAN**, and **INDIA**.

EAST-NESS, or **EASTONNESS**, a cape in the German ocean, on the east coast of England, and county of Suffolk, between Southwold and Lowestoff.

EAST-NESS, on the coast of Yorkshire, near Rydel.

EASTON, a town of the United States, in Maryland, the capital of Talbot county, formerly named Talbot Court-House.

EASTON, a town of Pennsylvania, the capital of Northampton county, 70 miles N. of Philadelphia.

EAST POINT, the N. E. extremity of New Holland.

EATON, a town of England, in Buckinghamshire, on the N. side of the Thames, opposite to Windsor; famous for its collegiate school, founded by Henry VI. being a seminary for King's College, Cambridge, the fellows of which are all from this school.

EAU, [*Fr.*] signifies water; and hence makes part of the names of several compositions in perfumery, pharmacy, &c.

EAVES, in architecture, the margin or edge of the roof of a house; being the lowest tiles, slates, or the like, that hang over the walls, or throw off water to a distance from the wall.

EAVES-LATH, a thick feather-edged board, generally nailed round the eaves of a house for the lowermost tiles, slates, or shingles to rest on.

EAUSE, or **EAUZE**, an ancient town of France, in the department of Gersey, and province of Armagnac, 17 miles S. W. of Condom.

EBDOMADARIUS, **EBDOMAGENES**, or **HEBDOMADARIUS**. See **HEBDOMADARIUS**, &c.

EBENUS, the **EBONY TREE**; a genus of the decandria order, and diadelphia class of plants; natural order, Papilionaceæ. Calyx with teeth, the length of the corolla; wings scarcely any; seed one rough with hairs. It has two species, viz. *E. Cretica*, Cretan ebony, and *E. pinnata*, pinnated ebony: the former grows naturally in Crete, and some islands of the Archipelago; the latter is found in Barbary and the Levant.

EBERBEG, or **EBERNBERG**, a town of Germany, now included in one of the new departments on the left bank of the Rhine, five miles S. W. of Creuznach.

EBERNSTEIN, a town of Germany, in the duchy of Carinthia, twelve miles N. N. E. of Clagenfurt.

EBERSPERG, a town of Germany, in Bavaria, 19 miles E. of Munich.

EBERSTEIN, a town of France, in the department of the Lower Rhine, and late province of Alsace, eight miles S. W. of Strasburg.

EBERSTEIN, a principality and county of Germany, in Suabia, between Baden and Wurtemberg.

EBERSTEIN, a town and fort in the above county six miles S. E. of Baden.

EBERVIL, or **EBERVILLE**, a town of France, in the department of Puy de Dome, and late province of Auvergne, eight miles from Riom.

EBHER, a river and town of Persia, in the province of Irak.

EBION, the author of the heresy of the Ebionites, was a disciple of Cerinthus, and his successors. To the errors of his master, he had added new opinions of his own. He began his preaching in Judea; he taught in Asia, and even at Rome. His tenets infected the isle of Cyprus. St. John opposed both Cerinthus and Ebion in Asia; and it is thought that he wrote his gospel, in the year 97, particularly against this heresy.

EBIONITES, ancient heretics, who rose in the very first age of the church, formed themselves into a sect in the second century, denying the divinity of Jesus Christ. Origen takes them to have been so called from the Hebrew word *ebion*, which signifies poor; because, they were poor in understanding. Eusebius is of opinion they were thus called, as having poor thoughts of Jesus Christ, taking him for no more than a mere man. It is more probable the Jews gave this appellation to the Christians in general out of contempt: because in the first age few but poor people embraced the Christian religion. This opinion Origen himself seems to give into, in his book against Celsus, where he says, that they called Ebionites, such among the Jews as believed that Jesus was truly the expected Messiah. There is even some probability, that the primitive Christians assumed the name themselves, in conformity to their profession. It is certain, Epiphanius observes, they valued themselves on being poor, in imitation of the apostles. The same Epiphanius, however, is of opinion, that there had been a man of the name of Ebion, the founder of the sect, contemporary with the Nazarenes and Cerinthians. He gives a long and exact account of the origin of the Ebionites, making them to have risen after the destruction of Jerusalem, when the first Christians, called Nazarenes, went out of it to live at Pella. The Ebionites seem to have been a branch of Nazarenes: only they altered and corrupted the

purity of the faith held among those first adherents to Christianity. For this reason, Origen distinguishes two kinds of Ebionites, in his answer to Celsus: the one believed that Jesus Christ was born of a virgin: and the other, that he was born after the manner of other men. The first was orthodox in every thing, except that to the Christian doctrine they joined the ceremonies of the Jewish law, with the Jews, Samaritans, and Nazarenes; together with the traditions of the Pharisees. They differed from the Nazarenes, chiefly as to what regards the authority of the sacred writings; for the Nazarenes received all for scripture contained in the Jewish canon; whereas the Ebionites rejected all the prophets, and held the very names of David, Solomon, Isaiah, Jeremiah, and Ezekiel, in abhorrence. They also rejected all St. Paul's epistles, whom they treated with the utmost disrespect. They received nothing of the Old Testament but the Pentateuch; which should intimate them to have descended rather from the Samaritans than from the Jews. They agreed with the Nazarenes in using the Hebrew gospels of St. Matthew, otherwise called the Gospel of the Twelve Apostles; but they had corrupted their copy in many places; and particularly, had left out the genealogy of our Saviour, which was preserved entire in that of the Nazarenes, and even in those used by the Cerinthians.

EBONY, an exceedingly hard and heavy kind of wood, susceptible of a very fine polish, and on that account used in mosaic and inlaid works, toys, &c. There are divers kinds of ebony: the most usual among us are black, red, and green, all produced in the island of Madagascar, where the natives call them indifferently *hazon mainthi*, *q. d.* black wood. The island of St. Maurice likewise furnishes part of the ebonyes used in Europe. Authors and travellers give very different accounts of the tree that yields the black ebony. By some of their descriptions it seems to be a sort of palm-tree; by others, a *cytisus*, &c. The most authentic is that of M. Flacourt, who resided many years in Madagascar as governor; he assures us, that it grows very high and big, its bark being black, and its leaves resembling those of our myrtle, or a deep, dusky, green colour. Tavernier assures us, that the islanders always bury trees, when cut down, to make them the blacker, and to prevent their splitting when wrought. F. Plumier mentions another black ebony tree, discovered by him at St. Domingo, which he calls "*spartium portulacæ foliis aculeatum ebeni materie*." Pliny and Dioscorides say the best ebony comes from Ethiopia, and the worst from India; but Theophrastus prefers the Indian. Black ebony is much preferred to that of other colours. The best is a jet black, free from veins and rind, very massive, astringent, and of an acrid pungent taste. Its rind, infused in water, is said to purge piltuita, and cure venereal disorders; whence Matthiolus took guaiacum for a sort of ebony. It yields an agreeable perfume when laid on burning coals: when green, it readily takes fire from the abundance of its fat. If rubbed against a stone, it becomes brown. The Indians make statues of their gods, and sceptres of their princes, of this wood. It was first brought to Rome by Pompey, after he had subdued Mithridates. It is now much less used among us than anciently; since the discovery of so many ways of giving other hard woods a black colour. The cabinet-makers, inlayers, &c. make pear-tree and other woods pass for ebony, by giving them a black colour, by a few washes of a hot decoction of galls; and when dry, adding ink, and polishing them with a stiff brush, and a little hot wax. Others burn their wood black.

EBORACUM, in ancient geography, a famous city of the Brigantes in Britain, now called York, which see.

EBRBUHARITES, a sect among the Mohammedans, so named from their founder Ebrbuhar, a disciple of Nacschibendi. They profess great sanctity, with a total dereliction of all worldly things; yet are regarded by the other Mussulmans, as little better than heretics, because they do not go in pilgrimage to Mecca. From this labour they excuse themselves, by pretending that the purity of their souls, their sublime contemplations, ecstasies, &c. shew them Mecca and Mohammed's tomb without stirring from their cells.

EBREUIL, or **EBREUILLE**, a town of France, in the department of Allier, 6 miles W. of Gannat.

EBRO, a large river of Spain, which rises in the mountains of Santillane, on the confines of Old Castile, and falls with great rapidity into the Mediterranean, about 20 miles below Tortosa. It was anciently called Iberus.

EBSTORE, a town of Germany, in Lower Saxony, 47 miles W. N. W. of Ultzen.

EBULLITION, [*ebullitio*, Lat.] the act of boiling up with heat; any intestine violent motion of the parts of a fluid.

EBUSUS, in ancient geography, the greater of the two islands called Pityusæ, in the Mediterranean, S. W. of Majorca. Now called Ivica, 100 miles in compass, without any noxious animals.

ECASTOR, or **MECASTOR**, in antiquity, an oath wherein Castor was invoked. It was a custom for men never to swear by Castor, nor the women by Pollux.

ECAVESSADE, in the manege, is used for a jerk of the cavesson.

ECBATANA, in ancient geography, the royal residence and capital of Media, built by Deioces, king of the Medes, according to Herodotus: Pliny says, by Seleucus; but that could not be, because it is mentioned by Demosthenes. It was situated on a gentle declivity, twelve stadia from Mount Orontes, and was in compass 150 stadia. Here stood the royal treasury and tombs. It was an open unwall'd town, but had a very strong citadel, encompassed with seven walls, within and rising above each other. The extent of the utmost was equal to the whole extent of Athens, according to Herodotus; the situation favouring this construction, as being a gentle ascent, and each wall was of a different colour.

ECBATANA, another town of Persia, inhabited by the Magi.

ECCENTRICAL, or **ECCENTRIC**, [*eccentricus*,] 1. Deviating from the centre. 2. Not having the same centre with another circle: such circles were supposed by the Ptolemaic philosophy.

ECCENTRICITY OF THE PLANETS, the distance between the sun and the centre of the orbit in which the planet moves. See **ASTRONOMY**.

ECHELLENSIS, **ABRAHAM**, a learned Maronite, whom the president Le Jai employed in the edition of the Polyglott Bible. Gabriel Sionita, his countryman, drew him to Paris, to make him his fellow-labourer in publishing that bible. They fell out: Gabriel complained to the parliament, and defamed his associate; their quarrel made a great noise. The congregation de propaganda fide associated him, in 1636, with those whom they employed in making an Arabic translation of the scriptures. They recalled him from Paris, and he laboured in that translation at Rome, in 1652. While he was professor of the Oriental languages at Rome, he was pitched upon by the great duke Ferdinand II. to translate from Arabic into Latin the 5th, 6th, and 7th of Apollonius's Conics; in which he was assisted by John Alphonso Borrelli, who added commentaries to them. He died at Rome, in 1664.

ECCHYMOSIS, [from *εκχυω*, to pour out, or from *εξ*, out of, and *χυμος*, juice,] an effusion of humours from their respective vessels, under the integuments; or, as Paulus Aegineta says, "When the flesh is bruised by the violent collision of any object, and its small veins broken, and the blood is gradually discharged from them." This blood, when collected under the skin, is called an ecchymosis, the skin in the mean time remaining entire; sometimes a tumour is formed by it, which is soft and livid, and generally without pain. If the quantity of blood is not considerable, it is usually resorbed; if much, it suppurates: it rarely happens that any farther inconvenience follows; though in a very bad habit of body, a mortification may be the result.

ECCLESFECHAN, a town of Scotland, in Dumfries-shire, 15 miles E. of Dumfries. It has a fair once a month.

ECCLESHALL, a town in Staffordshire, 7 miles N. W. of Stafford. Lon. 2. 9. W. Lat. 53. 2. N.

ECCLESIANI, or **ECCLESIANI**, in church history, a title given by the adherents of the emperors, to those who adhered to the interest of the church, during the disputes between the emperors and popes.

ECCLESIASTES, a canonical book of the Old Testament, the design of which is to shew the vanity of all sublunary things. It was composed by Solomon; who enumerates the several objects on which men place their happiness, and then shews the insufficiency of all worldly enjoyments. The Talmudists make king Hezekiah to be the author of it: Grotius ascribes it to Zorobabel, and others to Isaiah; but the generality of commentators believe this book to be the produce of Solomon's repentance, after

after having experienced all the pleasures, follies, and vanities of life.

ECCELESTASTICAL COURT. See **COURTS, ECCELESTASTICAL.**

ECCELESTASTICAL STATE, in geography, lately the Pope's dominions in Italy. They consisted of the following provinces: Campagna, St. Peter's Patrimony, Umbria, Ancona, Urbino, Romagna, Bologna, and Ferrara. Avignon and Venaissin included in the French empire, also belonged to the Ecclesiastical State; as well as the duchy of Benevento, in Naples, which last, was the last that his holiness retained of his ancient dominions. The kingdom of Naples and the duchies of Parma and Placentia also held as fiefs of the papal see. Pope Paul IV. who succeeded Marcellus II. in 1555, boasted, that he had 22,800 parishes, 4400 monasteries under his jurisdiction. In obedience to a French imperial decree of May 17, 1809, the Ecclesiastical States are now annexed to the empire of France; and in Feb. 1810, divided into two departments, viz. those of Rome and Trazimene.

ECCELESTASTICUS, an apocryphal book, so called, from its being read in the church, ecclesia, as a book of piety and instruction, but not of infallible authority. The author was a Jew, called Jesus, or Joshua, the son of Sirach. The Greeks call it the Wisdom of the son of Sirach.

ECCELESTON, a town of Lancashire, 24 miles S. of Lancaster. Lon. 2. 55. W. Lat. 53. 40. N.

ECCLISIS, [*ἐκκλησία*, Gr.] a luxation.

ECCO, in music books, signifies the repetition of part of a tune, in imitation of an echo.

ECCOPROTICS, [*ἐκκαὶ πρὸς*, Gr.] such medicines as gently purge the belly, so as to bring away no more than the natural excrements lodged in the intestines.

ECSCRINOLOGICA, [*ἐκσκληνολογία*, Gr.] that part of medicine, which treats of excretions.

ECDICI, [*ἐκδικαί*, Gr.] among the ancients, patrons of cities, who defended their rights, and took care of the public money.

ECDYSSIA, an ancient festival held by the Phœstians, in honour of Latona.

ECHALLENS, a town of the Helvetic republic, in the late canton of Bern, 6 miles from Lausanne.

ECHALLENS, a late bailiwick of Switzerland, belonging to the cantons of Bern and Friburg.

ECHAPE, [*échappee*, Fr. a prank,] in the manege, a horse begot between a stallion and a mare of different breeds and countries.

ECHAPER, [*échapper*, Fr. to escape,] in the manege, a term used in the academies implying to give a horse a head, or to put on at full speed.

ECHENEIS, the **REMORA**, in ichthyology, a genus of the order of thoracici. Head flat, naked, depressed, and marked with a number of transverse ridges; it has ten rays in the branchiostegic membrane; and the body is naked. There are six species, natives of the Indian ocean.

ECHEVIN, in the late French and Dutch polity, a magistrate elected by the inhabitants of a city or town, to take care of their common concerns, and the decoration and cleanliness of the city.

ECHINITES, in natural history, the name by which authors call the fossile centronia, frequently found in our chalk pits.

ECHINOPHORA, a genus of the digynia order, and pentandria class of plants; natural order, Umbellata. Male florets lateral, with the central one hermaphrodite; seed one, sunk into an indurated involucre. It has two species.

ECHINOPUS, in botany, a genus of the polygamia segregata order, and syngenesia class of plants; natural order, Compositae. Calyx uniflorous; corolla tubulated, hermaphrodite; receptacle bristly; down indistinct. Five species, herbaceous plants, with alternate leaves.

ECHINORYNCHUS, in natural history, a genus of the class and order *vermes* *intestina*. Body round; proboscis cylindrical retractile, and crowned with hooked prickles. These animals are found fixed very firmly to the viscera of various animals, generally the intestines; and often remain on the same part during the life of the animal. There are about fifty species, divided into sections: A. infesting mammalia, of this E. *gigas* is found in the intestines of swine. B. infesting birds. C. infesting reptiles. D. infesting fish.

ECHINUS, **SEA-URCHIN**, in natural history, a genus of the

class and order *vermes* *mollusca*. Body roundish, covered with bony satured crust, and generally furnished with moveable spines; mouth placed beneath, and mostly five-valved. They are divided into sections, chiefly distinguished by the situation of the vent. A. vent vertical; tentacula every where simple. B. vent placed beneath; mouth without tentacula. C. vent lateral; mouth with pencilled tentacula. Each of these sections are subdivided. There are more than 100 species, besides varieties. They are all inhabitants of the sea, and many of them have been found in a fossil state; many are esculent. In old times they were a favourite dish. They were dressed with vinegar, honied wine or mead, parsley or mint; and thought to agree with the stomach.

ECHITES, in botany, a genus of the monogynia order, and pentandria class of plants; natural order, Contortae. Follicles two, long and straight; seeds downy; corolla funnel-shaped, with the throat naked. Twenty-two species, mostly natives of the West Indies.

ECHIU, **VIPER'S BUGLOSS**, in botany, a genus of the monogynia order, and pentandria class; natural order, Asperifoliae. Corolla irregular, with the throat naked. There are twenty-one species.

ECHIU **VULGARE**, or **COMMON BUGLOSS**, the flowers of which are very grateful to bees. It is a native of many parts of Britain. The stem is rough with hairs and tubercles. The leaves are spear-shaped, and rough with hair.

ECHO, or **ECCHO**, is formed from the Greek *ἠχέω*, *sound*. The ancients being wholly unacquainted with the true cause of the echo, ascribed it to several causes sufficiently whimsical. The poets, who were not the worst of their philosophers, pretended it was a person of that name metamorphosed, and that she affected to take up her abode in particular places; for they found that she was not to be met with every where. But the moderns, who knew sound to consist in a certain tremor or vibration in the sonorous body communicated to the contiguous air, and by that means to the ear, give a more consistent account of echo. See **ACOUSTICS**. A tremulous body, striking on another solid body, may be repelled without destroying or diminishing its tremor; and consequently a sound may be redoubled by the resiliency of the tremulous body, to the air. But a simple reflection of the sonorous air is not enough to solve the echo: for then every plain surface of a solid hard body, being fit to reflect a voice or sound, would redouble it; which we find does not hold. To produce an echo, therefore, it should seem, that a kind of concameration or vaulting were necessary, to collect, and by collecting to heighten and increase, and afterwards reflect the sound; as we find is the case in reflecting the rays of light, where a concave mirror is required. In fact, as often as a sound strikes perpendicularly on a wall, behind which is any thing of a vault or arch, or even another parallel wall; so often will it be reverberated in the same line, or other adjacent ones. For an echo to be heard, therefore, it is necessary that the ear be in the line of reflection: for the person who made the sound to hear its echo, it is necessary he be perpendicular to the place which reflects it: and for a manifold or tautological echo, it is necessary there be a number of walls, and vaults or cavities, either placed behind or fronting each other. A single arch or concavity, &c. can scarce ever stop and reflect all the sound; but if there be a convenient disposition behind it, part of the sound propagated thither, being collected and reflected as before, will present another echo: or, if there be another concavity, opposed at a due distance to the former, the sound reflected from the one upon the other will be tossed back again by this last, &c. Many of the phenomena of echoes are well considered by the bishop of Leighs, &c. who remarks, that any sound, falling directly or obliquely on any dense body of a smooth superficies, whether plain or arched, is reflected, or echoes, more or less. The surface, says he, must be smooth; otherwise the air, by reverberation, will be put out of its regular motion, and the sound thereby broken and extinguished.

ECHO, is also used for the place where the repetition of the sound is produced or heard. In echoes, the place where the speaker stands is called the *centrum phonicum*; and the object or place that returns the voice, the *centrum phonocampticum*. Echoes are distinguished into two kinds; viz. Single and Tautological, or Multiple.

i. **ECHOES, SINGLE**, are those which return the voice but once. Of these some are Tonical, others Polysyllabical.

1. **ECHOES**,

1. **ECHOES, POLYSYLLABICAL**, are those which return many syllables, words, and sentences. Of this last kind is that fine echo in Wood-stock park, which Dr. Plot assures us, in the day-time, will return very distinctly 17 syllables, and in the night 20.

2. **ECHOES, TONICAL**, are those which only return a voice, when modulated into some particular musical tone.

ii. **ECHOES, TAUTOLOGICAL, or MULTIPLE**, are those that return syllables and words, the same oftentimes repeated. At the sepulchre of Metella, wife of Crassus, was an echo, which repeated what a man said five times. Authors mention a tower at Cyzicus, where the echo repeated seven times. One of the finest echoes we read of is that mentioned by Barthius, in his notes on Statius Thebais, lib. vi. 30, which repeated the words a man uttered 17 times: it was on the banks of the Naha, between Coblentz and Bingen. Barthius assures us, he had proved what he writes; and had told 17 repetitions. In common echoes, the repetition is not heard till some time after hearing the word spoken, or the notes sung; but in this, the person who speaks or sings is scarce heard at all; but the repetition most clearly, and always in surprising varieties; the echo seeming sometimes to approach nearer, and sometimes to be further off. Sometimes the voice is heard very distinctly, and sometimes scarce at all. One hears only one voice, and another several: one hears the echo on the right, and the other on the left, &c. At Milan in the late Cisalpine republic, is an echo which reiterates the report of a pistol 56 times; and if the report is very loud, upwards of 60 reiterations may be counted. The first 20 echoes are pretty distinct; but as the noise seems to fly away, and answer at a great distance, the reiterations are so doubled, that they can scarce be counted.

ECHO, in architecture, a term applied to certain kinds of vaults and arches, most commonly of the elliptic and parabolic figures used to redouble sounds, and produce artificial echoes.

ECHO, in poetry, a kind of composition wherein the last words or syllables of each verse contains some meaning, which, being repeated apart, answers to some question or other matter contained in the verse; as in this beautiful one from Virgil:

Crudelis mater magis, an puer improbus ille?

Improbus ille puer, crudelis tu quoque mater.

The elegance of an echo consists in giving a new sense to the last words; which reverberate, as it were, the motions of the mind and by that means affect it with surprise and admiration.

ECHO, in the mythology, a daughter of Aer and Tellus, who chiefly resided in the vicinity of the Cephissus. She was once one of Juno's attendants, and became the confidant of Jupiter's amours. Her loquacity however displeased Jupiter, and she was deprived of the power of speech by Juno, and only permitted to answer the questions which were put to her. Echo, after she had been punished by Juno, fell in love with Narcissus; but being despised by him, pined to death, having nothing but her voice left.

ECHOMETER, [$\epsilon\chi\omicron\mu\epsilon\tau\epsilon\rho$, sound, and $\mu\epsilon\tau\epsilon\rho\omega$ to measure,] among musicians, a kind of scale or rule, with several lines thereon, serving to measure the duration and length of sounds, and to find their intervals and ratios.

ECIJA, or EXIJA, a town of Spain, in Andalusia, 55 miles E. N. E. of Seville.

ECKARDSBERGA, a town of Germany in Upper Saxony, 10 miles W. S. W. of Naumburg.

ECKTERNAC, a town of France, in the department of Forets, 18 miles N. E. of Luxembourg. Lon. 6. 33. E. Lat. 49. 50. N.

ECCLECTICS, [from $\epsilon\kappa\lambda\epsilon\gamma\omega$, to choose,] ancient philosophers, who, without attaching themselves to any particular sect, chose what they judged good and solid from each. Laertius says that they were also denominated Analogetici; but that they call themselves Philalethes, i. e. lovers of truth. The founder of the Eclectici was one Potamon of Alexandria, who lived under Augustus and Tiberius; and who, weary of doubting of all things with the Sceptics and Pyrrhonians, formed the Eclectic sect; which Vossius calls the Elective.

ECCLECTICS were also a certain set of physicians among the ancients, of whom Archigenes, under Trajan, was the chief, who selected from the opinions of all the other sects, that which appeared to them best and most rational; hence they were called eclectics, and their prescriptions *medicina eclectica*.

ECCLECTICS, or MODERN PLATONICS, a sect of Christians, who arose about the end of the second century. They professed to make truth the only object of their enquiry, and to be ready to

adopt from all the different systems and sects; such tenets as they thought agreeable to it. However, they preferred Plato to the other philosophers, and looked upon his opinions concerning God, the human soul, and things invisible, as conformable to the spirit and genius of the Christian doctrine.

ECLEGMA, [$\epsilon\kappa$ and $\lambda\epsilon\gamma\mu\alpha$,] a form of medicine made by the incorporation of oils with syrups, and which is to be taken upon a liquorice stick.

ECLIPSE, [$\epsilon\kappa\lambda\iota\psi\iota\varsigma$,] an obscuration of the luminaries of heaven; the sun is eclipsed by the intervention of the moon; the moon by the interposition of the earth. See **ASTRONOMY**.

ECLIPTA, in botany, a genus of the polygamia superflua order, and syngenesia class. Receptacle chaffy; no pappus; corollulae of the disk quadrifid. It has five species natives of both the Indies.

ECLIPTIC, [$\epsilon\kappa\lambda\iota\pi\tau\iota\kappa\omicron\varsigma$,] a great circle of the sphere, passing through the middle of the Zodiac. See **ASTRONOMY**.

ECLOGUE, [$\epsilon\kappa\lambda\omicron\gamma\eta$, Gr. *choice*,] in poetry, a kind of pastoral composition, wherein shepherds are introduced conversing together. According to the etymology, eclogue should be no more than a select or choice piece; but custom has determined it to a farther signification, viz. a little elegant composition in a simple natural style and manner. Idyllion and eclogue, in their primary intention, are the same thing: thus, the idyllia, $\alpha\iota\delta\upsilon\lambda\lambda\iota\alpha$, of Theocritus, are pieces written perfectly in the same vein with the eclogæ of Virgil. But custom has made a difference between them, and appropriated the name eclogue to pieces wherein shepherds are introduced speaking; idyllion, to those written like the eclogue, in a simple natural style, but without any shepherds in them.

ECLUSE, a town of France, in the department of the North, and late province of Dutch Flanders. Lon. 3. 10 E. Lat. 50. 52. N.

ECONOMY, [$\omicron\iota\kappa\omicron\nu\omicron\mu\iota\alpha$,] a term of extensive signification, and if its meaning be properly understood and practised, the result cannot fail to be attended with the happiest effects. It is, in particular, applied to rural, domestic, animal, political, and other objects, to denote the regulation and management of them, and the ascertaining of their uses, advantages, &c.

ECONOMICS, the art of managing our affairs in an appropriate and advantageous manner.

ECOUTE, in the manege, a pace or motion of a horse, when he rides well upon the hands and the heels, is compactly put upon his haunches, and hears or listens to the heels or spurs, and continues duly balanced between the heels, without throwing to either side. This happens when a horse has a fine sense of the aids of the hand and heel.

ECPHORA, in architecture, commonly signifies the distance between the extremity of a member or moulding, and the naked of the column, or any other part it projects from. Some authors, however, account for the ecphora from the axis of the column, and define it to be the right line intercepted between the axis and the outermost surface of a member or moulding.

ECPHRACTICS, [$\epsilon\kappa$ and $\phi\epsilon\rho\alpha\tau\iota\omega$,] such medicines as render tough humours more thin, so as to promote their discharge. See **ATTENUANT**, **DEOBSTRUENT**, and **DETERGENTS**.

ECSTATICI, [$\epsilon\kappa\varsigma\tau\alpha\tau\iota\kappa\iota$, from $\epsilon\zeta\iota\varsigma\tau\eta\mu\iota$, I am entranced,] in antiquity, a kind of diviners who were cast into trances or ecstasies, in which they lay like men dead or asleep, deprived of all sense and motion; but, after some time, returning to themselves, gave strange relations of what they had seen and heard.

ECTHESIS, [Gr.] in church history, a confession of faith, in the form of an edict, published A. D. 639, by the emperor Heraclius, to pacify the troubles occasioned by the Eutychian heresy in the eastern church.

ECTHLIPSIS, among Latin grammarians, a figure of prosody whereby the *m* at the end of a word, when the following word begins with a vowel, is elided, or cut off, together with the vowel preceding it, for the sake of the measure of the verse: thus, for "Monstrum horrendum, informe, ingens, cui lumen ademptum" they read, Monstru' horrend' inform' ingens, cui lumen ademptum.

ECTROPIUM, in surgery, is when the eye-lids are inverted, or retracted, so that they shew their internal or re surface, and cannot sufficiently cover the eye.

ECTYLOTICS, remedies proper or-consuming callosities.

ECTYPE, [$\epsilon\kappa\tau\upsilon\pi\omicron\varsigma$,] among antiquarians, an impression of a medal,

medal, seal, or ring, or a figured copy of an inscription, or other ancient monument.

ECU, a French crown. See COIN.

EDA, one of the Orkney islands.

EDAM, a town of Batavia, or Holland, in the department of Amstel, 12 miles N. of Amsterdam. Lon. 4. 58. E. Lat. 52. 32. N.

EDDA, the system of the ancient Icelandic or Runic mythology, containing many curious particulars of the theology, philosophy, and manners, of the northern nations of Europe; or of the Scandinavians, who had migrated from Asia, and from whom our Saxon ancestors were descended. Mr. Mallet apprehends that it was originally compiled, soon after the Pagan religion was abolished, as a course of poetical lectures, for the use of such young Icelanders as devoted themselves to the profession of a scald or poet. It consists of two principal parts; the first containing a brief system of mythology, properly called the Edda; and the second being a kind of art of poetry, and called *Scalda* or poetics. The most ancient Edda was compiled by Soemund Sigfusson, surnamed the Learned, who was born in Iceland about A. D. 1057. This was abridged, and rendered more easy and intelligible about 120 years afterwards, by Snorro Sturleson, who was supreme judge of Iceland in 1215 and 1222; and it was published in the form of a dialogue. He added also the second part in the form of a dialogue, being a detail of different events transacted among the divinities. The only three pieces that are known to remain of the more ancient Edda of Soemund are the Voluspá, the Havamaal, and the Runic chapter. The Voluspá or prophecy of Vola or Fola, appears to be the text, on which the Edda is the comment. It contains in 200 or 300 lines the whole system of mythology, disclosed in the Edda, and may be compared to the Sibylline verses, on account of its 'laconic' yet 'bold style, and its imagery and obscurity.

EDDISTO, or PONPON, a large river of South Carolina.

EDDY WIND is that which returns or is beat back from a sail, mountain, or any thing that may hinder its passage.

EDDYSTONE ROCKS, the name of some rocks in the English Channel; so called from the great variety of contrary currents in their vicinity. They are situated nearly S. S. W. from the middle of Plymouth Sound, their distance from the port about 14 miles, and from Ram-Head, the nearest point of land, 12 and a half. They are almost in the line which joins the Start and the Lizard Points; and as they lie nearly in the direction of vessels coasting up and down the Channel, they were very dangerous, and ships were sometimes wrecked on them, before the light-house was established. They are so exposed to the swells of the ocean, from all the S. and W. points of the compass, that the heavy seas come uncontrolled and break on them with the utmost fury. Sometimes, after a storm, when the sea in general is, to all appearance, quite smooth, and its surface unruffled by the slightest breeze, the growing swell or under current, meeting the slope of the rocks, the sea beats dreadfully upon them, and even rises above the light-house in a magnificent manner, overtopping it for the moment, as with a canopy of frothy wave. Notwithstanding this tremendous swell, Mr. Henry Winstanley, in 1696, undertook to build a light-house on the principal rock, for the rest are under water; and he completed it, in 1700. This ingenious mechanic was so confident of the stability of his structure, that he declared his wish to be in it, during the most tremendous storm that could blow. Unfortunately he obtained his wish, for he perished in it, during the dreadful storm which destroyed it, on the 27th Nov. 1703. In 1709, another light-house was erected of wood on this rock, but on a different construction, by Mr. John Rudyard. It stood till 1755, when it was burnt. A third one, of stone, was begun by the late celebrated Mr. John Smeaton, on the 2nd of April 1757, and finished 24th Aug. 1759: and has withstood the rage of all weathers ever since. The rock, which slopes towards the S. W. is cut into horizontal steps; into which are dove-tailed and united by a strong cement Portland stone and granite: for Mr. Smeaton discovered, that it was impossible to make use of the former entirely, as there is a marine animal that can destroy it; and that he could not use the latter solely, as the labour of working it would have been too expensive. He therefore used the one for the internal and the other for the external part of the structure. Upon the principle of a broad base and accumulation of matter, the whole, to the height of 35 feet from the foundation, is a solid

mass of stones engrafted into each other, and united by every kind of additional strength. The light-house has four rooms, one over another, and at the top a gallery and lantern. The stone floors are flat above, but concave below, and are kept from pressing against the sides of the building by a chain let into the walls. The light-house is nearly 80 feet high, and withstands the most violent storms, without sustaining the smallest injury. It has now stood above 39 years, during which time it has been often assaulted by all the fury of the elements: And, in all probability, as Mr. Smeaton said, nothing but an earthquake can destroy it. The wooden part of it, however, was burnt in 1770, but renewed in 1774. Lon. 4. 21. W. Lat. 50. 3. N.

EDEN, [עֵדֶן, Heb. *i. e.* pleasure,] a country, with a garden, in which the progenitors of mankind were settled by God himself. It would be endless to recount the various conjectures as to its situation, some of which are very wild and extravagant. Moses says, that "a river went out of Eden to water the garden, and from thence it was parted and became into four heads." This river is supposed to be the common channel of the Euphrates and Tigris, after their confluence; which parted again, below the garden, into two different channels: so that the two channels before, and the other two after their confluence, constitute the heads mentioned by Moses. This will determine the situation of the garden to have been in the S. of Mesopotamia, or in Babylonia. The garden was also called *Paradise*; a term of Peric original, denoting a garden.

EDEN, a river of England, in Westmoreland.

EDEN, a river of Scotland, in Berwickshire, and another in Fifeshire.

EDEN, a town of Germany, in Westphalia.

EDENTON, a district on the sea-coast of North Carolina.

EDENTON, the capital of the above district, 97 miles N. of Newbern. Lon. 77. 11. W. Lat. 36. 6. N.

EDESSA, a town of European Turkey, in Macedonia, 44 miles W. N. W. of Salonichi.

EDGAR, the son of Edmund I, one of the most fortunate of the Anglo-Saxon monarchs. He succeeded his brother Edwy, A. D. 959; and is said to have been rowed down the Dee by eight kings his vassals. He died in 975.

EDGARTON, a town of Massachusetts, capital of Duke's county, situated on the east side of the island of Martha's Vineyard.

EDGCOMB, a county of Halifax district, N. Carolina.

EDGEFIELD, a town and county of South Carolina, the southernmost in the district of Ninety-Six.

EDGEWARE, a town in Middlesex, 8 miles N. W. of London.

EDGHIR, a town of Hindostan, in Golconda, 75 miles S. W. of Hydrabad.

EDGINGS, in gardening, the series of small but durable plants, set round the edges or borders of flower-beds, &c. The best and most durable of all plants for this use, is *box*; which, if well planted, and rightly managed, will continue in strength and beauty for many years. The seasons for planting this, are the autumn, and very early in the spring: and the best species for this purpose is the dwarf Dutch box.

EDICT, [*edictum*, Lat.] a proclamation of command or prohibition; a law promulgated. An edict is an order or instrument, signed and sealed by a prince, to serve as a law to his subjects. We find frequent mention of the edicts of the prætor, in the Roman law. In the late French law, the edicts were of several kinds; some importing new laws or regulations; others, the erection of new offices; establishments of duties, rents, &c. and sometimes articles of pacification. In despotic governments, an edict is much the same as a proclamation is with us: but with this difference, that the former has the authority of a law from the power which issues it; whereas the latter is only a declaration of a law, to which it refers, and has no power in itself.

EDILE. See *EDILE*. This ancient title was resumed in the late constitution of the Roman republic.

EDINBURGH, the metropolis of Scotland, is situated in the county of Mid-Lothian, about a mile S. from the Frith of Forth. Lon. 3. 0. W. Lat. 56. 0. N. The old town is built upon a steep hill, rising from E. to W. and terminating in a high and inaccessible rock, upon which the castle stands. At the E. end or lower extremity of this hill stands the abbey of Holyrood house, the ancient

cient royal palace, distant from the castle upwards of a mile; and betwixt which along the top of the ridge, and almost in a straight line, runs the high street. The castle stands on a high rock, accessible only on the E. side. On all others it is very steep, and in some places perpendicular. It is about 300 feet high from its base: so that before the invention of artillery, it might have well been deemed impregnable; though the event shewed that it was not. The entry to this fortress is defended by an outer barrier of palisadoes; within this is a dry ditch, draw-bridge, and gate, defended by two batteries which flank it; and the whole is commanded by a half-moon mounted with cannon, carrying balls of 12 pounds. The churches, both presbyterian and episcopal, are very numerous; as are also other places of worship of various denominations. The New Town was projected in 1752; but as the magistrates could not then procure an extension of the royalty, the execution of the design was suspended for some time. In 1767, an act was obtained, by which the royalty was extended over the fields to the N. of the city; upon which advertisements were published by the magistrates, desiring proper plans to be given in. Plans were given in accordingly, and that designed by Mr. James Craig, architect, was adopted. Immediately afterwards, people were invited to purchase lots from the town council; and such as purchased became bound to conform to the rules of the plan. The elegance of the buildings, the fineness of the situation, and the regularity of the plan of the New Town have rendered it extremely agreeable and beautiful. The number of inhabitants is upwards of 80,000. In 1581, a grant was obtained from K. James VI. for founding a college or university within the city of Edinburgh; and the citizens, aided by various donations, purchased a situation for it, consisting of part of the areas, chambers, and church of the collegiate provostry and prebends of the Kirk-a-field, otherwise called Templum et Præfectura Sanctæ Mariæ in Campis, lying on the S. side of the city. Next year, a charter of confirmation and erection was obtained, from which the college afterwards derived all the privileges of an university. For several years the college consisted only of the principal and 4 regents or professors of philosophy. Each of these regents instructed one class of students for 4 years, in Latin, Greek, logic, mathematics, ethics, and physics, and graduated them at the conclusion of the 4th course. A professor of Latin was afterwards appointed, who prepared the students for entering under the tuition of the regents; also professors of mathematics, and another of Hebrew. It was not till about 1710 that the 4 regents began to be confined each to a particular profession; since which time they have been commonly styled Professors of Greek, Logic, Moral Philosophy, and Natural Philosophy. The first medical professors instituted at Edinburgh,

were Sir Robert Sibbald and Dr. Archibald Pitcairn, in 1685. Such was the flourishing state of this university, that it became necessary to erect a new college, which is a complete and commodious edifice. The university is celebrated throughout the world; and its medical school, in particular, is entitled to the first rank.

EDITOR, [*editor*, Latin,] he that revises or prepares any work for publication.

EDLAND, LAKE, or SLAVE LAKE, a lake of N. America, N. of the lake of Arapescow, near the Arctic Circle.

EDMONDSBURY, ST. See BURY.

EDMUND I, king of England, the son of Edward the Elder, succeeded his brother Athelstan, A. D. 941, and exhibited proofs of great courage and abilities during a short reign of about 8 years. He was murdered by Leolf, a robber, A. D. 948.

EDMUND II, surnamed IRONSIDE, from his strength and valour, succeeded his father Ethelred II. A. D. 1016, in that part of England which was not then possessed by the Danes. He was endowed with great abilities, but was murdered by the traitor, Edric, D. of Mercia, before he had reigned a year.

EDOM, [עֲדָם, Heb. *i. e. red*,] or ESAU, the son of Isaac and brother of Jacob. The name, Edom, was given him, either because he sold his birth-right to Jacob for a mess of red pottage, or by reason of the colour of his hair and complexion. Idumæa is derived from Edom, and is often called in scripture the land of Edom.

EDOM, or IDUMÆA, in ancient geography, a district of Arabia Petraea. A great part of the S. of Judea was also called Idumæa, because occupied by the Idumæans, upon the Jewish captivity, quite to Hebron. But the proper Edom or Idumæa appears not to have been very extensive, from the march of the Israelites, in which they compassed it on the S. eastwards, till they came to the country of the Moabites.

EDROM, anciently ETHERHAM, a parish of Scotland in Berwickshire, about 10 miles long and 6 broad. The surface is generally flat, the climate healthy, and the soil mostly fertile, though part of it is moorish and barren, or clayey. The population in 1790, stated by the Rev. William Redpath, in his report to Sir J. Sinclair, was 1336. He does not mention the population in 1755. The number of horses was 280, of sheep 3000, and of black cattle 600. There are a paper mill, a lint mill, and a wheel manufacture in the parish: which employ 66 people. Husbandry is much improved, and the greater part of the ground is inclosed.

EDSAN, a river of Russia, a branch of the Lena, 20 miles S. E. of Zigansk.

EDUCATION,

Is the art of rearing, forming, and instructing, of children, according to the most appropriate rules and maxims. Its grand object is the gradual improvement and regulation of our moral, physical, and intellectual faculties. Education affords that series of means, by which the human understanding is gradually enlightened, and the dispositions of the human heart are formed and called forth to the performance of their proper action. The word Education, among the ancients seems to have had a signification different from that which is affixed to it by the moderns. *Educit obstetrix*, says Varro, *educat nutrix*, *instituit pædagogus*, *docet magister*. According to this distinction, education, institution, and instruction, are as different, as the midwife, the nurse, the preceptor, and the master. But these verbal distinctions are now laid aside. As no subject is of more importance than education; being in a manner, the foundation, when properly considered, of all science, as well as of all virtue; so many eminent authors, both ancient and modern, have wrote upon it. Lycurgus and many others of the most eminent legislators of antiquity, considered a proper education as so necessary to form good citizens, that they

incorporated their systems of education, with the codes of laws they gave to their countrymen. But among all the legislators and authors of antiquity, of whose works any relics have come down to us, none appears to have written with more propriety on this subject, than the celebrated QUINTILIAN; who taught rhetoric in Rome under Domitian, Nerva, and Trajan. Experience and observation have fully evinced, that the future conduct and happiness of a child depend in many respects principally on his education; hence the necessity of attending to that maxim of heavenly origin, *Train up a child in the way he should go; and when he is old, he will not depart from it*.

The limits of our plan will not permit us to expatiate on this important and useful article, and therefore it will be necessary to confine ourselves to a few general observations, and for further information, to refer to the treatises, which have been written on this subject. We shall make some selections from Dr. Chapman's excellent treatise on education.

"MAN is eminently distinguished among the inhabitants of this globe. He derives this distinction from the structure and aspect

even of his body, and still more from the powers and affections of his mind. The mind indeed seems to have but few ideas at first, and even to be indebted for these to external objects. But the noble and extensive powers, with which it is endued, discover themselves by degrees, and render it highly susceptible of improvement. This improvement is closely connected with the perfection and happiness of mankind: if the mind be darkened by error, and corrupted by vice, we shall be miserable, as well as mean; if it be enlightened by knowledge, and formed to virtue, we shall more easily support the natural evils of life, and we shall open to ourselves the truest and the largest sources of happiness. Hence it appears, that of all the objects which can attract our attention, there is none so interesting as the mind itself. And hence it is, that those who have the charge of youth ought, in a particular manner, to study the nature of the human mind. They should trace it in all its different appearances, and observe it, with a still more curious and attentive eye, in the first and most incorrupted season of life. They should attend to its gradual openings; they should assist it in its exertions, and supply it with proper materials of knowledge. Beginning with the natural objects with which a child is surrounded, they should teach him how to discover their more obvious and useful qualities; then they should point out the changes made upon them by human industry, and the purposes for which such changes are made. Discoveries of this kind, and explanations as the children advance in age, and as the objects present themselves to their notice, will excite their curiosity, and instruct as well as employ their minds. This will be a proper foundation for the languages, the arts, the sciences. The acquisition of knowledge should be made, as much as possible, the fruit of their own inquiries, and of the unconstrained exertions of their mental powers. Thus they will learn to exercise their own understanding in the pursuit of knowledge, rather than trust, upon all occasions, in a lazy and implicit manner, to the opinions of their parents and teachers. Parents and teachers are surely intitled to the highest respect, as well as obedience, from children; but they should take the most effectual measures to secure this respect; they should take the simplest and most probable methods of cherishing those seeds of knowledge which seem more or less to be lodged in the minds of children, and require only proper culture to rear them. Far from pushing children forward in a precipitate manner, by loading their memories with unexplained words, or by requiring from them tasks above their comprehension, or of little utility in life, they should keep pace with their rising genius, by adapting their instructions to their confined ideas, and respective capacities, by explaining every word till it be fully understood, and by teaching with greater care those things which are afterwards to be most useful to them. Further, as education is known to have a powerful influence in forming the tempers and characters of men, parents and teachers should endeavour, as soon as children are capable of comprehending the social ties, to cherish, with the utmost vigilance, that benevolence which is the bond of society, to strengthen that sense of right and wrong which makes a distinguished part of the human constitution, and to prevent those false associations of ideas which are destructive of happiness, and which, children inexperienced in life, and deluded by appearances, are apt to form. Above all, they should study to inspire them with sentiments of duty and gratitude to the Supreme Being, considered as their parent, benefactor, and judge; and to enforce, by a prudent discipline, all those principles which have a tendency to make them happy in themselves, and useful to others. "While they are thus employed in cultivating the mind, the body is by no means to be neglected. Its influence over the mind is as great as its union with it is surprising. The body, when softened by indolence, or by mistaken tenderness, enfeebles the mind, relaxes its vigour, and unfits it for every great or difficult undertaking; when pampered and weakened by luxury, or the gratification of irregular appetite, it subjects the mind to wants not its own, and excites those passions which are the enemies of happiness and of life; but when it is nourished by temperance, and hardened by exercise, it enables the mind to exert its native strength, inspires it with cheerfulness, kindles up the benevolent affections, sets virtue in the most amiable light; and shews it to be the truest happiness of man. If we consider the simplicity of children, and study carefully to preserve them from prejudice, we shall find them open to the best impressions, and delighted with every step they

advance in the road to knowledge and to virtue. This encourages parents and tutors to cultivate the minds of children with the utmost attention; and renders them inexcusable, if they suffer the noxious weeds of folly and vice to spring up in a soil so valuable, and so capable of improvement. This attention, as has been already observed, should begin with the earliest period of life. Weak and flexible, while destitute of experience, and unimproved by reflection, children are ready to adopt the sentiments and copy the manners of those on whom they depend. This propensity to imitation, together with the contagion of example, may hurry them into a blind compliance with the vices and follies of others, and thereby expose them to all the inconveniences of error in judgement and in practice. At the same time, this very propensity, if properly directed, will act like a powerful engine in favour of virtue. From such reflections as these, we may see the dignity of the human mind, the importance of education, the manner in which we ought to conduct it at first, the great objects we ought always to have in view, the necessity of taking care of the body as well as the soul, and the encouragement we have to turn our attention to this subject from the innocence and the docility of children. Hence too parents may learn, that if they neglect the education of their children, the riches which they may accumulate, and the splendid or lucrative employments, which they may procure for them, will but increase their misery. And hence teachers may see the principles which they ought to inculcate, and the nature of the duties incumbent on them, or rather of the high privilege conferred upon them. What occupation is there on earth more useful to mankind, or more delightful in itself, than to improve the mind of man? And what more probable means of succeeding in so noble an attempt, than to superintend it in the first exertions of its faculties, and preserve it, through the critical season of youth, in that healthful state in which its happiness consists. The foregoing observations are sufficiently confirmed by the experience of the ancients as well as the moderns. History, that mirror of human life, exhibits to our view the fortune of mankind ever varying in proportion to their care or negligence in the education of youth. Where this was attended to, and properly conducted, we see, that not only individuals, but even societies, were virtuous and happy: where this was neglected, or the method of conducting it mistaken, we see likewise, that they plunged themselves into vice; and felt, at length, its direful and unavoidable effects. The errors which are frequently committed in education by parents, and those to whom they transfer the care of their children, may be reckoned one great source of human misery. A few instances will confirm the truth of this observation. The manifold accidents to which we are continually exposed, the opposite views and different tempers of mankind, and the precarious hold we have of whatever is external, require that the mind should be formed, by an early and prudent culture, to bear with fortitude and self-command, the various troubles and misfortunes to which we may be subjected. Notwithstanding this, it is no uncommon thing, to see those children whose tempers are warm, and who are susceptible of the finest feelings, frequently neglected in this important point. Instead of teaching them patiently to endure pain and disappointment, and the other evils of life, which cannot be altogether avoided; instead of teaching them to govern their passions, and direct them to proper objects, their parents are often blind enough to allow them to contract an impatience under misfortune, and an impetuosity of spirit when thwarted, both which, gathering strength from indulgence, are often productive of trouble to others, and of misery to themselves. To sources of this kind may be traced many of those outrages which disturb the peace of society, and blast the enjoyment of life. Instead of being taught candidly to acknowledge his faults, the child is suffered to make excuses for them; and sometimes, by a direct lie, to disown them. Thus the sacred regard which is due to truth is gradually diminished, and that fence being broken down, dissimulation, the bane of virtue, establishes an early and a powerful empire in the human heart. Is the child sluggish or refractory? it is thought proper to engage him to his duty by a bribe. Thus, instead of disinterestedness, and the love of virtue, he contracts a sordid and mercenary turn, and a strong attachment to money, which he considers as the great object that interests the passions of men, and the spring by which they ought to be moved: and the high encomiums on it which he so frequently hears, the

passion

passion for it which he observes in the generality of mankind, and the respect which he sees paid to the rich, independent of their virtues, naturally tend to pervert his taste, and teach him to associate the ideas of merit, and of happiness, with the possession of riches. If he gets money from his relations or friends, which they design, through a fond but mistaken affection, as an expression of their regard or esteem, he is often permitted, or rather encouraged, to throw it away in purchasing those things which will sow the seeds of luxury and profusion in his tender mind. Hence that unhappy keenness for toys, fruits, sweet-meats, &c. which we observe in youth, and which, like other infirmities, is nourished by indiscreet and early indulgence; and hence may be derived that desire of superfluities, and those numerous artificial wants, with which a vitiated appetite, or depraved taste, punishes those who depart from the simplicity of nature. Thus we are so far from cultivating a principle of virtue in children during this early period, that we cannot fail, by so unwary a conduct, to ingraft vice in their tender breasts. Hence it is that teachers find it so difficult a task, to root out of their unfortunate pupils those false notions which they have already formed, and to train them up, by virtuous habits, to be good men and useful members of society. When the child arrives at 6 or 7 years, and begins now to multiply his amusements, and to extend his acquaintance, seldom is sufficient care taken to regulate his diversions, and make them subservient to the improvement of his mind, or the health of his body. Is attention given in proportion to the flexibility of his temper, or his want of experience, to shew him the difference of character among the living as well as the dead; to guard him against the infectious example of any idle or naughty children, with whom he may have occasion to converse; and to encourage an intimacy between him and those who are diligent, modest, and virtuous? Is he taught with proper care, to strive with his equals in the noble contest of making himself wiser and better than they? Is he taught, at the same time, to suppress the first risings of envy, that enemy of human happiness, and so resist the emotions of pride and vanity, those silly and selfish passions which are so apt to steal into the unguarded breasts of youth, and especially those of the brightest genius? Is he taught, likewise, to love his companions, to sympathize with them under sickness or unfortunate accidents; to look upon all mankind as his brethren, children of the same common parent; and to consider those to whom he is superior in understanding, or in any of the advantages of fortune, as intitled, upon all occasions, to his advice and assistance? The Author of nature, who confers his gifts with a liberal hand, and adapts them with a parental foresight to the various exigencies of mankind, often bestows a particular genius upon particular persons, and seems by this wise provision, to have marked out the walk of life for which they were designed. Notwithstanding this innate and useful bias, it seldom happens that either the parents or the instructors of a child apply their sagacity to discover the bent of his genius, or direct his studies with a view to render it most valuable to himself, and most beneficial to society. But if his genius be not particular, it would be proper as he advances through youth, and before he chuses his employment, to give him a just view of the advantages and disadvantages, which attend the different occupations of mankind, and to point out to him how far any trade or profession, which he may have in view, is useful to society, and how far it may be suited to his capacity, his temper, and his constitution. Though such considerations as these ought to have great weight in determining his choice, yet seldom is such attention given to direct him, as the importance of that critical step, and the need he has of advice, seem to require. Inexperienced in life, and ignorant of what qualities are necessary in different occupations, he is by no means a proper judge for himself: uninstructed by his parents or teachers, he is too ready to determine himself by the taste of his companions, or by the little incidents which may happen to strike his fancy in the place where he receives his education. In this critical period he is seldom instructed, with proper care, in the use of his time and his money; or taught to spend the former as becomes a rational creature, to divest the latter of the false value stamped upon it by the prejudices of mankind, and to view it in the true light in which it ought to be viewed. To acquire those accomplishments and those habits, when young, which will render us useful in life; to provide for ourselves when of age, and for our families, that they may not be burdens

to society; to give our children a virtuous education; to relieve the indigent, to encourage modest merit, to promote honest industry and public spirit among men, and in general, to do good to our fellow-creatures, are the great purposes to which our time and our money should be applied. We may observe too, that he is not sufficiently taught to look upon industry in his future employment and upon a faithful performance of the duties of his station, as a debt which he owes to the public; nor is he instructed to value men by the decency and propriety with which they acquit themselves in society, rather than by the rank they hold. He ought among other things, to be taught that, if an employment be useful, however humble, it is never to be treated with ridicule or contempt; and can never be so mean, as to preclude the person who industriously and honestly follows it, from the protection and good opinion of mankind." Of all animals, man comes into the world in the most feeble and helpless condition. No other animal, therefore, requires such early, constant, and long continued attention as he does. In this early period of his existence, he is much more an object of care and management than of education. However, it is to be observed, that as "the influence of his body over his mind is great, every plan of education ought to provide for the health of the former, as well as the soundness of the latter." The dress of children, but especially of infants should be light, thin, and easy. The practice of binding up their limbs in swaddling clothes is happily exploded. It is indeed astonishing, that it should ever have been adopted, and still more, that it should have so long, and so generally prevailed. "With us," says the Count de Buffon, "an infant no sooner leaves the womb of its mother, and has hardly enjoyed the liberty of moving and stretching its limbs, than it is clapped again into confinement. It is swathed, its head fixed; its legs stretched out at full length, and its arms placed straight down by the side of its body. In this manner it is bound tight with cloths and bandages, so that it cannot stir a limb," &c. But these barbarous exertions of anxious, but ill-directed care, are now nearly, if not totally abolished. They were kindly intended to prevent deformities, but they operated only to torture the child, and to produce them. The clothes of children should be made so loose and wide, as to leave them the full and free use of all their limbs, without obstructing the circulation of the blood by ligaments of any kind. The dress recommended by Dr. Chapman is "A thin night-cap, a flannel waistcoat without sleeves, a petticoat and gown of light stuff; a thin flannel shirt for the night," and "no shoes or stockings till they are able to run abroad." If too warm clothes are hurtful to children, the custom of sitting near a fire and of sleeping in warm rooms is still more so. Such habits tend to relax the muscular strength of the body, and even in some degree to enfeeble and enervate the powers of the mind. The mother who has milk and strength to nurse her child, and yet gives it up to the care of a mercenary nurse, acts an unfeeling and unnatural part: but she who carries her maternal affection to excess, though she acts from a better principle, deviates no less from the paths of nature. When she makes an idol of her child; increases its weakness, by preventing its sense of it; and, as if she could emancipate him from the laws of nature, prevents every approach of pain or distress; without thinking, that, for the sake of preserving him at present from a few trifling inconveniences, she is accumulating on his head a distant load of anxieties and misfortunes; without thinking that it is a barbarous caution to enervate and indulge the child at the expence of the man. Thetis, says the fable, to render her son Achilles invulnerable, plunged him into the waters of Styx. This is an expressive allegory. The over fond mothers act directly contrary: by plunging their children in softness and effeminacy, they render them more tender and vulnerable; they lay open, as it were, their nerves to every species of afflicting sensations, to which they will certainly fall a prey as they grow up. The course of nature is quite different. She continually exercises her children, and fortifies their constitutions by inuring them early to grief and pain. In cutting their teeth they experience the fever; griping colics throw them into convulsions; the hooping-cough suffocates, and worms torment them; and their blood, by throwing off various purulent matters, subjects them to dangerous cutaneous eruptions. Almost the whole period of childhood is sickness and danger, half the children, that are born, dying before they are eight years old. In passing through this course of experiments, the child who survives them, gathers strength

strength and fortitude, and, as soon as he is capable of enjoying life, the principles of life become less precarious. Experience shews, that children delicately educated die in a greater proportion than others. Provided they are not allowed to exert themselves beyond their powers, less risque is run by exercising, than indulging them in ease. Inure them therefore by degrees to those inconveniencies they must one day suffer. Harden their bodies to the intemperance of the seasons, climates, and elements; to hunger, thirst, and fatigue; in a word, dip them in the Stygian flood. Before the body has acquired a settled habit, we may give it any we please without danger; but when it is once arrived to its full growth and consistence, every alteration is hazardous. A child will bear those vicissitudes which to a man would be insupportable. The soft and pliant fibres of the former readily yield to impression; those of the latter are more rigid, and are reduced only by violence to recede from the forms they have assumed. We must therefore bring up a child robust and hearty, without endangering either its life or health; and though even some risk were run in this respect, it would not afford sufficient cause of hesitation. As soon as a child begins to distinguish objects, a proper choice should be made in those which are presented to it. Every new object is naturally interesting to a child. It finds itself so weak and feeble, that it is fearful of every thing it is not acquainted with. But familiarity, which renders objects uninteresting, destroys this timidity. Children, educated in elegant houses, where cobwebs are carefully swept away, are always afraid of spiders, and retain the same disgust for them as they grow up. What peasant, either man or woman, was ever afraid of a spider? In this view, the education of a child evidently begins before it can speak or understand, since even the choice of objects, presented to its view, is sufficient to render it either timid or courageous. They should be habituated then to new objects, to ugly, disgusting, and uncommon animals; beginning with them, however, at a distance, and letting them approach by degrees; or till, being used to see others handle them themselves. If a child, during his infancy, has been used to regard toads, serpents, or crayfish, with indifference, he will look without horror, as he grows up, on any animal whatever. When a child begins to talk, it weeps less. This progression is natural; one language being only substituted for another. As soon as he can complain in express terms, why should he do it by tears? If a child be of a delicate constitution, extremely susceptible, and naturally apt to cry for nothing, we should dry up the source of his tears, by rendering them fruitless. So long as he continues crying, no one ought to go near him; but run to him immediately on his becoming silent. His manner of calling us to his assistance would be then by his silence, or, at most, by giving only one cry. It is from the perceptible effect of signs, that children judge of their meaning; they see no other relation between them. Whatever mischief a child may have done to itself, it is very rare for it to cry; when alone, at least if it has no hopes of being heard. If a child get a fall, a bump on his forehead, make his nose bleed, or cut his fingers; instead of running to him with an air of apprehension, we should remain quite still, at least for some time. The mischief is done, and there is a necessity for his bearing the pain of it; our over-solicitude would only serve to frighten him the more, and increase his sensibility. In fact, it is less the pain than the fright, which affects children on these occasions. We should spare him, at least, the anxiety of the latter; for he will certainly judge of his misfortune in a great degree as we do. If he sees us alarmed, run eagerly to his relief, console and pity him, he will think himself undone: but if he see us apparently indifferent, and make light of it, he will soon make as light of it himself, and think himself cured as soon as the smart is over. It is at this age children acquire their first principles of courage; and by being inured to slight inconveniencies, learn by degrees to support greater. Indeed, so far from being anxious to prevent a child from cutting or hurting himself, it is better that this should sometimes happen; and that he should not grow up without feeling pain. The first thing we ought to learn, and that which is of the greatest consequence for us to know, is to suffer. It seems as if children were formed little and feeble only to learn this important lesson without danger. If they fall down, or run against any thing, they neither break a leg nor an arm: if they wound themselves with any sharp instrument, the wound is hardly ever fatal, or very deep. We know, in

short, scarcely any instance of a child, when left at liberty, having killed, maimed, or done itself any considerable damage; unless, indeed, where it has been imprudently exposed to tumble down from some high place, to fall into the fire, or water, or within the reach of some deadly weapon. Instead, therefore, of keeping him in the close air of his nursery, he should be taken out every day into the open fields. There he might run and play about; and if he tumbles a hundred times a day, so much the better; he will the sooner learn, when down, to get up again. The pleasure of being at liberty will be a sufficient recompence for his falls. As the child advances in years and understanding, it is of the utmost consequence to inculcate such principles of religion, and consequently of morality as are suited to his years and capacity. "The first and most obvious lesson of morality," says Dr. Chapman, is, 'Not to do ill; not to give pain to another.' This is a lesson which cannot be too frequently inculcated upon children. This is the safest rule for their conduct, and the surest test of their virtue. To this the precept of doing good is but subordinate. The aversion from doing ill, when once rooted in the mind, will accustom children to exercise the understanding in distinguishing between right and wrong; it will check the violence of their passions; it will teach them, if not the most shining, yet the most useful virtues in life; good nature, justice, and prudence." In order that a child may learn this lesson effectually and to good purpose, it is necessary to explain to him in a familiar manner and by some easy comparison, or simile within the compass of his comprehension, that God is his heavenly father, that by him he is preserved in the use and exercise of his powers of body and mind, that it is God his heavenly father who supplies his earthly parents with food, raiment, &c. for his support and convenience. He should then be taught that the highest reverence is due to his heavenly father, as is also his utmost love. He should then be informed that as long as he is obedient to his heavenly father he will find delight and pleasure, but on the contrary when he offends God he will be sure to suffer for it. The child being thus instructed, a foundation will be laid, for inculcating not only the above moral lesson, but many others of a similar nature with their opposites. It may now be observed to him how exceedingly displeasing it is to God for any of his creatures to do ill, or to give pain to another, and by this means an abhorrence of this immorality will be fixed in his breast. Children are so susceptible of instructions, that there is no doubt but their efforts to put in practice what has been communicated will soon be perceived, and perhaps they may sometimes be observed to fail in the performance of their duty; here the parent or instructor has an opportunity to give them another most useful lesson. Here he may unfold to his opening reason the natural depravity and wickedness of the human mind, and letting alone all abstruse reasonings on the subject the proof of it is to be given on the authority of the sacred scriptures, and the observations and experience of good men. He is further to be shewn that he originally brought himself into this state by wilfully doing what was wrong, or forbidden by the Creator, and that in consequence of his crime man was become incapable of doing any thing that is good, and that had it not been for the love and mercy of God in giving a Saviour to redeem man, he must have been miserable and wretched for ever. He may now easily be made sensible that the power of keeping from the commission of evil, and of performing what is right comes from God, and also that God will give, and delights to give this power to all who ask it in the name of Jesus Christ, and that therefore it is necessary thus to ask his grace and to use it, in order that we may be the partakers of real happiness. Lest any should say that these instructions are too difficult for children or not sufficiently important, we shall observe that they are not so difficult as some may imagine. The beauty of our religion is, that it is plain and easy to be understood, especially by those whose minds are not prejudiced by a train of vices, or evil reasonings, and therefore these obvious, essential, and simple, principles of Christianity are fit to be presented to the minds of children. It is also necessary, whenever reason begins to dawn, that these divine precepts be taught on account of their importance. This will be evident to every one who will suffer reason to speak: reason in conjunction with the sacred oracles informs us that to do the will of God, to have a dependence upon him, and to proceed according to his directions, must be the same as to do that which will please him, and that because our happiness or misery entirely depends on his being

pleased, or displeased with us, on his approbation, hence then nothing can be of such importance as these instructions which shew our obligations to the Deity, and the way to please him. Hence it is clear that these subjects cannot be too soon and too carefully impressed on the minds of children, provided the instruction be conveyed in terms and by examples &c. suited to their years and understanding. We find in general that children are ingenious, and ready to believe whatever is told them, they do not naturally seem to manifest a suspicious temper. And on this account we cannot help taking notice of a very general error—(or rather we may say crime,) committed in the education of most children, by mothers, grand-mothers, nurses, servants, and almost all others about them, who, upon every trivial occasion impose upon their ingenious credulity, by telling them the most gross and palpable falsehoods. There is not indeed a more common, or perhaps a more dangerous blunder than this, in the management and education of children. It is attended with various bad consequences. It undermines the first principles of virtue. The child, as soon as it begins to exercise its idea, upon the objects around it, finds it has been told many falsehoods. Hence it begins to suspect falsehood in every thing, and the lessons it afterwards receives from its parents and teachers against lying come rather too late. Besides how cruel it is to impose upon this ingenious readiness of children to believe whatever they are told, by telling them falsehoods from their very birth upwards? It is thus that we teach them falsehood and deceit, and then blame them when we find them afterwards attempting to deceive us. Upon the subject of expressive indulgence we have to observe that when a child evidences a strong desire for any thing, we ought to judge immediately of the propriety of complying with, or refusing it. When a refusal is once given it ought to be absolute and irrevocable. On this head the sentiments of M. Rousseau, contain some very just observations. "But, above all (says he) beware of teaching your child the ceremonious jargon of politeness, a set of phrases which he employs, like magic syllables, to subject to his pleasure every one that comes near him, and to obtain upon demand whatever he desires. In the mode of education adopted by the rich, their children never fail of being rendered politely imperious, by being instructed to make use of such expressions as nobody chooses to resist. Neither in voice nor manner have they any thing suppliant about them: on the contrary, they are as arrogant, if not more so, in their requests, than in their commands, inasmuch as they are always more certain of being obeyed. One sees immediately, that their, If you please, means, It is I please; and that their, pray, stands for do. Admirable politeness this, which teaches them only to pervert the meaning of words, and not to be able to speak otherwise than with the air of command! Surely it is a less evil that a child should prove clownish than insolent, and we had much rather hear him say in a suppliant tone, Do so or so, than make use of a dictatorial Pray, if you please. It is not the words he makes use of that are of so much consequence, but the acceptance he annexes to them. Excessive severity, as well as excessive indulgence, should be equally avoided. If you leave children to suffer, you expose their health, endanger their lives, and make them actually miserable; on the other hand, if you are too anxious to prevent their being sensible of any kind of pain and inconvenience, you only pave their way to feel much greater; you enervate their constitutions, make them tender and effeminate; in a word, you remove them out of their situation as men, into which they must hereafter return in spite of all your solicitude. In order not to expose them to the few evils nature would inflict on them, you provide for them many which they would otherwise never have suffered. Would you know the most infallible way to make your child miserable? It is to accustom him to obtain every thing he desires: for, those desires still increasing from the facility of gratification, your incapacity to satisfy them must sooner or later reduce you to the necessity of a refusal; and that refusal, so new and uncommon, will give him more trouble than even the want of that which he desires. From wanting your cane he will proceed to your watch; he will next want the bird that flies in the air, the star that glitters in the firmament; in short, every thing he sees; nothing less than omnipotence would enable you to satisfy it. It is natural to man to regard every thing as his own, which he has in his power. Could we increase with our desires the means of gratifying them, every one would conceive himself the lord over all. The child, therefore, who needs only desire a thing to obtain it, is led naturally

to imagine himself the proprietor of the universe; he looks upon all mankind as his slaves; and when any thing is, at length, refused him, he, who conceives not the impossibility of executing any of his commands, esteems such refusal as an act of rebellion: all the reasons that can be given him at an age incapable of reasoning, appear to him only pretexts. He sees your ill-will through the whole: the sense of an imaginary injustice sours his disposition; he begins to hate every body; and, without ever thinking himself obliged by their complaisance, is enraged at their contradiction. How is it possible that children, thus subject to be made the prey of the most irascible passions, can ever be happy? Their desires, irritated by the facility with which they have usually been gratified, are bent on impossibilities, whilst they meet on every side with nothing but contradictions, obstacles, sufferings, and sorrow. Always grumbling, fractious, and passionate, they pass their time amidst perpetual tears and complaints. How can these be supposed happy in their situation? Imbecility and authority united, generate only folly and misery. But if these notions of tyranny and command make men miserable in their infancy, how much more will they do so as they grow up, when the relations they stand in to others become more numerous and extensive! Accustomed to see every thing give way to their desires, how will they be surprised, in entering on the world, to see every thing resist their will, and to find themselves oppressed by the weight of that universe, which they imagined they could move about at pleasure! However the lawful and reasonable desires of children, being such as are calculated to make them happy, should be readily complied with. And in every thing they demand, the motive which excites them to make such demand, ought constantly to engage our attention, and determine our conduct with regard to the indulging or denying of their request. While the child is preserved from immoderate and improper desires and indulgences the principles of justice and benevolence should be engrafted, the ideas of right and wrong and those of kindness should be instilled with great care into his mind, presenting him with the choicest examples. Particularly by our own conduct, which a child always observes, we should inculcate these principles. They may also be incited to benevolence, by being encouraged to give something, which they possess and esteem, to relieve or accommodate others. But as M. Rousseau justly observes, we ought not to encourage this to be done, "by returning to children immediately whatever they give;" for, this tends only "to render a child liberal in appearance, and covetous in fact;" and can only "teach them the liberality of an usurer, who gives a penny for a pound" in return. No pecuniary rewards ought, therefore, to be given for acts of charity and generosity. The child should rather, on such occasions be led to reflect on the great good he has done to a poor old man or woman, or to a helpless family of infants, who perhaps, but for his generosity, would have had nothing to eat; and when such scenes of distress (as are alas! too common) are properly represented to his feelings, the child may then be asked, whether he has not more satisfaction in thus supplying their necessities out of his pocket-money, than he could have had by laying it out upon the finest fruits, or the nicest dainties which the confectioner's shop could afford. Thus he will be taught, and will soon begin to feel, that the exercise of such virtue is in reality its own reward. In short, we are fully persuaded, that to breed up children in the principles of virtue and morality, they must be taught these principles as early as possible; and that to inure them to the practice through life, they cannot too early begin. While the heart is young and tender, it is susceptible of every fine feeling and of every good impression; which by habit will afterwards take such firm root as never to be afterwards eradicated. But if we wait till the social virtues spring up spontaneously, as M. Rousseau advises, without ever attempting to plant or cultivate them, it is to be feared we may wait in vain, and discover when too late, that the whole soil is over-run with the weeds of self-love;—a principle, which, however necessary, as the chief spring of action and preservation in every individual, requires nevertheless our utmost exertions to keep it within due bounds, without which, indeed, it becomes the origin of every vice, that disgraces human nature. Mr. Pope in his *Essay on Man*, has been at great pains to prove, agreeably to his friend Lord Bolingbroke's opinion, that

"All self-love and social are the same:"

But Zenith and Nadir are not more opposite; the one being the fountain of all that is good, and the other, when not under due restraint,

straint, of all that is evil in human nature. A proper regulation, therefore of self-love ought to be a principal object with parents and teachers in the education of children. Before we conclude this article, it will be proper to take notice of the impropriety and inconvenience of not teaching young people to think and act of themselves. The art of a governor, and the lessons of a preceptor, change a child into a youth; they infuse into him a greater share of knowledge than he could be naturally supposed to have at his age. But this very child, when he arrives to that stage of life in which he must think, speak, and act, of himself, is stripped all of a sudden of his premature merit. His summer is far from answering the fine blossoms of his spring. The too solicitous education he has received, becomes rather prejudicial to him, by reason of its being the occasion of his falling into the dangerous habit of letting other people think for him. His mind has contracted an internal laziness, which makes him wait for external impulses to resolve and to act. The mind contracts a laziness with as much facility as the legs and feet. A man who never stirs without the assistance of some vehicle, becomes soon incapable of the same free use of his legs, as a person that has been constantly accustomed to walk. As therefore, we must lend a hand to the one when he walks, so we must help the other to think, and even to will: whereas a child bred up to the exercise of his own thoughts and reason, naturally brings his powers into exertion, and his mind from being accustomed to labour becomes active. He learns to reason and determine of himself, in the same manner as other things are learned. At length he attains to argue and resolve rightly, by mere dint of reasoning and reflecting on the cause of his deception, when the events convince him of the error of his judgement. It is not our purpose here to enter into a detail of the several particular branches of education and discipline of youth in their different rising years, and according to their different stations in life, and the different views of their parents; neither have we room to expatiate on the proper qualifications and requisites of tutors, governors, &c. or on the peculiar advantages or disadvantages of public schools, and of private or domestic education. For full information on these subjects, we refer to the numerous treatises, which have been written on education, and of which we shall mention a few of the most remarkable. The most excellent author on education, among the ancients, is Quintilian, who, when he gave over teaching rhetoric at Rome, wrote a Treatise on Rhetoric, and on the most proper means for educating a boy, so as to render him both an eloquent orator, and a good man. In that work Quintilian gives a particular detail of all that appears most likely to conduce to those ends. Even from his birth, he would have the greatest care to be used in selecting those who are to be placed about his young orator. The nurse must have no impediment of speech. If his parents be not persons of sense and learning, his tutor, at least, must possess these qualifications. As soon as he can speak distinctly, he must be initiated in the first elements of literature. Even at this early period of life, Quintilian proposes, that maxims of prudence and the first principles of morals should be inculcated upon his mind, by the books which are put into his hands, and by the lines which he copies in learning to write. The Greek language was to the Romans in Quintilian's time, (like the Latin, Greek, and French, to us at present,) indispensably necessary to all who aspired to a liberal education; and Quintilian judged it proper, that the boy should begin his literary course with the Greek, in preference to the Latin language. Quintilian, after examining the question, whether a domestic or a public education is liable to the fewest inconveniences, and likely to be attended with the greatest advantages; gives his decided opinion in favour of the latter, and wishes that parents would place their children in public seminaries of education. This judicious author declares against severe chastisements of children. "According to his temper and dispositions, let the boy be treated with mildness or severity; but never let severity extend to blows. Let the boy be allured and led, by the most artful and insinuating treatment, to do his duty; there will then be no occasion to punish him for neglecting it." Quintilian's professed object being, not merely to give general directions for forming the heart and cultivating the understanding, but to form a particular character in life, the scholar and the orator; he enters into minute details concerning the manner in which the boy is to be instructed in speaking, writing, grammar, and composition. Music and geometry, he advises also to make a part of the young

orator's studies; to render him accurate in reasoning, and capable of relishing the beauties of the poets. With tender attention, this elegant writer accompanies his pupil through the course of his studies; insists that he be placed under a master distinguished for purity of morals, as well as for abilities; advises his memory to be stored with the best passages of the poets, orators, and historians; and refutes the opinions of those who represent genius as above industry. Among the moderns, few names are more justly venerated, than that of John Milton. His life was devoted to study; and part of it was employed in instructing youth. Among his other works we find a Treatise on Education. He had himself been educated according to the plan long established in the English universities. The object of his directions is chiefly to form the scholar, and to exhibit a plan of "a better education, in extent and comprehension far more large, and yet of time far shorter, and of attainment far more certain, than any that had yet been in practice." His treatise contains many useful observations. The name of John Locke is sufficient to excite the attention of every reader to what he has written on the education of youth. He was capable of thinking for himself; but unlike Rousseau, more desirous of rendering himself useful, than of being admired for singularity. Mr. Locke had been conversant with the world, had inquired into the principles of human nature, and had examined without prejudice the effects of those modes of education of which he disapproves. When we consider, that, to render himself useful to mankind, he could descend from the heights of science to the humble task of translating *Æsop's Fables*, which a philosopher of less philanthropy would have disdained; we cannot but look with veneration on so exalted a character. Mr. Locke's two chief objects in his Treatise on Education, are, 1st, To preserve and strengthen the bodily constitution; 2dly, To inform the understanding with useful knowledge, and to cherish good dispositions in the heart. In his directions on the first of these heads, he recommends plain fare, simple and light clothing, with abstinence from physic and strong liquors, as the most judicious means for preserving and confirming the health of children; together with temperance and early rising. In one thing, however, few parents will be willing to comply with Mr. Locke's advice. He not only directs that the child's feet be frequently bathed in cold water; but even wishes that his shoes were always kept in such a condition as to admit water freely. This he thinks likely to fortify the constitution of the body in such a manner, as to render him less liable, in the course of life, to such diseases as arise from any unusual exposure to wetness or cold, than others whose feet have been more carefully kept dry. Mr. Locke entertained so unfavourable an opinion of the effects of medical preparations on the human body, that he insists on the parent to beware of administering any of them to his child. But whatever may be thought of these advices, or of his plan of invigorating the constitution, by exposure to hardships, his method of cultivating the understanding, and forming the dispositions, deservedly claims the attention of parents and preceptors. With a virtuous indignation he reproaches that folly by which we generally corrupt the heart, and spoil the temper of children, in infancy; so as to render them incorrigible when they advance in life. On the other hand he reckons it neither necessary nor prudent to treat them with harshness or severity. Let them be formed to obedience from their earliest years: let them be accustomed to submit implicitly to the direction of those on whom they depend. But beware of souring their tempers, and depressing their spirits by harshness; as well as of accustoming them to neglect their duty, except when allured to it by the hopes of reward. Mr. Locke's treatise is well deserving the perusal of the judicious parent, or teacher; and though a few things may be found in it exceptionable, yet for the most part it will present and furnish rules and observations, not only appropriate, but exceedingly proper for practical application. The Rev. Dr. Isaac Watts, whose numerous works upon philosophy, logic, divinity, &c. are well known, has also a Discourse on the Education of Children and Youth; annexed to his excellent treatise on *The Improvement of the Mind*. It treats of, 1. Instructing children in religion, which the Dr. thinks should be attempted "as soon as they begin to know almost any thing." 2. The improvement of their natural powers: 3. Self-government, which he proposes children to be early instructed in: 4. Reading and writing: 5. An employment: 6. Rules of prudence: 7. Accomplishments in life among which the Dr. enumerates the Greek, Latin, and French

French languages, logic, mathematics, astronomy, natural philosophy, and the fine arts. With regard to the languages, the Dr. reckons "the knowledge of things of much more importance than that of words." 8. Of evil influences, from terrifying stories, bloody histories, &c. 9. Of sports and diversions, amongst which he justly condemns the practice of cock-fighting, as well as plays and masquerades. 10 and 11. His two last sections treat of the proper degrees of liberty and restraint in sons and daughters. From these general heads, this tract evidently appears to be well worthy of the attention of Christian parents. Dr. Turnbull published *Observations on Liberal Education*; at London, in 1742. This work contains the essence of what has been written on the subject by the ancients; with remarks from Mr. Locke and others of the moderns. The author shews the importance of early habits of virtue, and recommends along with the acquisition of the vernacular and learned languages, the study of natural and moral philosophy, and the cultivation of a taste for the beauties of nature, and the still greater beauties of virtue. Dr. Chapman says it "abounds in instructions very useful to parents and children." In 1743, Mr. James Barclay published at Edinburgh a *Treatise on Education*, in 12mo. containing, says Dr. Chapman, "many useful observations on public and private education, the duty of parents and teachers; grammar, history, taste, poetry," &c. In 1756, Mr. James Neidson, apothecary, published *An Essay on the Government of Children*, under three general Heads; Health, Manners, and Education, 12mo. Lond. Dr. Chapman recommends this work as containing "many judicious rules and observations worthy the attention of parents and teachers." In 1762, the celebrated John James Rousseau surprised the public with his *Emilius*; a moral romance in 4 vols. 12mo. In this work there are many things deserving of the severest censure, while other parts are highly commendable in his system, which is theoretical, and often unfit for practice; he fixes the time for commencing certain instruction by far too late. Even Rousseau himself, notwithstanding the art with which he lays down his system, cannot avoid acknowledging indirectly, on several occasions, that our social dispositions, our rational and our moral powers, display themselves at an earlier period, than that at which he wishes us to begin the cultivation of them. But though the great outlines of his system be merely theory, unsupported by facts, nay, plainly contradictory to facts; yet his observations on the impropriety or absurdity of the prevalent modes of education are very often just, and many of the particular directions which he gives for the conducting of education are judicious. Father Gerdil, in his *Reflections on Education*, published in 1765, examines the principles laid down by M. Rousseau in his *Emilius*, and shews in opposition to him, that man is designed for a social state, and improved by it; that children are capable of early instruction, and may be taught fables, geography, history, and geometry; that they may be formed to a taste for true Latinity; and that the lower, as well as the higher rank of life, ought to be trained, by early culture, to the fear of God, obedience to parents, and the fundamental duties of society. Mr. Sheridan, in his *Plan of Education for the young Nobility and Gentry of Great Britain*, published in 1769, censures the methods commonly pursued in the great schools in England, and points out the ends we ought to have in view, and the means and the instruments we ought to use, in the education of youth: the ends are, to make good men, good citizens, and good Christians; the means, a strict attention to their behaviour, and the adapting their studies to their talents, and to their future professions and offices in life; the instruments, a sense of honour, a sense of shame, and, above all, a sense of delight. The learned and pious author of *Letters*, containing a *Plan of Education for Rural Academies*,

published in 1773, complains that education does not engage the attention it merits; represents the country as most favourable to the health, the safety, the morals, and the religious training, of youth; recommends a plain diet, and a plain, but neat dress; prescribes a course of education from 7 to 11 years of age, to consist of the principles of religion, moral tales, the rudiments of Latin, and elements of Greek, with writing and arithmetic; from 11 to 15, he enjoins perseverance in the study of the classics, and of history, with the elements of rhetoric, algebra, and geometry; sends his pupil to the university, if he be designed for any of the learned professions; thinks that the student suffers much from discontinuing his studies during the summer months, and advises him to be sent back to the academy through the summer, to prevent habits of idleness and dissipation, to revise what he had formerly learned, and to prepare for the next course at the university; but, instead of sending him to the university at the age of 15, he detains him at the academy, if he be designed for the service of his country in a civil or military capacity; prescribes a continuation of his former studies, and introduces him to natural history and philosophy; lays down a course of study at the academy for such as are to follow a mercantile employment; proposes a plan for the education of young ladies at a rural academy; and concludes with a plan of education in parochial schools, laid down by Mr. Fletcher of Salton, who made a figure about the beginning of this century. "This author, says Dr. Chapman, insists much on instilling religious and moral principles, and on training the youth of both sexes, by virtuous habits, to the different duties of life." In 1777, Dr. Ash published *Sentiments on Education*, collected from the best authors, with occasional observations: in 2 vols. 12mo. Lond. Vol. i. contains instructions and observations; on teaching to read; grammar; writing; drawing; arithmetic; geometry; geography; astronomy; chronology; music; rhetoric; a course of reading; public speaking; trade and commerce. Vol. 2 treats of female accomplishments; of modesty; the passions; epistolary correspondence; subordination in society; behaviour in social and civil life; love and marriage; management of a family; and religion. The Rev. Mr. Knox, in his *Liberal Education, or Practical Treatise on the Methods of acquiring Useful and Polite Learning*, published in 1781, prefers public education for boys, and domestic, with little exception, for girls; condemns the use of translations, and editions of the classics with notes; insists on industry, and the diligent use of dictionaries in schools; enjoins the rules of Lily's Grammar, and large portions of the best classics to be got by heart, with the writing of exercises, and the composition of themes in English and Latin, and in verse as well as prose, according to the practice of the best schools of England; advises that there be public rehearsals by the elder scholars once every week from the best English and Latin authors, and public examinations at short intervals; insists on a judicious and well supported discipline in schools; and makes many just and ingenious observations on cultivating the minds of both sexes, &c. Dr. Chapman says, Mr. Knox's stile is so accurate and elegant, that it may be said to be truly attic. In 1792, Dr. George Chapman published the fifth edition, improved and enlarged, of his *Treatise on Education*, in two parts. With the Author's *Method of Instruction* while he taught the School of Dumfries; and a *View of other Books on Education*. This work is one of the best and most complete we have on this subject, and is admirably adapted for practice. *Strictures on female education*, by Mrs. A. More, is a work well adapted to give those entrusted with the education of young ladies proper views of this important charge.

EDULCORATION, in chemistry, properly signifies the rendering of substances more mild. It consists almost always in taking away acids and other saline substances; and this is effected by washing the bodies, to which they adhere, in a large quantity of water. The washing of diaphoretic antimony, powder of algaroth, &c. till the water comes off quite pure and insipid, are instances of chemical edulcoration.

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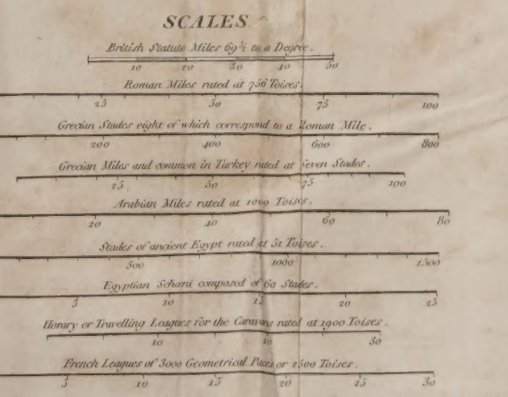
EDULCORATION, in pharmacy, is merely the sweetening of juleps, potions, and other medicines, by adding sugar or syrup.

EDWARDS, GEORGE, F. R. A. SS. was born at Stratford, a hamlet of Westham in Essex, April 24, 1694. Upon leaving school, he was put apprentice to a tradesman in Fenchurch-street, who treated him with great kindness; but about the middle of his apprenticeship, an accident happened, which led young Edwards



M E D I T E R R A N E A N S E A

EGYPT
called in the Country
MISSIR,
By J.B. DANVILLE,
of the Royal Academy of Belles Lettres, and
of the Academy of Sciences of Petersburg.



EFT, in zoology. See LACERTA.

EGAKTO, one of the smaller Kurile islands, in the N. Pacific ocean.

EGENBURG, or EGGENBURG, a town of Germany, in the archduchy of Austria, 36 miles N.W. of Vienna.

EGERI, one of the late grand communities of Switzerland, which, with the town of Zug, formed the Canton of Zug.

EGERIA, or ÆGERIA, a nymph held in great veneration by the Romans. She was courted by Numa Pompilius; and according to Ovid, became his wife. This prince to give his laws the greater authority, solemnly declared, before the Roman people, that they were previously sanctified and approved by the nymph Egeria. Ovid says, that Egeria was so disconsolate at the death of Numa, that she melted into tears and was changed into a fountain by Diana.

EGG, in physiology, a body formed in certain females, in which is contained an embryo, or fœtus of the same species, under a cortical surface or shell. The exterior part of an egg is a shell; which in a hen, for instance, is a white, thin, and friable cortex, including all the other parts. The shell becomes more brittle by being exposed to a dry heat. It is lined every where with a very thin, but a pretty tough membrane, which dividing at, or very near, the obtuse end of the egg, forms a small bag, where nothing but air is contained. In new-laid eggs this follicle appears very little, but becomes larger when the egg is kept. Within this are contained the albumen, or white, and the vitellus, or yolk; each of which have their different virtues. The albumen is a cold, viscous, white liquor in the egg, different in consistence in its different parts. It is observed that there are two distinct albumens, each of which is inclosed in its proper membrane. Of these one is very thin and liquid; the other is more dense and viscous, and of a somewhat whiter colour; but in old and stale eggs, after some days incubation, inclining to a yellow. As this second albumen covers the yolk on all sides, so it is itself surrounded by the other external liquid. The albumen of a fecundated egg, is as sweet and free from corruption, during all the time of incubation, as it is in new-laid eggs; as is also the vitellus. As the eggs of hens consist of two liquors separated one from another, and distinguished by two branches of umbilical veins, one of which goes to the vitellus, and the other to the albumen; so it is very probable that they are of different natures, and consequently appointed for different purposes. When the vitellus grows warm with incubation, it becomes more humid, and like melting wax or fat; whence it takes up more space. For as the fœtus increases, the albumen insensibly wastes away and condenses; the vitellus, on the contrary, seems to lose little or nothing of its bulk when the fœtus is perfected, and only appears more liquid and humid when the abdomen of the fœtus begins to be formed. The chick in the egg is first nourished by the albumen; and when this is consumed, by the vitellus, as with milk. If we compare the chalazæ to the extremities of an axis passing through the vitellus, which is of a spherical form, this sphere will be composed of two unequal portions, its axis not passing through its centre; consequently, since it is heavier than the white, its smaller portion must always be uppermost in all positions of the egg. The yellowish white round spot, called cicatricula, is placed on the middle of the smaller portion, and therefore always appears on the superior part of the vitellus. Not long before the exclusion of the chick, the whole yolk is taken into its abdomen; and the shell at the obtuse end of the egg, frequently appears cracked some time before the exclusion of the chick. The chick is sometimes observed to perforate the shell with its beak. After exclusion, the yolk is gradually wasted, being conveyed into the small guts by a small duct. Eggs differ very much according to the birds that lay them, as to their colour, form, bigness, age, and the different way of dressing them: those most used in food are hens' eggs; of which such as are new-laid are best. As to the preservation of eggs, it is observed that the egg is always quite full when it is first laid by the hen; but from that time it gradually becomes less and less so, to its decay: and however compact and close its shell may appear, it is nevertheless perforated with a multitude of small holes, though too minute for the discernment of our eyes, the effect of which is a daily decrease of matter within the egg, from the time of its being laid; and the perspiration is much quicker in hot weather than in cold. To preserve eggs fresh, there needs no more than to preserve them full, and stop the transpiration; the method

of which is, by stopping up those pores with matter which is not soluble in watery fluids: and on this principle it is that all kinds of varnish, prepared with spirit of wine, will preserve eggs fresh for a long time, if they are carefully rubbed all over the shell; tallow, mutton fat, and even fresh butter are also good for this purpose; for such as are rubbed over with any of these will keep as long as those coated over with varnish. M. Reaumur observes, that hens eggs are properly a sort of chrysalis of the animal; their germ, after they are impregnated by the cock, containing the young animal alive, and waiting only a due degree of warmth to be hatched, and appear in its proper form. When eggs have been long kept, there is a road found near one of their ends, between the shell and the internal membrane; this is a mark of their being stale, and is the effect of an evaporation of part of their humidity; the varnish which M. Reaumur used to the chrysalis, being tried on eggs, was found to preserve them for two years, as fresh as if laid but the same day, and such as the nicest palate could not distinguish from those that were so.

EGLANTINE, in botany. See ROSA.

EGLISOW, an ancient town of the Helvetic Republic, in the canton of Zurich, 15 miles N. of Zurich.

EGMONT, a town of Batavia or Holland, in the dept. of the Texel, 3 miles S. of Alcaer.

EGMONT ISLAND, in the south Pacific Ocean, is 6 miles long, and 4 broad. The land is low and full of trees. Lon. 138. 30. W. Lat. 19. 20. N.

EGOTISM, [from *ego*, Lat.] the fault committed in writing by the frequent repetition of the word *ego* or *I*; too frequent mention of a man's self in writing or conversation.

EGRA, a river and town of Bohemia, 76 miles W. of Prague. Lon. 12. 40. E. Lat. 50. 9. N.

EGREMONT, a town of England, in the county of Cumberland, 9 miles S.S.E. of Whitehaven.

EGYPT, an extensive country of Africa, lying between 30° and 36° of lon. E. and between 21° and 31° of lat. N. It is bounded by the Mediterranean on the N.; by the Red-sea and Isthmus of Suez, which divide it from Arabia, on the E.; by Abyssinia or Ethiopia, on the S.; and by the deserts of Barca and Nubia, on the W.; being 600 miles in length from N. to S. and from 100 to 250 in breadth from E. to W. Ancient Egypt is by some divided into two parts, the Upper and Lower Egypt: by others into three, the Upper Egypt, properly so called, or Thebais; the Middle Egypt, or Heptanomis; and the Lower Egypt, the best part of which was the Delta, or that space encompassed by the branches of the Nile. See THEBAIS, &c. Egypt may with justice lay claim to as high antiquity as any nation in the world. The country was most probably peopled by Mizraim the son of Ham and grandson of Noah. By its ancient inhabitants it was called Chemia, and is still called Chemi in the language of the Copts or native Egyptians. This name it is supposed to have received from Ham the son of Noah. In scripture we find it most generally named Mizraim; though it is styled in the Psalms the land of Ham. To us it is best known by the name of Egypt, the etymology of which is more uncertain. Some derive it from Ægyptus, a supposed king of the country: others say it signifies no more than "the land of the Copts;" *aia* in Greek signifying a country, and *Αἰγυπτος*, *Aicoptos*, being easily hardened into Ægyptus. The most probable opinion, however, seems to be, that it received this name from the blackness of its soil, and the dark colour both of its river and inhabitants: for such a blackish colour is by the Greeks called *ægyptios* from *γυψ* and *Αἰγυπτος* a vulture; and by the Latins, *subvulturius*. For the same reason, other names of a similar import have been given to this country by the Greeks; such as *Aeria*, and *Melambolus*; the river itself was called *Melo* or *Melas*; by the Hebrews, *Shihor*; and by the Ethiopians, *Siris*; all of which signify black. The air and climate of Egypt are extremely hot, not only from the height of the sun, which in summer approaches near to the zenith, but from the want of rain, and from the vicinity of those burning and sandy deserts which lie to the S. In July and August, according to M. Volney, Reaumur's thermometer stands, even in the most temperate apartments, at 24° or 25° above the freezing point; and in the southern parts it is said to rise still higher. Hence, he says, only two seasons should be distinguished in Egypt, the cool and the hot, or spring and summer. The latter continues for the greatest part of the year, viz. from March to November, or even longer; for by the end of February,

February the sun is intolerable to an European at nine o'clock in the morning. During the whole of this season, the air seems to be inflamed, the sky sparkles, and every one sweats profusely, even without the least exercise, and when covered with the lightest dress. This heat is tempered by the inundation of the Nile, the fall of the night dews, and the subsequent evaporation; so that some of the European merchants, as well as the natives, complain of the cold in winter. The dew does not fall regularly throughout the summer, as with us; the parched state of the country not affording a sufficient quantity of vapour for this purpose. It is first observed about June 24th when the river has begun to swell, and consequently a great quantity of water is raised from it by the heat of the sun, which being soon condensed by the cold of the night air, falls down in copious dews. By reason of the great dryness of the air, Egypt is exempted from the phenomena of rain, hail, snow, thunder, and lightning. Earthquakes are also seldom heard of in this country; though sometimes they have been very fatal and destructive, particularly one in 1112. In the Delta, it never rains in summer, and very seldom at any other time. In 1761, however, such a quantity of rain unexpectedly fell, that a great number of houses, built with mud-walls, tumbled entirely down by being soaked with the water, to which they were unaccustomed. In the Higher Egypt the rain is still less frequent; but the people, sensible of the advantages which accrue from it, always rejoice when any falls, however insufficient to answer the purpose. This deficiency of rain is supplied by the inundation and dews. The latter proceed, partly from the waters of the inundation, and partly from the sea. At Alexandria, after sunset, in April, the clothes exposed to the air on the terraces are soaked with them as if it had rained. These dews are more or less copious according to the direction of the wind. They are produced in the greatest quantity by the W. and N. W. which blow from the sea; but the S. and S. E. winds, blowing over the deserts of Africa and Arabia, produce none. According to M. Volney, who gives a very particular description of the face of the country, the entrance into Egypt at Rosetta presents a most delightful prospect, by the perpetual verdure of the palm-trees on each side, the orchards watered by the river, with orange, lemon, and other fruit-trees, which grow there in vast abundance; and the same beautiful appearance is continued all the way to Cairo. As we proceed farther up the river, he says, that nothing can more resemble the appearance of the country than the marshes of the lower Loire, or the plains of Flanders: instead, however, of the numerous trees and country houses of the latter, we must imagine some thin woods of palms and sycamores, with a few villages of mud-walled cottages, built on artificial mounds. All this part of Egypt is very low and flat, the declivity of the river being so gentle, that its waters do not flow at a greater rate than one league in an hour. Throughout the country nothing is to be seen but palm-trees, single or in clumps, which become more rare as you advance; with wretched villages composed of huts with mud walls, and a boundless plain, which at different seasons is an ocean of fresh water, a miry morass, a verdant field, or a dusty desert; and on every side an extensive and foggy horizon, where the eye is wearied and disgusted. At length towards the junction of the two branches of the river, the mountains of Cairo are discovered on the E.; and to the S. W. three detached masses appear, which from their triangular form are known to be the Pyramids. We now enter a valley which turns to the S. between two chains of parallel eminences. That to the E. which extends to the Red Sea, merits the name of a mountain from its steepness and height, as well as that of a desert from its naked and savage appearance. Its name in the Arabic language is Mokattam, or the hewn mountain. The western is nothing but a ridge of rocks covered with sand, which has been very properly termed a natural mound or causeway. In short, that the reader may at once form an idea of this country, let him imagine on one side a narrow sea and rocks; on the other, immense plains of sand; and in the middle, a river, flowing through a valley of 150 leagues in length, and from three to seven wide, which at the distance of 30 leagues from the sea separates into two arms; the branches of which wander over a soil almost free from obstacles, and void of declivity. This country is still divided into two principal parts, called the Higher, or Upper, and Lower Egypt. It is subdivided into 80 provinces.

EGYPT, HIGHER, or UPPER, says M. Savary, is only a long narrow valley beginning at Sienuia, and terminating at Cairo. It is

bounded by two chains of mountains running from N. to S. and taking their rise from the last cataract of the Nile. On reaching the latitude of Cairo they separate to the right and left; the one taking the direction of mount Colzoum, the other terminating in some sand-banks near Alexandria; the former being composed of high and steep rocks, the latter of sandy hillocks over a bed of calcareous stone. Beyond these mountains are deserts bounded by the Red Sea on the east, and on the west by other parts of Africa; having in the middle that long plain which, even where widest, is not more than nine leagues over. Here the Nile is confined in its course betwixt these insuperable barriers, and during the time of its inundation overflows the country all the way to the foot of the mountains; and Mr. Bruce observes, that there is a gradual slope from the bed of the river to those mountains on both sides. The baron de Tott says, that the mountains four leagues from the Nile, and facing Cairo, "are only a ridge of rocks above 40 or 50 feet high, which divide Egypt from the plains of Libya; which ridge accompanies the course of the river, at a greater or less distance, and seems as if only intended to serve as a bank to the general inundation."

EGYPT, LOWER, according to M. Savary, comprehends all the country between Cairo, the Mediterranean, the Isthmus of Suez, and Libya. "This immense plain (says he) presents on the borders of its parching sands a stripe of lands, cultivated along the canals of the river, and in the middle a triangular island to which the Greeks gave the name of Delta; at the top of the angle of which, the Baron de Tott informs us, the rocks of Libya and the coasts of Arabia open and recede from each other, towards the E. and W. parallel to the Mediterranean. This great extent of country, from Barca to Gaza, is either overflowed by the river, or capable of being so; which thus fertilizes in a high degree a tract of country, seemingly devoted to perpetual barrenness, on account of the want of rain and the heat of the climate. According to the testimonies of both Mr. Bruce and M. Volney, the coast of Egypt is so extremely low, that it cannot be discovered at sea till the mariners come within a few leagues of it. In ancient times the sailors pretended to know when they approached this country, by a kind of black mud brought up by their sounding lines from the bottom of the sea; but this notion, though as old as the days of Herodotus, has been discovered to be a mistake by Mr. Bruce; who found the mud to arise while the vessel was opposite to the deserts of Barca. All along the coast of Egypt a strong current sets to the eastward. The river Nile, when swelled by the rains which fall in Abyssinia, begins to rise in Egypt about the month of May; but the increase is inconsiderable till towards the end of June, when it is proclaimed by a public crier through the streets of Cairo. About this time it has usually risen five or six cubits; and when it has risen to sixteen, great rejoicings are made, and the people cry out Waffah Allah, *i. e.* God has given abundance. This commonly takes place about the end of July, or before the 20th of August; and the sooner it takes place, so much the greater are the hopes of a good crop. Sometimes, though rarely, the necessary increase does not take place till later. In 1705, it did not swell to sixteen cubits till the 19th of September, the consequence of which was, that the country was depopulated by famine and pestilence. We may easily imagine, that the Nile cannot overflow the whole country of itself, in such a manner as to render it fertile. There are therefore, innumerable canals cut from it across the country, by which the water is conveyed to distant places, and almost every town and village has one of these canals. In those parts of the country, which the inundation does not reach, and where more water is required than it can furnish, as for the watering of gardens, &c. they have recourse to artificial means for raising it from the river. Formerly they made use of Archimedes's Screw, (see HYDROSTATICS;) but now in place of it they have the Persian wheel. This is a large wheel turned by oxen, having a rope hung with several buckets which fill as it goes round, and empty into a cistern at the top. Where the banks of the river are high, they frequently make a bason in the side of them, near which they fix an upright pole, and another with an axle across the top of that, at one end of which they hang a great stone, and at the other a leathern bucket; this bucket being drawn down into the river by two men, is raised by the descent of the stone, and emptied into a cistern placed at a proper height. This kind of machine is used chiefly in the upper parts of the country, where the raising of water is more difficult than in places near the sea. When any of their gardens or plantations want water, it is conveyed from the cisterns into little trenches,

trenches, and from thence conducted all round the beds in various rills, which the gardener easily stops by raising the mould against them with his foot, and diverts the current another way as he sees occasion. The rise of the inundation is measured by an instrument adapted for the purpose, called mireas, which we translate nilometer. Mr. Bruce informs us, that this is placed between Geeza and Cairo, on the point of an island named Rhoda, about the middle of the river, but somewhat nearer to Geeza. It is a round tower with an apartment, in the middle of which is a cistern neatly lined with marble. The bottom of this cistern reaches to that of the river, and there is a large opening, by which the water has free access to the inside. The rise of the water is indicated by an octagonal column of blue and white marble, on which are marked 20 cubits of 22 inches each. The two lowermost have no subdivisions; but each of the rest is divided into 24 parts called digits; the whole height of the pillar being 36 feet 8 inches. When the river has attained its proper height, all the canals are opened, and the whole country laid under water. During the time of the inundation a certain vortical motion of the waters takes place; but notwithstanding this, the Nile is so easily managed, that many fields lower than the surface of its waters are preserved from injury merely by a dam of moistened earth, not more than eight or ten inches in thickness. This method is used particularly in the Delta when it is threatened with a flood. As the Nile does not always rise to a height sufficient for the purposes of agriculture, the former sovereigns of Egypt were at vast pains to cut proper canals to supply the deficiency. Some of these are still preserved; but great numbers have been rendered useless through the indolence or barbarity of their successors. The arts and all kinds of learning are at a very low ebb among the Egyptians. Even the most simple of the mechanical professions are still in a state of infancy. The work of their cabinet-makers, gunsmiths, and locksmiths, is extremely clumsy. There are manufactures of gunpowder and sugar; but the quality of both is very indifferent. The only thing, in which they can be said to have arrived at any degree of perfection, is the manufacture of silk stuffs; though even these are far less highly finished than those of Europe. In ancient times, when Egypt was governed by its native sovereigns, it is said to have contained 20,000 cities and towns: its armies to have amounted to 300,000 men, and its total population to eight millions. By the tyranny of the Beys and Mamelukes, it now hardly amounts to half that number. The inhabitants of Egypt have been long distinguished, into four distinct races of people, viz. Arabs, Copts, Mamelukes, and Turks. The Arabs may be subdivided into three classes: 1. The posterity of those who settled here immediately after the conquest of the country by Amrou Ebn Al As, the khalif Omar's general. 2. The Magrebiens, or Western Arabs, who at different times have migrated from the countries to the westward of Egypt, and are descended from the Saracen conquerors of Mauritania. 3. The Bedouins, or Arabs of the desert, known to the ancients by the name of Scenites, or dwellers in tents. The Copts are descended of those inhabitants of Egypt whom the Arabs subdued; and who were composed of original Egyptians, Persians, and Greeks. M. Volney is of opinion that their name of Copts is only an abbreviation of the Greek word *Αιγυπτίος*, an Egyptian. They are principally to be met with in the Said, though some also inhabit the Delta. They have all a yellowish dusky complexion, puffed up visages, swollen eyes, flat noses, and thick lips; and in fact, the exact countenance of the mulatto. The Mamelukes may be considered as the real masters of Egypt; and to secure themselves in the possession of the country, they took several precautions. One of the principal was the degradation of the military corps of azabs and janizaries, both of which were formerly very formidable. They effected this only in consequence of the wretched government of the Turks; for, before the revolt of Ibrahim Kiaya, the Turkish troops, which ought to have consisted of 40,000, were reduced to less than half that number through the avarice of their officers. Their degradation was completed by Ali Bey; who, having first displaced all the officers who gave him any umbrage, left their places vacant, and so reduced the consequence of the whole, that the azabs and janizaries are now only a rabble, who dread the Mamelukes as much as the meanest of the populace. The principal body of the Mamelukes reside at Cairo; but many of them are dispersed through the country, in order to keep up their authority, collect

the tribute, and oppress the people. They are all horsemen; and as war is accounted the only honourable employment among them, it is reckoned disgraceful to walk on foot, none but cavalry being by them accounted soldiers. The Turks have the title of being masters of Egypt, but are chiefly to be met with at Cairo, where they possess the religious and military employments. Formerly they possessed also the posts under government; but these were of late monopolised by the Mamelukes. Besides camels, horses, asses, mules, sheep, black cattle, and other domestic quadrupeds, there are many wild animals in Egypt; particularly tigers, hyenas, antelopes, crocodiles, apes with heads resembling those of dogs, hippopotamuses, ichneumons, chameleons, yellow lizards, and a species of rats resembling ferrets, remarkably useful for destroying the crocodiles' eggs. Among the feathered tribe, there are ostriches, eagles, hawks, pelicans, and water fowls of various kinds, among which last the most remarkable is the ibis, a bird of the duck kind, which was deified by the ancient Egyptians, on account of its usefulness in destroying serpents and noxious insects. These are numerous, and among the different species of serpents the cerastes, or horned viper, abounds, whose bite proves mortal, except to those who have the secret of charming it. "It would require volumes," (says John Walker, in his "Elements of Geography,") to describe the astonishing remains of ancient temples, palaces, columns, statues, paintings, &c. that are so profusely scattered over a great part of this once renowned country. Some of these we have already described. See ALEXANDRIA and CATACOMBS, others will be found in their order. See LABYRINTH, OBELISK, and PYRAMIDS. M. Volney says, "the soil of Egypt is the most fruitful of the whole earth, the easiest cultivated, and the most certain in its crops. Plenty does not there depend as in the Morea and Candia upon the contingency of rain." Egypt was in the earliest ages much celebrated for its fertility. This Volney ascribes to the salt with which it abounds. So great is the propensity of the Egyptian soil to produce salt, that even when the gardens are overflowed for the sake of watering them, the surface of the ground, after the evaporation and absorption of the water, appears glazed over with salt. The water found in the wells contains mineral alkali, marine salt, and a little nitre. M. Volney is of opinion, that the fertile mould of Egypt, which is of a black colour, differs essentially from that of the other parts; and is derived from the internal parts of Ethiopia along with the waters of the Nile; but there is no reason to suppose this kind of earth to be of a foreign origin; it being always the result of vegetation and cultivation. Even the most barren and sandy spots in the world, if properly watered, and such vegetables planted in them as would grow there, in time would be covered with this black earth as well as others: and of this kind of artificial formation of soil, Dr. Shaw gives a remarkable instance in the garden of the monks at mount Sinai, which they have rendered very fertile, though the country is naturally as barren as in any place of the world. On the whole, we may reasonably conclude, that the natural fertility of Egypt is not diminished in modern times, provided the same pains were taken in the cultivation of it as formerly. "The Delta," (says M. Savary,) is at present in the most favourable state for agriculture. Washed on the E. and W. by two rivers formed by the division of the Nile, each of which is as large and more deep than the Loire, and intersected by innumerable rivulets; it presents to the eye an immense garden, all the different compartments of which may be easily watered. During the three months that the Thebais is under water, the Delta possesses fields covered with rice, barley, vegetables, and winter fruits. It is also the only part of Egypt where the same field produces two crops of grain within the year, the one of rice, the other of barley." Oranges, lemons, figs, dates, almonds, cassia, plantains, &c. abound in it. But the territory of Egypt in general produces every thing that either Europe or Asia can boast; as corn, rice, cotton, flax, indigo, sugar, saffron, coffee, sena, rhubarb, aloes, opium, &c. The only cause of all this fertility is the Nile, without which the whole country would soon become an uninhabitable desert, as rain falls very seldom in this part of the world.

EGYPT, PYRAMIDS OF. See PYRAMIDS.

EGYPTEN, a town of the duchy of Courland, 100 miles S. E. of Mitau. Lon. 26. 40. E. Lat. 56. 2. N.

EGYPTIANS, the inhabitants of Egypt. See EGYPT. T. the different races mentioned under that article.

considerable number of Jews, Greeks, and Syrians, who are mingled with the other Egyptians.

EGYPTIANS, or GYPSIES. See GYPSIES.

EGYPTIAN THORN. See ACACIA.

EHINGEN, or EBINGEN, a town of Germany, in Suabia, on the Danube. Lon. 9. 45. E. Lat. 48. 18. N.

EHINGEN, or EBINGEN, a town in Suabia, on the Neckar, belonging also to Austria. Lon. 8. 45. E. Lat. 48. 25. N.

EHLE, a river of Germany, in Upper Saxony, which runs into the Elbe, near Magdeburg.

EHRETIA, a genus of the monogynia order, and pentandria class of plants; natural order, Asperifolize. Fruit a bilocular berry; seeds solitary, bilocular; stigma emarginated. Five species, which are trees or shrubs.

EHRFELDEN, a town of Germany, in the circle of the Upper Rhine, 8 miles W. of Darmstadt.

EHRHARTA, in botany, a genus of the monogynia order, and hexandria class of plants. Calyx a two-valved, abbreviated, one-flowered glume; corolla a double glume, each two-valved, the exterior one compressed, and scymeter-shaped, transversely wrinkled, and gashed at the base; stigma simple, compressed, four-tufted. It has five species.

EHUD, the son of Gera, a Benjamite, who delivered the republic of Israel from the oppressions of Eglon, king of the Moabites, by assassinating the tyrant in his own parlour; A. M. 2570, according to Alstedius, or as others have it, A. M. 2679. Ehud is ranked by chronologers, as the third judge of Israel after Moses, although he is not expressly mentioned in scripture as a judge, but only as a deliverer. See Judges iii. 15—31.

EIA and EY, in our old writers, are used for an island. Hence the names of places ending in *ey*, denote them to be islands. Thus, Ramsey, the isle of rams; Shepey, the isle of sheep, &c.

EIA is also sometimes used for water; and hence the names of places near waters or lakes terminate in *ey*.

EICHENBUHL, a town of Germany, in the late circle of the Lower Rhine, 29 miles of Heidelberg.

EICHSFELD, or EISFELD, a county of Germany in the late circle of the Lower Rhine.

EICHTERNACH, a town of France, in the department of Forests, and late province of Luxemburgh; 9 miles N. W. of Treves.

EJECTA, a term used by lawyers for a woman deflowered, or cast from the virtuous.

EJECTION, [*ejectio*, Lat.] in Scots law, is the turning out the possessor of any heritable subject by force; and is either legal or illegal.

1. EJECTION, ILLEGAL, is one person's violently turning another out of possession, without lawful authority.

2. EJECTION, LEGAL, is where a person having no title to possess, is turned out by the authority of law.

EJECTMENT, in English law, a writ or action which lies for the lessee for years, on his being ejected or put out of his land, before the expiration of his term, either by the lessor or a stranger. It may also be brought by the lessor against the lessee, for rent in arrears, or holding over his term, &c. Ejectment of late is become an action in the place of many real actions, as writs of right, formedons, &c. which are very difficult, as well as tedious and expensive; and this is now the common action for trial of titles, and recovering of lands, &c. illegally held from the right owner; yet where entry is taken away by descent, fines, recoveries, disseins, &c. an ejectment shall not be brought; whereby we find that all titles cannot be tried by this action. The method of proceeding in the action of ejectment is to draw up a declaration, and feign therein a lease for three, five, or seven years, to him that would try the title; and also feign a casual ejector or defendant; and then deliver the declaration to the ejector, who serves a copy of it on the tenant in possession, and gives notice at the bottom, for him to appear and defend his title; or that, he the feigned defendant will suffer judgement by default, whereby the true tenant will be turned out of possession; to this declaration the tenant is to appear at the beginning of next term by his attorney, and consent to a rule to be made defendant, instead of the casual ejector, and take upon him the defence, in which he must confess lease, judgement, entry, and auster, and at the trial stand upon the title only;

but in case the tenant in possession does not appear, and enter into the said rule in time, after the declaration served, then, on affidavit being made of the service of the declaration, with the notice to appear as aforesaid, the court will order judgement to be entered against the casual ejector by default; and thereupon the tenant in possession, by writ habere facias possessionem, is turned out. On the trial in ejectment, the plaintiff's title is to be set forth from the person last seised in fee, under whom the lessor claims down to the plaintiff, proving the deeds, &c. and the plaintiff shall recover only according to the right which he has at the time of bringing his action. And here, another who has title to the land, may be defendant in the action with the tenant in possession; for the possession of the lands is primarily in question, and to be recovered, which concerns the tenant, and the title thereto is tried collaterally, which may concern some other.

EIFELD, EICHFIELD, or ELFELD, a town of Germany, in the late circle of the Lower Rhine and electorate of Mentz, eight miles N. W. of Mentz.

EIFFEL, a department of France one of the six new ones formed in Dec. 1797, out of the conquered countries on the left bank of the Rhine. It comprehends part of the late duchies of Juliers and Aremberg, part of the electorate of Cologne, with the towns of Aix la Chapelle, Coblenz, &c. Coblenz is reckoned the chief town.

EIMEO, or EIMEEO, one of the Society islands, in the South Pacific ocean, almost wholly surrounded with rocks, four leagues W. from the N. W. part of Otaheite. Lat. 17. 30. S. Lon. 149. 54. W. in parts of a degree, and 9h. 59m. 36s. in time.

EINBECK, or EIMBECK, a town of Germany, in Lower Saxony, 48 miles S. S. W. of Brunswick.

EISENACH, a late principality of Germany, in Thuringia, and circle of Upper Saxony, situated on the confines of Hesse. It is mountainous, and hardly produces corn enough for the inhabitants. Some wine is made, but of a very indifferent sort. It has some mines of copper, iron, vitriol, and alum, with some salt springs.

EISENACH, the capital of the above country, 26 miles W. S. W. of Erfurt.

EISKOI, a town of Russia, in the government of Caucasus, on the E. coast of the sea of Azoph, 50 miles S. W. of Azoph.

EISLEBEN, a town of Germany, in the late electorate of Saxony, and county of Mansfeld. It is 12 miles W. of Hall.

EKATERINEBURG, or CATHERINBURG, a province of Russia, in the government of Perm, about 360 miles long, and from 100 to 160 broad.

EKATERINEBURG, the capital of the above province. It is 148 miles S. E. of Perm, and 960 E. S. E. of Petersburg.

EKATERINOGRAD, or CATHERINOGRAD, a town of Russia, in the government of Caucasus, on the Malva.

EKATERINOSLAVSKOI, or CATHERINENSLAVSKOI, a province of Russia, in the government of Ekaterinoslaw, comprehending what has formerly been called Budziac Tartary, and the Ukraine, now a part of the government of Ekaterinoslaw.

EKEBERGIA, a genus of the class and order decandria monogynia. Calyx four-parted; petals four; berry contains five oblong seeds. There is one species, a tree of the Cape.

EKEREFOED, or EKRENFORD, a town of Denmark, in the duchy of Sleswick. It is 12 miles S. E. of Sleswick. Lon. 10. 20. E. Lat. 54. 56. N.

EKESIO, a town of Sweden, in the province of Smaland, 60 miles N. W. of Calmar.

EKIE, a town of Asia, in Thibet, 55 miles S. of Toson Hotun.

EKRON, a city and government of the Philistines. It fell by lot to the tribe of Judah, in the first division made by Joshua (xv. 45,) but was afterwards given to the tribe of Dan. (xix. 43.) It was situated near the Mediterranean, between Ashdod and Jamnia. Ekron was a powerful city, and it does not appear that the Jews were ever sole peaceable possessors of it: the Ekronites were the first who said that it was necessary to send back the ark of the God of Israel, in order to be delivered from those calamities which the presence of it brought upon their country. 1. Sam. v. 10. The idol Baalzebub was principally adored at Ekron. 2. Kings i. 2. &c.

EKSENIDE, a town of Asiatic Turkey, in the province of Natolia, 84 miles S. of Dognizlu.

ELABORATORY. See LABORATORY.

ELEAGNUS, the OLEASTER, or WILD OLIVE, a genus of the monogynia

monogynia order, and tetrandria class of plants; natural order, Calycistoreæ. No corolla; calyx campanulated, quadrifid, superior; drupe below the calyx. It has nine species.

ELEOCARPUS, in botany, a genus of the monogynia order, and polyandria class of plants. Corolla pentapetalous, lacerated; calyx pentaphyllous; drupe with a wrinkled kernel. It has six species mostly natives of the East Indies.

ELEODENDRUM, in botany, a genus of the monogynia order, and pentandria class of plants. Corolla five-petaled: drupe ovate, with a two-celled nut. There are two species, of which *E. orientale* is a moderate-sized twiggly shrub, or tree, a native of the oriental regions.

ELEOTHESIUM, in antiquity, the anointing room, or place where those, who were to wrestle or had bathed, anointed themselves.

ELAIS, in botany, a genus belonging to the natural order of Palmae. Male calyx hexaphyllous; corolla sexfid; stamina six: female calyx hexaphyllous; corolla hexapetalous; stigmata three; drupe fibrous, with a three-valved kernel. It has one species.

ELAM, (עֵלָם, Heb. i. e. a young man,) one of the sons of the patriarch Shem.

ELAM, in ancient geography, a country frequently mentioned in Scripture, lying S. E. of Shinar. In the time of Daniel (vii. 2.) Susiana seems to have been part of it; and before the captivity, it does not appear that the Jews called Persia by another name. Elymæ and Elymais are often mentioned by the ancients. Ptolemy, though he makes Elymais a province of Media, places Elymæ in Susiana, near the sea-coast. Stephanus takes it to be a part of Assyria: but Pliny and Josephus more properly of Persia, whose inhabitants the latter tells us sprang from the Elamites.

ELAPHEBOLIA, [from ελαφος, a deer,] in Grecian antiquity, a festival in honour of Diana the huntress. In the celebration a cake was made in the form of a deer, and offered to the goddess.

ELAPHEBOLIUM, in Grecian antiquity, the ninth month of the Athenian year, answering to the latter part of February and beginning of March. It consisted of 30 days; and took its name from the Elaphebolia, which was celebrated in it.

ELASTIC, **ELASTIC**, [from ελαστος,] having the power of returning to the form from which it is distorted or withheld; springy: having the power of a spring.

ELASTIC FLUIDS. See PNEUMATICS, ELECTRICITY, GAS, &c.

ELASTICITY, a force in bodies, by which they endeavour to restore themselves to the posture from whence they were displaced by any external force. The principal phenomena observable in elastic bodies are: 1. That a body perfectly elastic, endeavours to restore itself with the same force with which it is pressed or bent. 2. An elastic body exerts its force equally towards all sides. 3. Elastic bodies in what manner soever struck, or impelled, are inflected, and rebound after the same manner: thus a bell yields the same musical sound, in what manner or on what side soever it be struck; the same of a tense or musical chord; and a body rebounds from a plane in the same angle in which it meets or strikes it, whether the intensity of the stroke be greater or less. 4. The elastic properties of bodies seem to differ, according to their greater or less density or compactness, though not in an equal degree: thus, metals are rendered more compact and elastic by being hammered: tempered steel is much more elastic than soft steel; and the density of the former is to that of the latter as 7809 to 7738: cold condenses solid bodies, and renders them more elastic; whilst heat, that relaxes them, has the opposite effect: but, on the contrary, air, and other elastic fluids, are expanded by heat, and rendered more elastic. For the cause of elasticity, and other phenomena of this property of bodies, See PHYSICS.

ELATE, in botany, a genus belonging to the natural order of Palmae. Male, calyx three-toothed; corolla three-petaled; anthers six, sessile. Female, calyx one-leaved; corolla three-petaled; pistils one; stigmas three; drupe one-seeded. There is but one species, viz. *E. sylvestris*, prickly-leaved elate, native of the East Indies.

ELATER, in zoology, a genus of the class and order insecta coleoptera. Antennæ setaceous; an elastic spring or spine projects from the hinder extremity of the breast or under side of the thorax. By means of this kind of spring, the animal, when turned upon his back, contrives to leap up into the air, and so turn itself. About 200 species are enumerated, and divided in two sections, A. feelers hatchet-shaped; B. feelers clavate, the club round; of this division there are three species. When the insect is young and

newly metamorphosed, its elytra are of a beautiful deep red; but in a few days they change to a much darker hue, and are nearly of a chesnut colour. In the state of larvæ it inhabits the trunks of decayed trees, and is there transformed. See Plate XXXVII.

ELATERIUM, [Lat.] an inspissated juice, light, of a friable texture, and an acrid and pungent taste.

ELATERIUM, [ελατηριον,] a genus of the monandria order and monœcia class of plants; natural order, Cucurbitaceæ. There is neither male nor female calyx; corolla salver-shaped; capsule inferior, unilocular, and bivalved. It has two species.

ELATH, or **ELOTH**, in ancient geography, a part of Idumæa situated upon the Red Sea, which David in his conquest of Edom took, (2 Sam. viii. 14,) and there established a trade to all parts of the world. Solomon built ships in Elath, and sent them from thence to Ophir for gold, 2 Chron. viii. 17, 18.

ELATINE, in botany, a genus of the tetragynia order, and octandria class of plants: natural order, Inundatæ. Calyx four-leaved; petals four; capsule four-celled, four-valved, flattened. Two species, annual aquatic herbs, very low and spreading.

ELATMA, a town of Russia, in the government of Tambov, on the Oka, 132 miles N. of Tambov.

ELBA, an island in the Mediterranean, near the coast of Tuscany, eight miles long and two broad, 36 miles W. of Cape Corso.

ELBASSANO, a town of European Turkey, in Albania; 45 miles S. E. of Durazzo. Lon. 20. 9. E. Lat. 41. 34. N.

ELBE, a large river in Germany, anciently called Albis, which rising on the confines of Silesia, runs through Bohemia, Misnia, Upper Saxony, Anhalt, Magdeburg, Brandenburg, and Danneberg; and falls into the German ocean, about 70 miles below Hamburg. It is navigable for great ships higher than any other river in Europe.

ELBE, another river of Germany, in the Upper Rhine.

ELBERTON, a town in Effingham county, Georgia, on the N. E. bank of Ogeechee river. Lon. 80. 30. W. Lat. 32. 18. N.

ELBEUF, a town of France, in the department of the Lower Seine, 65 miles N. W. of Paris.

ELBING, a city in the duchy of Warsaw, and kingdom of Saxony, 30 miles S. E. of Dantzick. Lon. 19. 35. E. Lat. 54. 9. N.

ELBING, a river of the late Polish Prussia, in Marienburg.

ELBOGEN, a circle of Bohemia.

ELBOGEN, the capital of the above circle, with a citadel, 16 miles N. E. of Egra. Lon. 13. 0. E. Lat. 50. 16. N.

ELBOW. That eminence whereon the arm rests, is by the Latins called cubitus, and the Greeks αγκυων, and ολεκρανον. See ANATOMY.

ELBOW is also used by architects, masons, &c. for an obtuse angle of a wall, building, or road, which diverts it from its right line.

ELBURG, a town of Batavia or Holland late in the department of Yssel, and province of Guelderland, 10 miles N. E. of Harderwick.

ELCATIF, a sea-port of Arabia Felix, on the W. coast of the Gulf of Persia. Lon. 53. 5. E. Lat. 26. 0. N.

ELCESAITES, in church history, a sect of heretics, who appeared in the reign of Trajan. They worshipped one God, observed the Jewish Sabbath, circumcision, and the other ceremonies of the law; but they rejected the Pentateuch, the prophets, and the writings of the apostles, particularly those of St. Paul.

ELCHE, a town of Spain in Valencia, in a forest of palm-trees, olives, and vines. Lon. 0. 23. W. Lat. 38. 7. N.

ELDEN HOLE, a famous natural cavern in Derbyshire, three miles from Buxton, ranked among the wonders of the Peak. It is a large and deep perpendicular chasm, of which the bottom has not yet been found, whence it is pretended to be unfathomable. Cotton says he sounded to the depth of 884 yards, yet the plummet still drew.

ELDER, in botany. See SAMBUCUS.

ELDERS, or **SENIORS**, in the ancient Jewish polity, were persons the most considerable for age, experience, and wisdom. Of this sort were the 70 men whom Moses associated with himself in the government; such, likewise, afterwards were those who held the first rank in the synagogue, as presidents.

ELDERS, in church history, were originally those who held the first place in the assemblies of the primitive Christians. The word presbyter is often used in the New Testament in this signification: hence the first councils of Christians were called presbyteria, or council of elders.

ELDERS,

ELDERS, in the Presbyterian discipline, are officers, who, in conjunction with the ministers and deacons, compose the kirk-sessions, who formerly used to inspect and regulate matters of religion and discipline; but whose principal business now is to take care of the poor's funds, which, it is but justice to say, they do all over Scotland with the utmost fidelity. They are chosen from among the people, and are received publicly with some degree of ceremony. In Scotland, there is an indefinite number of elders in each parish; generally about 12.

ELEA, or **ELIS**, in ancient geography, a district of Peloponnesus, situated between Achaia and Messenia, reaching from Aradia quite to the west or Ionian sea; so called from the city of Elis.

ELEA, or **VELIA**, an ancient town of the Lucani, where the Eleatic philosophy was first taught.

ELEATIC PHILOSOPHY, among the ancients; a name given to that of the stoics, because taught at Elea.

ELEATIC SECT. The founder of this sect of philosophers is supposed to have been Xenophanes, who lived about the 56th Olympiad, or about B. C. 550. It was divided into two parties, which may be denominated metaphysical and physical; the one rejecting, and the other approving, the appeal to fact and experiment. Of the former kind were Xenophanes, Parmenides, Melissus, and Zeno of Elea. They are supposed to have maintained principles similar to those of Spinoza: they held the eternity and immutability of the world; that whatever existed was only one being; that there was neither any generation nor corruption; that this one being was immovable, and immutable, and was the true God; and whatever changes seemed to happen in the universe, they considered as mere appearances and illusions of sense. However, some learned men have supposed, that Xenophanes and his followers, speaking metaphysically, understood by the universe, or the one being, not the material world, but the originating principles of all things, or the true God, whom they expressly affirm to be incorporeal. Thus Simplicius represents them merely metaphysical writers, who distinguished between things natural and supernatural; and who made the former to be compounded of different principles. Accordingly, Xenophanes maintained, that the earth consisted of air and fire, that all things were produced out of the earth, and the sun and stars out of clouds, and that there were four elements. Parmenides also distinguished between the doctrine concerning metaphysical object called truth, and that concerning physical or corporeal things, called opinion; with respect to the former there was one immovable principle, but in the latter two that were moveable, viz. fire and earth, or heat and cold; in which particulars Zeno agreed with him. The other branch of the Eleatic sect were the atomic philosophers, who formed their system from an attention to the phenomena of nature; of these the most considerable were Leucippus, Democritus, and Protagoras.

ELECAMPANE, in botany. See **INULA**.

ELECT, **ELECTI**, among ecclesiastical writers, those whom God has chosen, or predestinated to be saved. See **PREDESTINATION**.

ELECT, in matters of polity, is applied to archbishops, and other ecclesiastic officers, who are chosen, but not yet consecrated; as also to secular officers before they are invested with their office or jurisdiction: thus the emperor is said to be elect, before he is inaugurated; and the lord mayor, before his predecessor's mayoralty is expired.

ELECTION, a term frequently used in mathematics, to signify the several different ways of taking any number of things proposed, either separately, or as combined in pairs, in threes, in fours, &c. not as to the order, but only as to the number and variety of them. Thus, of the things *a, b, c, d*, &c. the elections

$$\begin{array}{l} \text{One thing} \\ \text{Two things} \\ \text{Three things} \end{array} \left. \begin{array}{l} \\ \\ \end{array} \right\} \text{are } \left\{ \begin{array}{l} (a) 1 = 2^1 - 1 \\ a, b, ab) 3 = 2^2 - 1 \\ a, b, c, ab, ac, bc, abc) 7 = 2^3 - 1 \end{array} \right.$$

And generally of any number *n*, all the elections are $2^n - 1$; that is one less than the power of 2, whose exponent is *n*, the number of single things to be chosen either separately, or in combination; thus, when $n = 12$, the answer is $2^{12} - 1 = 4096 - 1 = 4095$.

ELECTION, the choice that is made of a person, or thing, in preference to any other; as in the election of an emperor, of a pope, of a bishop, of members of parliament, &c.

ELECTION, in law, is where a person has a choice of one or more

things which happen upon several occasions; as where he has by law two remedies, and must take only one: thus, a creditor, in cases of bankruptcy, may either prove his debt under the commission, or proceed at law; but in this case he is compelled to make his election: where also a person having obtained a judgement, is entitled to execution, he may either take his remedy against the goods or the person of his debtor; but if he proved against the person in the first instance, he cannot afterwards have recourse to the goods; but if he take the goods, and these should be found inadequate to his demand, he may afterwards take the body.

ELECTION, in theology. See **PREDESTINATION**, and **GRACE**.

ELECTION, in British polity, is the people's choice of their representatives in parliament. See **PARLIAMENT**. In this consists the exercise of the democratical part of our constitution: for in a democracy there can be no exercise of sovereignty but by suffrage, which is the declaration of the people's will. In all democracies, therefore, it is of the utmost importance to regulate by whom, and in what manner, the suffrages are to be given. And the Athenians were so justly jealous of this prerogative, that a stranger, who interfered in the assemblies of the people, was punished with death, being esteemed guilty of high treason, by usurping those rights of sovereignty to which he had no title. In Britain, says Blackstone, where the people do not debate in a collective body, but by representation, the exercise of this sovereignty consists in the choice of representatives. The laws have therefore very strictly guarded against the usurpation or abuse of this power, by many salutary provisions; which may be reduced to these three points. 1. The qualifications of the electors. 2. The qualifications of the elected. 3. The proceedings at elections.

1. **ELECTION LAWS AS TO THE QUALIFICATIONS OF ELECTORS.** The true reason of requiring any qualification, with regard to property, in voters, is to exclude such persons as are in so mean a situation, that they are esteemed to have no will of their own. If these persons had votes, they would be tempted to dispose of them under some undue influence or other. This would give a great, an artful, or a wealthy man, a larger share in elections than is consistent with general liberty. If it were probable that every man would give his vote freely, and without influence of any kind; then, upon the true theory and genuine principles of liberty, every member of the community, however poor, should have a vote in electing those delegates to whose charge is committed the disposal of his property, his liberty, and his life. But since that can hardly be expected in persons of indigent fortunes, or such as are under the immediate dominion of others, all popular states have been obliged to establish certain qualifications; whereby some, who are suspected to have no will of their own, are excluded from voting, in order to set other individuals, whose will may be supposed independent, more thoroughly upon a level with each other. And this constitution of suffrages is framed upon a wiser principle, with us, than either of the methods of voting, by centuries or by tribes, among the Romans. In the method by centuries, instituted by Servius Tullus it was principally property, and not numbers, that turned the scale; in the method by tribes, gradually introduced by the tribunes of the people, numbers only were regarded, and property entirely overlooked. Hence the laws passed by the former method had usually too great a tendency to aggrandize the patricians or rich nobles; and those by the latter had too much of a levelling principle. Our constitution steers between the two extremes. Only such are entirely excluded as can have no will of their own: there is hardly a free agent to be found, but what is intitled to a vote in some place or other in the kingdom. Nor is comparative wealth, or property, entirely disregarded in elections; for though the richest man has only one vote at one place, yet, if his property be at all diffused, he has probably a right to vote at more places than one, and therefore has many representatives. This is the spirit of our constitution: not that we assert it is in fact quite so perfect as we have endeavoured to describe it; for if any alteration might be wished or suggested in the present form of parliament, it should be in favour of a more complete representation of the people. But to return to the qualifications; and first those of electors for knights of the shire. 1. By statute 8 Hen. VI. c. 7. and 10 Hen. VI. c. 2. (amended by 14 Geo. III. c. 58.) the knights of the shire shall be chosen of people, whereof every man shall have freehold to the value of 40 shillings by the year within the county; which (by subsequent statutes) is to be clear of all charges and deductions, except parliamentary

and parochial taxes. The knights of shires are the representatives of the landholders, or landed interest of the kingdom: their electors must therefore have estates in lands or tenements within the county represented. These estates must be freehold, that is, for term of life at least; because beneficial leases for long terms of years were not in use at the making of these statutes, and copyholders were then little better than villeins, absolutely dependent upon their lords. This freehold must be of 40 shillings annual value; because that sum would then, with proper industry, furnish all the necessities of life, and render the freeholder, if he pleased, an independant man. For bishop Fleetwood, in his *Chronicon Pretiosum*, written at the beginning of the 18th century, has fully proved 40 shillings in the reign of Henry VI. to have been equal to 12 pounds per annum in the reign of Queen Anne; and, as the value of money is very considerably lowered since the bishop wrote, we may fairly conclude, from this and other circumstances, that what was equivalent to 12 pounds in his days, is equivalent to 25 pounds at present. The other less important qualifications of the electors for counties in England and Wales may be collected from the statutes 7 and 8 Will. III. c. 25, 10 Ann. c. 23, 2. Geo. II. c. 24, 18 Geo. II. c. 18, 31 Geo. II. c. 14, 3 Geo. III. c. 24, which direct, 2. That no person under twenty-one years of age shall be capable of voting for any member. This extends to all sorts of members as well for boroughs as counties; as does also the next, viz. 3. That no person convicted of perjury, or subornation of perjury, shall be capable of voting in any election. 4. That no person shall vote in right of any freehold, granted to him fraudulently to qualify him to vote. Fraudulent grants are such as contain an agreement to recover, or to defeat the estate granted; which agreements are made void, and the estate is absolutely vested in the person to whom it is so granted. And, to guard the better against such frauds, it is farther provided. 5. That every voter shall have been in the actual possession, or receipt of the profits, of his freehold to his own use for 12 calendar months before; except it came to him by descent, marriage, marriage settlement, will, or promotion, to a benefice or office. 6. That no person shall vote in respect of an annuity or rent-charge, unless registered with the clerk of the peace 12 calendar months before. 7. That in mortgaged or trust-estates, the person in possession, under the above-mentioned restrictions, shall have the vote. 8. That only one person shall be admitted to vote for any one house or tenement, to prevent the splitting of freeholds. 9. That no estate shall qualify a voter, unless the estate has been assessed to some land-tax aid, at least 12 months before the election. 10. That no tenant by copy of court-roll shall be permitted to vote as a freeholder. Thus much for the electors in counties. As for the electors of citizens and burgesses, these are supposed to be the mercantile part or trading interest of this kingdom. But as trade is of a fluctuating nature, and seldom long fixed in a place, it was formerly left to the crown to summon pro re nata, the most flourishing towns to send representatives to parliament. So that as towns increased in trade, and grew populous, they were admitted to a share in the legislature. But the misfortune is, that the deserted boroughs continued to be summoned, as well as those to whom their trade and inhabitants were transferred; except a few which petitioned to be eased of the expence, then usual, of maintaining their members: four shillings a-day being allowed for a knight of the shire, and two shillings for a citizen or burgess; which was the rate of wages established in the reign of Edward III. Hence the members for boroughs now bear above a quadruple proportion to those for counties; and the number of parliament men is increased since Portescue's time, in the reign of Henry VI. from 300 to upwards of 500, exclusive of those for Scotland. The universities were, in general, not empowered to send burgesses to parliament; though once, in 28 Edw. I. when a parliament was summoned to consider of the king's right to Scotland, there were issued writs, which required the university of Oxford to send up four or five, and that of Cambridge two or three, of their most discreet and learned lawyers for that purpose. But it was king James I. who indulged them with the permanent privilege to send constantly two of their own body; to serve for those students who, though useful members of the community, were neither concerned in the landed nor the trading interest; and to protect in the legislature the rights of the republic of letters. The right of election in boroughs is various, depending entirely on the several charters, customs, and

constitutions, of the respective places; which has occasioned infinite disputes: though now, by statute 2 Geo. II. c. 24. the right of voting for the future shall be allowed according to the last determination of the house of commons concerning it; and, by statute 3 Geo. III. c. 15, no freeman of any city or borough (other than such as claim by birth, marriage, or servitude,) shall be intitled to vote therein, unless he hath been admitted to his freedom twelve calendar months before.

2. ELECTION LAWS AS TO THE QUALIFICATIONS OF PERSONS TO BE ELECTED. Some of the qualifications to be elected members of the house of commons depend upon the law and custom of parliaments; declared by the house; others upon certain statutes. And from these it appears, 1. That they must not be aliens born, or minors. 2. That they must not be any of the 12 judges, because they sit in the lords' house; nor of the clergy, for they sit in the convocation: nor persons attainted of treason, or felony, for they are unfit to sit any where. 3. That sheriffs of counties, and mayors and bailiffs of boroughs, are not eligible in their respective jurisdictions, as being returning officers; but that sheriffs of one county are eligible to be knights of another. 4. That, in strictness, all members ought to have been inhabitants of the places for which they are chosen; but this, having been long disregarded, was at length entirely repealed by statute 14 Geo. III. c. 58. 5. That no persons concerned in the management of any duties or taxes created since 1692, except the commissioners of the treasury, nor any of the offices following (viz. commissioners of prizes, transports, sick and wounded, wine-licences, navy, and victualling; secretaries, or receivers of prizes; comptrollers of the army accounts; agents for regiments; governors of plantations, and their deputies; officers of Minorca, or Gibraltar; officers of the excise, and customs; clerks or deputies in the several offices of the treasury, exchequer, navy, victualling, admiralty, pay of the army or navy, secretaries of state, salt, stamps, appeals, wine-licences, hackney-coaches, hawkers, and pedlars,) nor any person that holds any new office under the crown created from 1705, are capable of being elected, or sitting as members. 6. That no person having a pension under the crown during pleasure, or for any term of years, is capable of being elected or sitting. 7. That if any member accepts an office under the crown, except an officer in the army or navy accepting a new commission, his seat is void; but such member is capable of being re-elected. 8. That all knights of the shire shall be actual knights, or such notable esquires and gentlemen as have estates sufficient to be knights, and by no means of the degree of yeomen. This is reduced to a still greater certainty, by ordaining, 9. That every knight of a shire shall have a clear estate of freehold or copyhold to the value of 600*l.* per annum, and every citizen and burgess of the value of 300*l.* except the eldest sons of peers and of persons qualified to be knights of shires, and except the members for the two universities: which somewhat balances the ascendant which the boroughs have gained over the counties, by obliging the trading interest to make choice of landed men: and of this qualification the member must make oath, and give in the particulars in writing, at the time of his taking his seat. But, subject to these standing restrictions and disqualifications, every subject of the realm is eligible of common right: though there are instances, wherein persons in particular circumstances have forfeited that common right, and have been declared ineligible for that parliament, by a vote of the house of commons; or for ever, by an act of the legislature. But it was an unconstitutional prohibition, which was grounded on an ordinance of the house of lords, and inserted in the king's writs, for the parliament holden at Coventry, 6 Hen. IV. that no apprentice or other man of the law should be elected a knight for the shire therein: in return for which, our law-books and historians have branded this parliament with the name of *parlamentum indoctum*, or the lack-learning parliament; and Sir Edward Coke observes with some spleen, that there was never a good law made thereat.

3. ELECTION LAWS RESPECTING THE METHOD OF PROCEEDING. The third point, regarding elections, is the method of proceeding therein. This is also regulated by the law of parliament, and by various statutes, all of which we shall blend together, and extract out of them a summary account of the method of proceeding to elections. As soon as the parliament is summoned, the lord chancellor, (or if a vacancy happens during the sitting of parliament, the speaker, by order of the house, and without such order

der if a vacancy happens by death in the time of a recess for upwards of twenty days) sends his warrant to the clerk of the crown in chancery; who thereupon issues out writs to the sheriffs of every county, for the election of all the members to serve for that county, and every city and borough therein. Within three days after the receipt of this writ, the sheriff is to send his precept, under his seal, to the proper returning officers of the cities and boroughs, commanding them to elect their members: and the said returning officers are to proceed to election within eight days from the receipt of the precept, giving four days notice of the same; and to return the persons chosen, together with the precept, to the sheriff. But elections of knights of the shire must be proceeded to by the sheriffs themselves in person, at the next county-court that shall happen after the delivery of the writ. The county-court is a court held every month, or oftener, by the sheriff, intended to try little causes not exceeding the value of 40s. in what part of the county he pleases to appoint for that purpose; but for the election of knights of the shire, it must be held at the most usual place. If the county-court falls upon the day of delivering the writ, or within six days after, the sheriff may adjourn the court and election to some other convenient time, not longer than 16 days, nor shorter than 10; but he cannot alter the place, without the consent of all the candidates: and, in all such cases, 10 days public notice must be given of the time and place of the election. And, as it is essential to the very being of parliament that elections should be absolutely free, therefore all undue influences upon the electors are illegal, and strongly prohibited. For Mr. Locke ranks it among those breaches of trust in the executive magistrate, which, according to his notions, amount to a dissolution of the government, "if he employ the force, treasure, and offices, of the society to corrupt the representatives, or openly to pre-engage the electors, and prescribe what manner of persons shall be chosen: for thus to regulate candidates and electors, and new-model the ways of election, what is it (says he) but to cut up the government by the roots, and poison the very fountain of public security?" As soon, therefore, as the time and place of election, either in counties or boroughs, are fixed, all soldiers quartered in the place are to remove, at least one day before the election, to the distance of two miles or more; and not to return till one day after the poll is ended. Riots likewise have been frequently determined to make an election void. By vote also of the house of commons, to whom alone belongs the power of determining contested elections, no lord of parliament, or lord lieutenant of a county, hath any right to interfere in the election of commoners; and, by statute, the lord warden of the cinque-ports shall not recommend any members there. If any officer of the excise, customs, stamps, or certain other branches of the revenue, presumes to intermeddle in elections, by persuading any voter or dissuading him, he forfeits 100*l.* and is disabled to hold any office. Thus are the electors of one branch of the legislature secured from any undue influence from either of the other two, and from all external violence and compulsion. But the greatest danger is that in which themselves co-operate by the infamous practice of bribery and corruption. To prevent which it is enacted, that no candidate shall, after the date (usually called the teste) of the writs, or after the vacancy, give any money or entertainment to his electors, or promise to give any, either to particular persons, or to the place in general, in order to his being elected, on pain of being incapable to serve for that place in parliament. And if any money, gift, office, employment, or reward, be given, or promised to be given, to any voter, at any time, in order to influence him to give or withhold his vote, as well he that takes, as he that offers such bribe, forfeits 500*l.* and is for ever disabled from voting and holding any office in any corporation; unless, before conviction, he will discover some other offender of the same kind, and then he is indemnified for his own offence. The first instance that occurs of election bribery was so early as 13 Eliz. when one Thomas Longe

(being a simple man, and of small capacity to serve in parliament) acknowledged that he had given the returning officer and others of the borough for which he was chosen four pounds to be returned member, and was for that premium elected. But for this offence the borough was amerced, the member was removed, and the officer fined and imprisoned. But as this practice hath since taken much deeper and more universal root, it hath occasioned the making of these wholesome statutes; to complete the efficacy of which, there is nothing wanting but resolution and integrity to put them in strict execution. Undue influence being thus guarded against, the election is to be proceeded to on the day appointed; the sheriff or other returning officer first taking an oath against bribery, and for the due execution of his office. The candidates likewise, if required, must swear to their qualification, and the electors in counties to theirs; and the electors, both in counties and boroughs, are also compellable to take the oath of abjuration, and that against bribery and corruption. And it might not be amiss, if the members elected were bound to take the latter oath, as well as the former; which, in all probability, would be much more effectual than administering it only to the electors. The election being closed, the returning officer in boroughs return his precepts to the sheriff, with the persons elected by the majority: and the sheriff returns the whole, together with the writ for the county and the knights elected thereupon, to the clerk of the crown in chancery; before the day of meeting, if it be a new parliament, or within 14 days after the election, if it be an occasional vacancy; and this under penalty of 500*l.* If the sheriff does not return such knights only as are duly elected, he forfeits, by the old statutes of Henry VI. 100*l.*; and the returning officer in boroughs, for a like false return, 40*l.*; and they are besides liable to an action, in which double damages shall be recovered, by the later statutes of king William; and any person bribing the returning officer shall also forfeit 300*l.* But the members returned by him are the sitting members, until the house of commons, upon petition, shall adjudge the return to be false and illegal. The form and manner of proceeding upon such petition are now regulated by statute 10 Geo. III. c. 16, (amended by 11 Geo. III. c. 42, and made perpetual by 14 Geo. III. c. 15.), which directs the method of choosing by lot a select committee of 15 members, who are sworn well and truly to try the same, and a true judgement to give, according to the evidence.

ELECTION, OF ECCLESIASTICAL PERSONS. Elections for the dignities of the church ought to be free, according to the stat. 9 Ed. II. cap. 14. If any persons, that have a voice in elections, take any reward for an election in any church, college, school, &c. the election shall be void. And if any persons of such societies resign their places to others for reward, they incur a forfeiture of double the sum; and both the parties are rendered incapable of the place. Stat. 31 Eliz. cap. 6.

ELECTION, OF VERDERORS OF THE FOREST, (electione viridariorum forestæ), in law, a writ that lies for the choice of a verderor, where any of the verderors of the forest are dead, or removed from their offices. This writ is directed to the sheriff, and the verderor is to be elected by his freeholders of the county, in the same manner as coroners.

ELECTIVE ATTRACTION, the same with affinity, or chemical attraction. See **CHEMISTRY**.

ELECTOR, he that has a vote in the choice of any officer. See **ELECTION**.

ELECTORATE, the territory of an elector.

ELECTRA, in the pagan mythology, one of the seven daughters of Atlas and Pleione, who were fabled to have been changed into the constellation, Pleiades. She was the mother of Dardanus, the first king of Troy, by Jupiter; and according to Hyginus, withdrew her light upon the destruction of Troy.

ELECTRICIAN, one who makes electrical experiments, and endeavours to investigate the nature, causes, and effects, of electricity.

ELECTRICITY.

ELECTRICITY, [*ηλεκτρον*, amber,] is that part of natural philosophy which investigates the nature, properties and effects, of a certain subtle fluid, found to exist in the material world, and denominat-

ed the electrical fluid. The term electricity is also applied to denote the phenomena and state of bodies under the influence of the electric fluid. Few or none of the refinements of science afford

so agreeable relaxation to the serious and liberal mind, as philosophical experiments. The rational entertainment, and pleasing instruction, conveyed by such inquiries, are constantly found to extend the faculties of the soul with an exalted idea of the beauty and sublimity of nature, while the mind is almost irresistibly led on to contemplate and adore its divine source. Few other departments of science yield phenomena so pleasing, so various, and, at the same time, so astonishing, as that of electricity. The variety of appearances produced by an electrical machine, in a copious current of the fluid, are, indeed, sometimes so strikingly curious, that the mind seems to be in a manner suspended between admiration of the effects, and inquiry into the cause. This affection seems to be natural and rational. The human mind can neither cease to admire, nor remain satisfied with vague appearances. The superior objects of its desire are knowledge and certainty; in the pursuit of which its industry is cheerfully exerted and frequently rewarded with success.

HISTORY OF ELECTRICITY.

Although the electric fluid, ever since the creation, has had the same share in all the operations of nature, that it has at present, yet the discovery of its action, and even of its existence, is of a very late date. Thales the Milesian, who lived about B. C. 600, was the first who observed that amber, from which the name electricity is derived, would attract light bodies when it was rubbed. The ancient naturalist, Theophrastus, who flourished 300 years later, tells us, that the lycurium (now called tourmalin) has the property of attracting light bodies as well as amber. From this time there is a chasm in the history of electricity for no less than 1900 years. Indeed, it is scarce to be supposed, that during this long interval any person applied himself to the investigation of the subject; as, for the greatest part of it, science of every kind was almost totally extinguished. The electrical properties of jet, however, and, according to Mr. Boze, of the agate, were some way or other discovered during this period. But it was not till the beginning of the seventeenth century, that electricity became properly a distinct science, and the foundation was laid of those discoveries which have since taken place. Dr. William Gilbert, an English physician, who, in 1600 wrote a book de Magnete, containing various electrical experiments, was the first who properly merits the title of an electrician. He, like his predecessors, however, considered only the attractive property of electric substances. Dr. Gilbert's merit consists in his having been at great pains to find a number of such substances, and thus considerably enlarging the number of electrics; on which account M. Cavallo says, "he may be justly deemed the father of the present electricity." Sir Francis Bacon also made some electrical experiments; but no farther discoveries appear to have been made till 1670, except some trifling additions to the catalogue of electrics. About this time Mr. Boyle applied himself to the study of electricity. He enlarged the catalogue of electrics; and found that their electric properties were increased by wiping and warming them before they were rubbed. He observed also, that all kinds of bodies were attracted promiscuously; and imagined that they were attracted in vacuo as well as in air. This last position, however, is denied by Mr. Beccaria; and Mr. Boyle must have been mistaken. He also observed the electric light, though only in the instance of some diamonds. The science, however, was much farther improved by Otto Guericke, who was cotemporary with Mr. Boyle. He made use of a sulphur globe, whirled on an axis much in the same way with our present glass globes. Thus he could excite a vastly greater power of electricity than any of his predecessors, and try all their experiments to much more advantage. He discovered electric repulsion; and not only saw the electric light more clearly than Mr. Boyle, but heard the hissing sound with which it is emitted. He also made another remarkable discovery, but which has since been very generally overlooked; namely, that a feather, when repelled by an excited electric, always keeps the same face towards the body which repels it, as the moon does to the earth. The celebrated Sir Isaac Newton made the next discovery of any moment; by observing, that the electric attraction and repulsion penetrated through glass; and it is much to be regretted that this accurate philosopher did not apply himself to the study of electricity with greater assiduity. A Treatise on Electricity was published in 1709, by Mr. Hawkesbee; who not only far excelled all his predecessors and contem-

poraries, but also made some discoveries which well deserve the attention of the most expert electricians at this day. Besides many new experiments upon electric attraction and repulsion, as well as the light emitted by electric bodies; he found a method of rendering opaque bodies transparent by electricity. He lined more than half the inside of a glass globe with sealing-wax; and having exhausted the globe, he put it in motion; when applying his hand to excite it, he saw the shape and figure of all the parts of his hand distinctly and perfectly on the concave superficies of the wax within, just as if only pure glass without any wax at all had been interposed between his eye and his hand. The lining of wax, where it was spread thinnest, would but just allow the light of a candle through it in the dark; but in some places the wax was at least an eighth part of an inch thick. Yet even in these places the light and figure of his hand were as distinguishable through it as any where else. The sealing-wax did not adhere to the glass in all places; but this made no difference with regard to the transparency. Pitch answered the purpose equally well with sealing-wax. Mr. Hawkesbee also made a further improvement by using a glass globe, which acts more powerfully than a sulphur one. After the death of Mr. Hawkesbee, "the science of electricity," says M. Cavallo, "however hitherto advanced, remained about twenty years in a state of quiescence, the attention of philosophers being at that time engaged in other philosophical subjects, which on account of the new discoveries of the incomparable Sir Isaac Newton were then greatly in repute. Mr. Grey was the first after this period of oblivion to bring the science again to light. He by his great discoveries re-introduced it to the acquaintance of philosophers, and from him the true flourishing era of electricity may be said to take its date." Mr. Stephen Grey's capital discovery was the distinction between conductors and non-conductors of electricity. In Feb. 1729, Mr. Grey, after some fruitless attempts to excite an electric power in metals, recollected a suspicion he had for some time entertained, that as a glass tube, when excited in the dark, communicated its light to various bodies, it might at the same time possibly communicate to them a power of attracting light bodies; which as yet was all that was understood by the word electricity. For this purpose he procured a glass tube, 3 feet 5 inches long, and near one inch and two tenths in diameter. To each end he fitted a cork, to keep out the dust when the tube was not used. Mr. Grey's first experiments were made to determine whether the tube would attract equally well with the ends shut as with them open. In this respect there was no difference; but he found that the corks attracted and repelled light substances as well, and rather better, than the tube itself. He then fixed an ivory ball upon a stalk of fir about four inches long, and thrusting the end of the stalk into one of the corks, he found the ball endowed with a strong attractive and repulsive virtue. This experiment he repeated in many different ways; fixing the ball upon long sticks, and upon pieces of brass and iron wire, always with the same success; but he constantly observed, that the ball at the end attracted more vigorously than that part of the wire nearest the tube. Mr. Grey next tried whether the ball might be suspended by a pack-thread with a loop on the tube, and the event fully answered his expectation. Having thus suspended bodies of the greatest length he conveniently could, he ascended a balcony 26 feet high, and fastening a string to his tube, found that the ball would attract light bodies on the ground below. This experiment succeeding in the greatest heights to which he could ascend, he next attempted to carry the electricity horizontally; but in this he failed, because he suspended his line, which was intended to carry the electricity horizontally, by a pack-thread; and thus the fluid got off from it. Whereupon he consulted Mr. Wheeler, and told him of the unsuccessful attempt he had made. Mr. Wheeler proposed to suspend the conducting line by silk instead of pack-thread, as being smaller than the other. With this they succeeded perfectly well, but by repeated experiments they soon discovered that the silk refused to conduct the electric fluid, not on account of its smallness, as they had supposed, but on account of some difference in the matter. The wires were smaller than the silk thread, yet the electricity was effectually carried off by them. This discovery of the non-conducting power of silk was made in the beginning of July, 1729, and was quickly followed by another, viz. that the same power existed in many other substances: and thus, in fact, the foundation of almost all the subsequent improvements in electricity was laid. Not long after Mr. Grey's discovery of the difference between

conductors

conductors and non-conductors, Mr. Du Fay discovered the difference between positive and negative, or, as they were for some time, and are still by some called, the vitreous and resinous electricities. This discovery was accidentally made in consequence of his observing, that a piece of leaf gold, repelled by an excited glass tube, and which he meant to chase about the room with a piece of excited gun copal, instead of being repelled by it, as it was by the glass tube, was eagerly attracted. The same was the case with sealing-wax, sulphur, rosin, and many other substances. He discovered also, that it was impossible to excite a tube in which the air was condensed. Mr. Boze, professor of philosophy at Wittenburgh, re-introduced the use of glass globes; though some attribute this to Christian Augustus Hansen, professor of mathematics at Leipsic. He added also a prime conductor, which consisted of a tube of iron or tin. It was at first supported by a man standing upon cakes of rosin; but afterwards suspended by silk lines horizontally before the globe. A bundle of thread was put into the end next to the globe, which not only prevented any injury to the glass, but rendered the electricity stronger. "The number of electricians," says M. Cavallo, "that hath been daily multiplying since Mr. Grey, the discoveries made, and the use derived from those, till the present time, are matters really worthy of attention, and deserve to be admired by every lover of the sciences, and well-wisher of the human race. "Whoever would make himself acquainted" (adds he) "with the particular transactions concerning those advances, should read the elaborate History of Electricity compiled by the learned Dr. Priestley, a work that will inform him of whatever had been done relative to the subject till its publication. I shall, in general, only observe, that although the science had, through the indefatigable attention of so many ingenious persons, and by the discoveries daily produced, excited the curiosity of philosophers, and engaged their attention; yet, as the causes of any thing, whether small or great, known or unknown, are seldom much attended to, if their effects are not striking and singular; so electricity had, till the year 1746, been studied by none but philosophers. Its attraction could in part be imitated by a load-stone; its light by a phosphorus; and in short, nothing contributed to make electricity the subject of public attention, and excite a general curiosity, until the capital discovery of the vast accumulation of its power in what is commonly called the Leyden phial, which was accidentally made in the memorable year 1745. Then, and not till then, the study of electricity became general, surprised every beholder, and invited to the houses of electricians a greater number of spectators, than were before assembled together to behold any philosophical experiments whatever." He adds in a note, "This great discovery was made by M. Van Kleist, dean of the cathedral in Camin." The method of giving the electric shock, or the accumulation of the power of electricity in a phial, got its name of the Leyden phial, from Mr. Cunaus, a native of Leyden, who exhibited it in repeating some experiments made by Messrs. Muschenbroek and Allamand, professors in the university of that city. M. Van Kleist, sent the following account of his discovery to Dr. Lieberkuhn, at Berlin, on the 4th Nov. 1745. "When a nail, or a piece of thick brass wire, &c. is put into a small apothecary's vial, and electrified, remarkable effects follow: but the vial must be very dry, or warm. I commonly rub it over beforehand with a finger on which I put some pounded chalk. If a little mercury, or a few drops of spirit of wine, are put into it, the experiment succeeds the better. As soon as this phial and nail are removed from the electrifying glass, or the prime conductor to which it hath been exposed is taken away, it throws out a pencil of flame so long, that with this burning machine in my hand, I have taken above sixty steps in walking about my room. When it is electrified strongly, I can take it into another room, and there fire spirits of wine with it. If, while it is electrifying, I put my finger or a piece of gold which I had in my hand, to the nail, I receive a shock which stuns my arms and shoulders. "A tin tube, or a man placed upon electrics, is electrified much stronger by this means than in the common way. When I present this vial and nail to a tin tube, which I have fifteen feet long, nothing but experience can make a person believe how strongly it is electrified. Two thin glasses have been broken by the shock of it." Not long after this the following method of giving the shock was discovered in Holland by Mr. Cunaus. Mr. Muschenbroek and his friends, observing

that electrical bodies exposed to the atmosphere, which is always replete with conducting particles of various kinds, soon lost their electricity, and were capable of retaining but a small quantity of it; imagined, that, were the electrified bodies terminated on all sides by original electrics, they might be capable of receiving a stronger power and retaining it longer. Glass being the most convenient electric for this purpose, and water the most convenient non-electric, they first made these experiments with water in glass bottles: but no considerable discovery was made, till Mr. Cunaus, happening to hold his glass vessel in one hand, and endeavouring to disengage it from the conductor with the other, (when he imagined the water had received as much electricity as the machine could give it), was surprised with a sudden shock in his arms and breast, which he had not in the least expected. The report of such a terrible effect of the electric power immediately raised the attention of all the philosophers in Europe. Many of them greatly exaggerated their accounts; either from a natural timidity, or a love of the marvellous. M. Muschenbroek, who tried the experiment with a very thin glass bowl, told M. Reaumur in a letter wrote soon after the experiment, That he felt himself struck in his arms, shoulder, and breast, so that he lost his breath; and was two days before he recovered from the effects of the blow, and the terror. He added, that he would not take a 2d shock for the whole kingdom of France. One of the most important discoveries yet made in electricity is the identity of the electric fluid with lightning. From almost the first discovery of the electric light, and the crackling with which it is emitted, a similarity between it and the phenomena of thunder and lightning had been observed. This is taken notice of by Dr. Wall, one of the first who viewed the electric light in any perfect manner. The Abbé Nollet, Mr. Winckler, and others, also enumerated many resemblances between the phenomena of electricity and those of thunder; but they did not think of any method by which their suppositions could be brought to the test of experience. This was first proposed by Dr. Franklin in 1750. He had before discovered the effects of pointed bodies in drawing off the electric matter more powerfully than others. This was suggested to him by one Mr. Thomas Hopkinson, who electrified an iron ball 3 or 4 inches diameter with a needle fastened to it, expecting to draw a stronger spark from the point of it; but was surprised to find little or none. Dr. Franklin, improving on this hint, supposed that pointed rods of iron, fixed in the air when the atmosphere was loaded with lightning, might draw from it the matter of the thunder bolt, without noise or danger, into the body of the earth. "The electric fluid (said he) is attracted by points. We do not know whether this property be in lightning; but since they agree in all the particulars in which we can already compare them, it is not improbable, that they agree likewise in this; let the experiment be made." Dr. Franklin's supposition was verified in 1752, and the discovery is almost the only one in the whole science, that has not been the result of accident. The most active persons were two French gentlemen, Messrs. Dalibard and Delor. The former prepared his apparatus at Marly la Ville, 5 or 6 leagues from Paris; the latter at his own house, on some of the highest ground in that capital. M. Dalibard's machine consisted of an iron rod 40 feet long, the lower extremity of which was brought into a centry-box, where the rain could not come; while on the outside it was fastened to three wooden posts by long silken strings defended from the rain. This machine was the first that was favoured with a visit of the ethereal fire. Mr. Dalibard himself was not at home; but, in his absence, he had entrusted the care of his apparatus to one Coissier a joiner, who had served 14 years among the dragoons, and on whose courage and understanding he could depend. This artisan had all the necessary instructions given him; and was desired to call some of his neighbours, particularly the curate of the parish, whenever there should be any appearance of a thunder storm. At length the long expected event arrived. On Wednesday, 10th May, 1752, between two and three P. M. Coissier heard a pretty loud clap of thunder. Immediately he ran to the machine, taking with him a phial furnished with a brass wire; and presenting the wire to the end of the rod, a small spark issued from it with a snap like that which attends a spark from an electrified conductor. Stronger sparks were afterwards drawn in the presence of the curate and a number of other people. The curate's account of them was, that they were of a blue colour, an inch and an half in length, and smelled

smelled strongly of sulphur. In making them, he received a stroke on his arm a little below the elbow; but he could not tell whether it came from the brass wire inserted into the phial, or from the bar. He did not attend to it at the time; but the pain continuing, he uncovered his arm when he went home in the presence of Coissier. A mark was perceived round it, such as might have been made by a blow with the wire on his naked skin. Dr. Franklin himself had an opportunity, about a month after this, of verifying his own hypothesis. He was waiting for the erection of a spire in Philadelphia, not imagining that a pointed rod of a moderate height could answer the purpose. At last it occurred to him; that by means of a common kite he could have a readier access to the higher regions of the atmosphere than any other way whatever. Preparing, therefore, a large silk handkerchief and two cross sticks of a proper length on which to extend it, he took the opportunity of the first approaching thunder-storm to take a walk into a field where there was a shed convenient for his purpose. But dreading the ridicule which too commonly attends unsuccessful attempts in science, he communicated his intention to nobody but his son, who assisted him in raising the kite. A considerable time elapsed before there was any appearance of success. One very promising cloud had passed over the kite without any effect; when just as he was beginning to despair, he observed some loose threads of the hempen string to stand erect and avoid one another, just as if they had been suspended by the conductor of a common electrical machine. On this he presented his knuckle to a key which was fastened to the string, and thus obtained a very evident electric spark. Others succeeded even before the string was wet; but when the rain had begun to descend, he collected electric fire pretty copiously. He had afterwards an insulated iron rod to draw the lightning into his house; and performed almost every experiment with real lightning, that had before been done with the artificial representations of it by electrical machines. A new and extensive field was thus opened for philosophers; but it was soon found, that experiments of this kind were attended with danger. In 1752, the Abbé Nollet published some cautions to those who tried experiments on lightning. He had been informed by letters from Florence and Bologna, that some persons in these places had received violent shocks, while they drew sparks from an iron bar electrified by lightning. A correspondent informed him, that once, as he was endeavouring to fasten a small chain, with a copper ball at one of its extremities, to a great chain which communicated with the bar at the top of the building, there came a flash of lightning which he did not see, but which affected the chain with a noise like that of wild-fire. The observer instantly received such a shock, that the ball fell out of his hands, and he was struck backwards four or five paces. But the most melancholy proof of the danger of these experiments, was the death of professor Richman, at Petersburg. This happened on the 6th Aug. 1753, as he was making experiments on lightning drawn into his own room. He had provided himself with an instrument for measuring the quantity of electricity communicated to his apparatus; and as he stood with his head inclined to it, Mr. Solokow an engraver, who was near him, observed a globe of blue fire, as big as his fist, jump from the instrument, which was about a foot distant, to Mr. Richman's head. The professor was instantly dead, and Mr. Solokow was also much hurt. The latter, however, could give no particular account of the way in which he was affected; for, at the time the professor was struck, there arose a sort of steam or vapour, which entirely benumbed him, and made him sink down to the ground; so that he could not even remember to have heard the clap of thunder, which was a very loud one. The globe of fire was attended with an explosion like that of a pistol; the instrument for measuring the electricity (called by the professor an electrical gnomon) was broken to pieces, and the fragments thrown about the room. Upon examining the effects of the lightning in the professor's chamber, they found the door-case half split through, and the door torn off and thrown into the room. A vein was opened in the body twice, but no blood followed; after which, they endeavoured to recover life by violent friction, but in vain: upon turning the corpse with the face downwards during the rubbing, an inconsiderable quantity of blood ran out of the mouth. There appeared a red spot on the forehead, from which spirted some drops of blood through the pores, without wounding the skin. The shoe belonging to the left foot was

burst open, and uncovering the foot at that part, they found a blue mark: whence it was concluded, that the electric matter having entered at the head made its way out again at that foot. Upon the body, particularly on the left side, were several red and blue spots resembling leather shrunk by being burnt. Many more also became visible over the whole body, and particularly over the back. That upon the forehead changed to a brownish red, but the hair of the head was not singed. In the place where the shoe was unripped, the stocking was entire; as was the coat every where, the waistcoat only being singed on the fore flap where it joined the hinder; but there appeared on the back of Mr. Solokow's coat long narrow streaks, as if red-hot wires had burned off the nap, and which could not well be accounted for. Next day, when the professor's body was opened, the cranium was very entire, having neither fissure nor contra-fissure: the brain was sound; but the transparent pellicles of the wind-pipe were excessively tender, and easily rent. There was some extravasated blood in it, as also in the cavities below the lungs. Those of the breast were quite sound; but those towards the back of a brownish black colour, and filled with more of the blood above-mentioned. The throat, the glands, and the small intestines, were all inflamed. The singed leather-coloured spots penetrated the skin only. In 48 hours the body was so much corrupted that they could scarce get it into a coffin. Since the discovery of the identity of lightning and the electric matter, long rods of iron or other metal have been made use of with a view to protect buildings from the danger or strokes of lightning. A considerable dispute has been carried on whether these rods ought to be pointed or not; but a committee of the Royal Society lately determined it in favour of the former.

EXPLANATION OF TERMS USED IN ELECTRICITY.

ELECTRIC FLUID. On rubbing glass, sealing-wax, sulphur, and several other bodies, with flannel or other proper rubber, and presenting the hand, or any other part of the body to the substance so rubbed; a fluid passing between the rubbed body, and the part presented is sensibly felt. This fluid has a sulphureous smell, and is rendered visible by its luminous appearance especially in the dark. The fluid thus exhibited has received the name of the electric, or electrical fluid.

ELECTRICAL APPEARANCES. It has been known for ages, that amber, jet, and some other bodies, when rubbed, attract and repel light bodies, as hairs, feathers, down, dust, &c. In more modern times, it was discovered, that glass, resins, silk, dry wood, &c. have the same properties; and that any of these, when dry, and rubbed for a short time, would attract light substances very readily. On darkening the room, and rubbing the glass tube again, sparks of fire will follow the hand; present a finger to the tube, at the distance of half an inch, and these sparks will be formed into pencils or brushes of light attended with a snapping noise. By varying the experiments other effects of the electric fluid will be perceived. The attraction, repulsion, sparkling, &c. are termed signs of electricity, or electrical appearances.

RUBBERS. The substance that rubs the electric to produce the electrical appearances, is termed the rubber. The rubber makes an essential part of the construction of an electrical machine.

EXCITATION. Those bodies, which by rubbing are made to exhibit electrical appearances, are said to be excited by the friction or rubbing.

ELECTRICS. Those bodies which can be excited, or made to produce the electrical appearances, are called electrics, and frequently electrics *per se*.

NON-ELECTRICS. Those which cannot be excited, are called non-electrics.

CONDUCTORS. It is found that some bodies admit the fluid to pass through them on which account they are called conductors. This property belongs principally to the non-electrics; hence the terms conductor and non-electric are nearly synonymous.

NON-CONDUCTORS. It is found that some bodies do not admit or with difficulty admit the fluid to pass through them, and these are called non-conductors. This property belongs principally to the electrics, hence the terms non-conductor and electric are nearly synonymous.

INSULATION. When a body is placed entirely upon non-conductors, it is said to be insulated. Insulation prevents the dissipation of the electric fluid, through the surrounding bodies. A per-

son is said to be insulated, when he is set with his feet upon a cake of resin, or on a stool with glass feet, or any other good electric, so that the communication between his body and the earth may be thereby cut off.

ELECTRIFICATION. Any body, to which the power of attraction and repulsion, &c. is communicated, is said to be electrified.

OF CONDUCTORS AND NON-CONDUCTORS.

One of the first principles in electricity is, that all the substances in nature are either electrics or conductors. Numberless experiments prove that a substance which is a conductor cannot be excited; and on the other hand, that a substance which can be excited is not a conductor. This law, however, must not be taken in an absolute sense; for, strictly speaking, there is no substance in nature that can be justly stiled a perfect electric, or a perfect conductor. In the best conductors the electric fluid finds some resistance; and it is partially transmitted through or along the surface of most, if not all electrics. These two classes so far approach each other's limits, that the less perfect conductors may be excited, and even some that are pretty good conductors. We insert the following lists of electrics and conductors, in the order of their perfection, as they are classed by Mr. Cavallo, who begins with the most perfect in each:

ELECTRICS. 1. Glass and all vitrifications whatever. 2. Precious stones; of which the most transparent are the best. 3. All resins and resinous compounds; or such consistent oily vegetable productions, as are inflammable, and not soluble in water. 4. Amber. 5. Sulphur. 6. Baked wood. 7. Bituminous substances. 8. Wax. 9. Silk. 10. Cotton. 11. Feathers, wool, hair, and all other dry animal substances. 12. Paper. 13. White sugar and sugar-candy. 14. Air. 15. Oils. 16. Metallic calces. 17. Ashes of animal and vegetable substances. 18. All dry vegetable substances. 19. All hard stoves. Many of these, when very hot, lose their electric property and become conductors; as red hot glass, melted resin, hot air, &c. The best vitrified glass also sometimes becomes a conductor.

CONDUCTORS. 1. Gold. 2. Silver. 3. Copper. 4. Brass. 5. Iron. 6. Tin. 7. Quick-silver. 8. Lead. 9. Semi-metals. 10. Metallic ores. 11. Charcoal, of animal or vegetable substances. 12. Fluids of animal bodies. 13. All other fluids, except air and oils. 14. The effluvia of flaming bodies. 15. Ice. 16. Snow. 17. Metallic salts, and most other saline substances. 18. Stony substances. 19. Smoke. 20. Steam. Electricity also pervades the vacuum made by an air-pump. Green vegetables, raw meat, &c. are rendered conductors by the fluids they contain. Hence all electrics before excitation should be well dried, and some even heated, to free them from every particle of dampness, otherwise they may act as conductors. We cannot close this part of our subject, without taking notice of the changes made in the same substance by different preparations. A piece of wood just cut from a tree is a good conductor: bake it and it will become an electric: burn it to charcoal, and it is a good conductor again; reduce it to ashes, and these will be found electrics. Similar changes are observable in many other bodies.

OF POSITIVE AND NEGATIVE ELECTRICITY.

If a fine downy feather, or any light body, be tied to a silk thread, and electrified strongly, by touching it with the excited glass tube, it immediately flies from, or is repelled by, the glass tube. If we now present an excited stick of sealing-wax, the feather immediately flies towards it. Thus what was attracted by excited wax, is repelled by excited glass. This experiment has given rise to a very important distinction in electricity, implying a contrariety of agency. Let two light balls formed of cork, or the pith of elder, be suspended by fine linen threads from small cylinders of wood, and insulated upon a common wine glass, that is wiped dry, and free from dust. Upon electrifying the two balls, thus suspended, by excited glass, they will repel each other; but we may destroy this electricity only by touching them with the finger. If again we electrify them, but with excited wax, they will again repel each other. But bring the balls electrified by wax towards those electrified by glass, and they immediately fly towards each other. From these and similar experiments, the two electricities were at first specifically distinguished by the names of Vitreous and Resinous. That which was thought to be

the constant production of rubbed glass, was stiled the **VITREOUS ELECTRICITY**; and that which was first observed to be produced by wax and other resinous substances was denominated the **RESINOUS ELECTRICITY**. But the vitreous, for reasons which will afterwards appear, is now called by the best electricians, **POSITIVE** or **PLUS ELECTRICITY**, and the resinous is denominated **NEGATIVE** or **MINUS ELECTRICITY**. Let a person be insulated upon any good electric, holding a dry glass tube in his left hand, and rubbing it with his right: both the person and the tube will be quickly electrified. If feathers, thread, bits of paper, or any other light substances, be presented to his body, they will be attracted and repelled. If another person presents his finger to him, a spark of light will follow the finger with a slight snapping noise. In a word he will exhibit every electrical appearance that the tube does. Yet the electricity of the person and that of the tube, are quite the opposite of each other; the one attracting what the other repels. Thus if a small piece of cork or any other light body, insulated or suspended by a silk thread, has been attracted and repelled by the glass tube, if no conducting substance come in contact with it in this state, it will not again be attracted by the tube. The same happens with the insulated person: if the light substance has been attracted and afterwards repelled by his body, it will not be again attracted. If, however, in this state of repulsion, the tube be presented to this light substance, it will be attracted violently by the tube; and when repelled by the tube, it will be again attracted by the insulated person. If two or more of these light insulated bodies be separately attracted by the tube, and when repelled brought near each other, they will repel each other, and continue in this electrified and repulsive state for some time. The same will happen if they be presented to the insulated person; after which they will likewise repel each other. But if one or more of them be attracted and repelled by the glass tube, and one or more others by the person, and afterwards all of them be brought near each other, they will then mutually attract instead of repelling each other; and instead of remaining in an electrified state, they will extinguish every appearance of electricity. These two electricities, therefore, appear to be the opposites of each other, and as if the one was an affirmative or positive power, and the other a negative, they balance each other, and lose every electrical property and appearance. There is another characteristic difference between them too, in the appearance of their light. If a needle, a wire, or any other pointed body, be presented to the excited tube in the dark, a small lucid globe, resembling a star, will be seen upon the point; but if the needle, or wire, be presented to the person, a lucid pencil of rays will appear issuing from the point, and diverging towards the person. These rays appear best when the needle is presented to the person, one inch from his body, while he is rubbing the tube. Another characteristic difference has been observed in some experiments. The electricity of the tube, when in the act of passing from a body overcharged with it to another, either not electrified, or possessed of the contrary electricity, shews an indisputable current from the former to the latter; and the electricity of the insulated person, when in the act of passing from a body overcharged with it to another, either not electrified, or possessed of the contrary electricity, shews clearly a current from the latter to the former. These two electricities are not only observed in the above-mentioned experiment, but in several other cases also; and they always accompany each other; for when different electrics are rubbed, some will acquire one electricity, and others will acquire the contrary; the rubber, if insulated, shewing at the same time signs of the electricity contrary to that acquired by the excited electric: besides this, almost all electrics may be made to shew at pleasure the one or the other electricity, according to the substance used for a rubber. Hence the following corollaries may be deduced; viz. 1. Whenever two different substances (being both insulated, or only that which is a conductor) are rubbed together, except they are both equally good conductors, they will be both electrified, and one acquire the electricity contrary to the electricity of the other. 2. Almost all the electrics may be made to acquire, at pleasure, the one or the other electricity by using proper rubbers. Many causes operate to produce a difference in the electricity. Often the same electric, rubbed with the same rubber, exhibits at one time signs of positive and at another of negative electricity. A slight variation in the surface, or in the degree of dryness, or a

different

different application of the same substance, often causes this difference. It appears from many experiments, that when two different substances are rubbed together, that whose surface is roughest, or whose electric power is strongest, generally acquires the positive, and the other the negative. And if two electrics every way equal are rubbed together, the substance, which suffers the greatest friction, acquires the negative electricity, and the other

the positive. We here present the ingenious with Mr. Cavallo's Table, which exhibits at one view what kind of electricity will be excited in the best electric by rubbing with different substances. "It might have been much extended, (he says) had he chosen to bring into it all the minutiae as far as is known. But this he thought both unnecessary and impracticable."

TABLE SHEWING THE KINDS OF ELECTRICITY EXCITED IN SOME ELECTRICS BY VARIOUS SUBSTANCES.

<i>Electrics rubbed.</i>	<i>Electricities.</i>	<i>Substances used as rubbers.</i>
The back of a cat.....	Positive	Every substance with which it has been hitherto tried.
Smooth glass.....	Positive	Every substance hitherto tried, except the back of a cat.
Rough glass.....	{ Positive	Dry oiled silk, sulphur, metals.
	{ Negative	Woollen cloth, quills, wood, paper, sealing-wax, white wax, the human hand.
Tourmalin.....	{ Positive	Amber, air blown with a pair of bellows.
	{ Negative	Diamond, the human hand.
Hare's skin.....	{ Positive	Metals, silk, loadstone, leather, hand, paper, baked wood.
	{ Negative	Other fine furs.
White silk.....	{ Positive	Black silk, metals, black cloth.
	{ Negative	Paper, hand, hairs, weasel's skin.
Black silk.....	{ Positive	Sealing-wax.
	{ Negative	Hare's, weasel's, and ferret's skin, loadstone, brass, silver, iron, hand.
Sealing-wax.....	{ Positive	Metals.
	{ Negative	Hare's, weasel's, and ferret's skin, hand, leather, woollen, cloth, paper.
Baked wood.....	{ Positive	Silk.
	{ Negative	Flannel.

OF THE EXCITATION OF ELECTRICS.

It is a well known law in electricity, that all electric substances may be excited by friction or rubbing. This, however, is not the only method of exciting electrics to exhibit electrical appearances. Several electrics are excited by melting or pouring a melted electric into another substance; by heating or cooling; and by evaporation or effervescence. These methods are attended with peculiar phenomena. Sulphur, melted in an earthen vessel, and left to cool upon conductors, is found strongly electrical; but not at all when left to cool upon electrics. If melted in a glass vessel and left to cool, both the glass and the sulphur acquire a high degree of electricity; the former positive and the latter negative, whether left to cool upon electrics or conductors. And it is remarkable that the sulphur acquires no electricity till it begins to cool. Melted sulphur poured into a vessel of baked wood, acquires a negative electricity, while the wood acquires a positive: but when poured into rough glass, or sulphur, it shews none. Sulphur melted, and poured into a metal cup, and there left to cool, exhibits no electrical appearances whilst in the cup; but if they be separated both will appear strongly electrified; the sulphur plus and the cup minus. Upon replacing the sulphur in the cup, every electrical sign vanishes; but if, while separate, the electricity of either be withdrawn, they will both appear possessed of the other electricity, on being replaced. Melted wax, poured into wood or glass, acquires a negative electricity, and leaves the glass or wood positive. Sealing-wax, poured into sulphur, acquires a positive electricity, and leaves the sulphur negative. If a stick of sealing-wax be broken in two pieces, the extremities that were joined will be electrified, the one positively, the other negatively. The late Mr. W. Henly, F. R. S. discovered, that chocolate fresh from the mill, becomes strongly electrical, as it cools in the tin pans. It soon loses this property, but recovers it once or twice, by being melted in an iron ladle and poured into the tin pans. When the mass becomes dry, the electricity cannot be restored by melting, unless olive oil be mixed with it in the ladle; in which case it completely recovers its electric power. The Tourmalin, or lapis electricus of Linnaeus, a hard semi-pellucid fossil, was first observed to exhibit electrical phenomena, by heating and cooling. This stone is common in the East Indies, and possesses many singular electrical properties. It exhibits, however, no electrical appearances, while kept in an equal temperature; but by increasing its heat, it becomes electrical, and still more so by diminishing it. Its electricity appears, not over its whole surface, but only on two opposite sides, which have been stiled its poles, as they are in

a line with its centre, and in the same direction with its strata; in which direction it is opaque, though semi-transparent in the other. The tourmalin, while heating, has one of its sides electrified positively, and the other negatively; but while cooling, the former becomes negative and the latter positive. If heated and allowed to cool without either side being touched, the former will be positive and the latter negative, all the time it is heating or cooling. If excited by rubbing, each of its sides, or both at once may be rendered positive. If heated or cooled upon an insulated substance, that substance will become possessed of the electricity contrary to that of the side of the tourmalin, which was laid on it. The electricity of both sides, or of either, may be reversed by heating or cooling the stone, in contact with other bodies. If a tourmalin be cut in pieces, each piece will have its positive and negative poles, as well as the whole stone. All the above properties are observable in vacuo. If this stone be covered over with wax, oil, or any similar electric, it will exhibit the same electric signs, as without the covering. Mr. William Canton remarked a vivid light upon this stone, while heating in the dark, by which he could determine which end of the tourmalin was positive or negative. When excited, it emits very strong flashes in the dark, from the positive to the negative end. Mr. Canton has also observed the Brazilian emerald emit light while heating in the dark. Mr. Cavallo "imagines that every other precious stone will shew it, if its electric power be sufficiently strong; since the light is a consequence of the passage of a sufficient quantity of electricity through the air, or other partly resisting medium." The electrical power of the tourmalin is sometimes improved, sometimes injured, sometimes not in the least affected, by a strong fire. Most of the above properties, which were supposed to be peculiar to the tourmalin, are possessed by several hard precious stones, which are capable of becoming electrical by heating and cooling, and have their positive and negative sides lying in the direction of their strata, &c. The method of exciting electricity by evaporation was lately discovered by Mr. Volta; who observed that the evaporation of water, and some other fluids, as well as certain effervescences, generated electricity. His experiments seem to prove, that fluids, or other bodies reduced to vapour, become electrified positively, and leave the bodies from which they evaporated, electrified negatively; and that on the other hand, when the vapours are condensed into a fluid, they become electrified negatively, and leave the bodies with which they were last in contact electrified positively.

OF COMMUNICATED ELECTRICITY.

"Under the title of communicated electricity, (says M. Cavallo) falls

falls almost all that is known of the subject; the passage of this virtue from one body to another is what causes its light; by being communicated to other bodies, we see its attraction; by its quick transition it melts metals, destroys animal and vegetable life; and in short it is by this communication, that the science is at all known and cultivated." When electricity is induced on a body, it is confined there by electrics alone; and for a longer or shorter time as these are more or less perfect. A glass tube rubbed acquires a quantity of electricity, which remains, in the glass, because it is surrounded by the air, which is an electric. But as the air is never a perfect electric, the glass tube cannot retain the electrical virtue perpetually, but only for a longer or shorter time, as the air happens to be in a more or less perfect electric state. It therefore imparts some of this virtue to the air, or to the conducting particles in it, gradually, till it loses it altogether. A finger or any other conductor presented to an excited electric, will receive a greater or less part of its electricity; but cannot receive the whole because the excited electric, being a non-conductor, cannot convey all its electricity to that side to which the conductor has been applied. Hence a conductor, presented to different parts of an excited electric, will receive at every approach a spark, without repeating the excitation, till the whole power excited is exhausted. When a conductor which communicates with the earth, is exhibited to an excited electric, at a proper distance, it acquires an electricity, on that side, contrary to that of the electric, and which increases the nearer they approach, till by the eager attraction between the two electricities, the conductor receives a spark from the electric, and thus the equilibrium is restored. If the conductor be insulated, both sides will appear electrified, but with different electricities: the side next the electric having acquired the electricity contrary to that of the electric, and the opposite side one of the same kind. These electricities increase as the conductor approaches the electric, but upon receiving the spark, the electricity of the conductor becomes the same with that of the electric throughout. All these effects are similar, though some other electric, as glass, rosin, wax, &c. be interposed between the excited electrics and the conductor; for the spark forces through the interposed electric, as it always does through the air, when it causes the snapping noise, that attends it. When an insulated conductor has received the electricity from an excited electric, it is said to be electrified by communication. It then acts like the excited electric; excepting that when touched by another conductor, that communicates with the earth, it discharges its whole surplus of electricity at once. The reason is, because the electricity belonging to the whole of the conductor is easily communicated through its own substance to the other conductor. Hence the electricity discharged from an electrified conductor is much more powerful than that discharged from an electric. If an insulated conductor be touched with another electrified conductor, it will acquire part of its electricity, and each will shew signs of it. It will not, however, be equally divided between them, unless they are equal in respect to their surfaces and situations. The quantity of electricity in each will be in proportion to their surfaces, and not to the quantity of matter in each. Mr. Cavallo; specifies these proportions very accurately in his *Complete Treatise*, vol. i. p. 40, 41. Edit. 4th. The distance to which an electric spark will go through the air, to reach a conductor, is in proportion to its quantity of electricity, the perfection of the conductor, and to the sharpness of the parts from which it flies off, and on which it strikes. The noise attending it also is in proportion to all these. A sharp-pointed body will throw off the electricity to, and receive it from, a greater distance, than a body of any other shape, but the communication is attended with little light and no noise, as the electricity comes by little and little, not in a large body. A current of air is sensibly felt in these cases at an electrified point, and always in the direction of the point. An electric spark, taken upon any part of a living body, occasions a disagreeable sensation, and more or less so in proportion to the strength of the spark. Electricity strongly communicated to insulated animal bodies, quickens the pulse and promotes perspiration. If the face or any part of the body be presented to an excited electric, or an electrified conductor, it will feel as if a wind was blowing, or rather a spider's web drawn over it. If an excited electric is presented to the nose, a smell will be perceived like that of phosphorus; but communicated electricity does not occasion any such sensation, unless a large quantity passes suddenly

from one body to another. A pretty large quantity of electricity pervades a long conductor with an astonishing, though imperceptible velocity, but a small quantity takes more time. Substances possessed of the same electricity repel, and those possessed of the opposite electricities attract each other. There is no electric attraction but between bodies possessed of different electricities; nor any electrical repulsion but between those possessed of the same electricity. Electricity communicated to insulated fruits, fluids, and other bodies in a state of evaporation, increases that evaporation. Electricity promotes vegetation by increasing the perspiration of vegetables. Plants often and long electrified, have shewn a more lively appearance than others that were not. Mr. Koestlin, however, says, that negative electrization retards both animal and vegetable life. When electricity is communicated to insulated vessels containing water that is running from a pipe, the electrified stream is but little accelerated, unless the tube be capillary, in which it is accelerated with an impetuosity and velocity, which is increased in proportion to the smallness of the tube. The electric power is neither affected by heat nor cold, for an iron bar made red hot, and any conducting fluid hard frozen, when electrified, exhibit sparks, attract or repel nearly as well as in their natural temperature. And it neither affects, nor is affected by the magnet. Electricity can be communicated to electrics, although it is done with difficulty, as their substance is impervious to it in a great degree. To make an electric acquire electricity, it must be touched several times, and in different parts, with the electrified body.

OF CHARGED ELECTRICS, AND PARTICULARLY OF THE LEYDEN PHIAL.

"If to one side of an electric (says M. Cavallo) sufficiently thin, as for instance a pane of common window glass, a plate of sealing-wax, &c. be communicated one electricity, and to the opposite side the contrary, that plate in that case is said to be charged; and the two electricities can never come together, except a communication of conducting substances be made between both sides, or the electric be broken by the power of electric attraction. When the two electricities of a charged electric are by any means united, and therefore their power destroyed, that electric is then said to be discharged, and the act of union of these two opposite powers is called the electric shock. "To avoid the difficulty of communicating electricity to an electric plate, it is customary to coat the sides of it with some conducting substance, as tin-foil, gilt paper, &c. by which means the charging and discharging becomes very easy; for when the electricity is communicated to one part of the coating, it is immediately spread through all the parts of the electric that are in contact with that coating; and when the electric is to be discharged, it is sufficient to make a conducting communication between the coatings of both sides, to discharge entirely the electricities of that electric." He adds, that "the coatings of both sides of an electric should not come very near one another towards the edge of the plate; for although they do not absolutely touch one another, yet when they are electrified, the electricity will easily force a passage through the air, and by passing over the surface of the electric, from one coating to the other, render it incapable of receiving any charge." It is by means of charged electrics, that we become acquainted with the greatest powers of electricity, as we can accumulate these powers, and use them in various experiments with advantage. If a glass plate be properly coated on both sides with a conducting substance, and if to one of these coatings be communicated some electricity, the other coating, while communicating with the earth, or with a sufficient quantity of conducting bodies, acquires by itself an equal quantity of the contrary electricity; but if, while one side is acquiring electricity, the opposite side does not communicate with the earth, or the conducting substances, the glass cannot be charged. The reason why, while one side of the glass receives the one electricity, the opposite side acquires the other, is, the property of bodies to acquire an electricity, contrary to that possessed by a contiguous electrified body; and the cause that hinders these two electricities from mixing, is the attraction between the glass plate and the fluid. It is of little consequence of what form the charged electric or Leyden jar be, provided the glass be sufficiently thin. "The thinner it is, (says M. Cavallo,) the greater charge it is capable of receiving; for the stronger in proportion is the power of the electricity of one side, to cause a contrary

contrary electricity on the opposite side. How thick a glass plate should be to become incapable of being charged, hath not yet been determined."

OF ATMOSPHERICAL ELECTRICITY, AND ITS EFFECTS; PARTICULARLY LIGHTNING.

ELECTRICITY is not only to be observed by rubbing an electric or warming a tourmaline, but has been found to be widely diffused through the atmosphere. It has been discovered that the air, the clouds, and even the rain, contain it; and that thunder and lightning, the aurora borealis, meteors, &c. are among its various and astonishing effects. The great similarity between lightning and the electric fluid had been for some time remarked by philosophers, particularly by the Abbé Nollet; but it was not suspected that they were the effects of the same cause, much less that the phenomena of lightning could be imitated by electricity, and those of electricity by lightning, till the celebrated Dr. Franklin hazarded the bold assertion, and advised the experiment to be made, and till he and the French philosophers proved the fact in 1752. Indeed, all the wonderful phenomena exhibited by electricians are only imitations on a small scale of those great effects which astonish and alarm us; and they depend upon the same mechanism. The same properties, and zig-zag sparks, their similar action on conducting substances, the power of rending, inflaming, and dispersing in every direction the substances on which lightning acts with power, the giving polarity to ferruginous matter, &c. all concur to shew their identity. But independent of these similarities, the fact is proved by the plainest and clearest evidence; when the atmosphere is charged with thunder clouds, we can by an electrical kite draw from it the matter of lightning, and with this matter perform every electrical experiment with which we are acquainted. There is not indeed a single phenomenon of the one, but may be imitated by the other. Lightning destroys edifices, trees, and animals; it goes through the best conductors that it meets within its course, and if its passage be obstructed by electrics, or less perfect conductors, it rends them, tears them to pieces, and disperses them in all directions. Lightning melts metals, and burns inflammable substances, &c. all of which effects can be produced by electricity. The air at some distance from houses, trees, masts of ships, &c. is commonly electrified positively, especially in frosty and clear weather. It is also electrified in foggy weather. "Clouds as well as rain, snow, and hail, says Mr. Cavallo, are almost constantly electrified, but oftener negatively than positively. How they come to be so, is not yet clearly ascertained, unless upon the principle of electricity produced by evaporation and condensation of lightning is the effect of their electricity, which darting from a cloud, or a number of clouds, highly electrified, strikes into another cloud, or upon the earth; preferring the most lofty and pointed places, and thus producing all those dreadful effects which are known to be occasioned by it," and of which it may not be improper to give a description, with an instance or two. When lightning is accompanied with thunder, it is well defined, and has generally a zig-zag form; sometimes it only makes one angle like the letter V, sometimes it appears like the arch of a circle. But the most formidable and destructive form which lightning is ever known to assume, is that of balls of fire. The motion of these is very often perceptible to the eye; but wherever they fall, much mischief is the result of their explosion. The next to this, in its destructive effects, is the zig-zag kind; for that species, whose flashes are indistinct, and whose form cannot easily be observed, is seldom known to do much hurt. The colour of lightning is also an indication of its power to do mischief, the palest and brightest flashes being most destructive in their effects. The zig-zag kind of lightning, when near, is remarkable for a kind of omnipresent property. If two persons be standing in a room, looking different ways, and a loud clap of thunder happens, accompanied with the zig-zag lightning, they will both distinctly see the flash, not only by that indistinct kind of illumination of the atmosphere, which is occasioned by fire of any kind, but the very form of the lightning itself, and every angle it makes in its course will be as distinctly perceptible, as though they had looked directly at the cloud from whence they proceeded. If a person happened at that time to be reading, he would distinctly see the form of the lightning between himself and the book. Lightning usually confines its effects to a small space; seldom exhibiting phenomena like those which ac-

company explosions of gunpowder, or of inflammable air in mines. Instances, however, of terrible explosions have occurred. The following is perhaps one of the most remarkable; "August 2, 1763, about six in the evening, there arose at Anderlight, about a league from Brussels, a conflict of several winds born upon a thick fog. This conflict lasted four or five minutes, and was attended with a frightful hissing noise, which could be compared to nothing but the yellings of an infinite number of wild beasts. The cloud then opening, discovered a kind of very bright lightning, and in an instant the roofs of one side of the houses were carried off and dispersed at a distance; above 1000 large trees were broke off, some near the ground, others near the top, some torn up by the roots; and many of the branches and tops carried to the distance of 60, 100, or 120 paces. Whole coppices were laid down, as corn is by ordinary winds; and the glass of the windows, situated near the spot, was shivered to atoms." It is not unusual for thunderstorms to produce most violent whirlwinds, such as are by some philosophers attributed to electricity; nay, even to occasion an agitation in the waters of the ocean itself; and all this too after the thunder and lightning has ceased. Of this the following instance happened at Great Malvern, October 26, 1761: at a quarter past four in the afternoon, the people were surprised with a most shocking and dismal noise; 100 forges, all at work at once, could scarce equal it. Upon the side of the hill, about 400 yards to the S. W. there appeared a prodigious smoke, attended with the same violent noise, as if a volcano had burst out of the hill; it soon descended, and passed on within about 100 yards of the south end of the house; it seemed to rise again in the meadow just below it, and continued its progress to the east, rising in the same manner for four different times, attended with the same dismal noise as at first; the air being filled with a nauseous and sulphureous smell. It gradually decreased till it was quite extinguished in a turnip field, about a quarter of a mile below the house; the turnip leaves, with leaves of trees, dirt, sticks, &c. filled the air, and flew higher than any of the hills. The thunder ceased before this happened, and the air soon afterwards became calm and serene." After the identity of lightning and the electric fluid was discovered, electricians began to describe other phenomena, formerly unaccounted for, to atmospherical electricity. Among these the aurora borealis was naturally, and with reason, ascribed to this cause. See AURORA BOREALIS. This conclusion was drawn not only from the imitation of its light by the electrical spark, but also from the observation, that the aurora borealis, when very strong, has been known to disturb the polarity of the magnetic needle. (See Phil. Trans. vol. lxx. p. 88.) The late Mr. Canton made several experiments in confirmation of this idea, by collecting considerable quantities of the electric fluid, during the time of an aurora borealis. His apparatus was very simple; it consisted of an insulated fishing-rod, with a wire twisted round it, erected on the top of his house. From his experiments performed with the atmospherical electrometer, and the electrometer for the rain, Mr. Cavallo deduces the following conclusions, respecting the electricity of the atmosphere:

"I. That there is in the atmosphere, at all times, a quantity of electricity; for whenever I use the above-mentioned instrument, it always acquires some electricity.

"II. That the electricity of the atmosphere, or fogs, is always of the same kind, namely, positive; for the electrometer is always negative, except when it is evidently influenced by heavy clouds near the zenith.

"III. That, in general, the strongest electricity is observable in thick fogs, and also in frosty weather; and the weakest, when it is cloudy, warm, and very near raining; but it does not seem to be less by night than in the day.

"IV. That in a more elevated place the electricity is stronger than in a lower one; for having tried the atmospherical electrometer both in the stone and iron gallery on the cupola of St. Paul's cathedral, I found that the balls diverged much more in the latter, than in the former less elevated place. Hence it appears, that if this rule takes place at any distance from the earth, the electricity in the upper regions of the atmosphere must be exceedingly strong."

OF THE ADVANTAGES DERIVED FROM ELECTRICITY.

Under this head, to which M. Cavallo devotes a whole chapter of his excellent treatise, he observes, that "besides the field that

electricity has opened for farther discoveries, and for the satisfaction of that curiosity, which before attended the contemplation of so many wonderful phenomena as have been explained by this science, there are two great advantages derived from electricity; the one is a defence against the direful effects of lightning, and the other a remedy for many disorders incident to the human body. 'In order to guard edifices or ships from being damaged by lightning, it was judiciously proposed by Dr. Franklin, to raise a metallic conductor some feet above the highest part of the building, and continue it down the wall till it penetrated some feet into the ground; by this means the house could never receive any damage; for whenever the lightning should happen to fall upon it, it is evident that the conductor, being of metal, and higher than any part of the building, would certainly attract it, and, by conducting it to the ground, hinder that building from receiving any damage; it being well known that electricity always strikes the nearest and best conductors that it meets within its way. 'The reasonableness and truth of this assertion has been confirmed by numberless facts, and the practice of raising such conductors has been found exceedingly useful, particularly in hot climates, where thunder-storms are very frequent, and the damages occasioned by the same, too often experienced. In regard to the construction of such conductors, there have been some controversies among electricians; and the most advantageous manner of using them has not, without a great many experiments, and but very lately, been ascertained. Some philosophers have asserted, that such conductors should terminate in a blunt end, that they might the less invite the lightning from the clouds; for a blunt end will not attract electricity from so great a distance as a sharp point. But other philosophers have thought a pointed termination to be much preferable to a blunt one; and their assertion seems, on the following accounts, founded on much better reasoning. A sharp-pointed conductor, it is true, will attract electricity from a greater distance than a blunt one, but at the same time will attract and conduct it by little and little, or rather by a continued stream, in which manner a remarkably small conductor is capable of conducting a very great quantity of electricity; whereas a blunt terminated conductor attracts the electricity in a full separate body or explosion, in which manner it is often made red hot, melted, and even exploded in smoke, and by such a quantity of electricity as perhaps would not have at all affected it, if it had been sharply pointed. A sharp-pointed conductor certainly invites the matter of lightning easier than a blunt one; but to invite, receive, and conduct it in small quantities, never endangers the conductor: and the object of fixing a conductor to a house, is to protect the house from the effects of, and not the conductor from transmitting the lightning. It is an observation much in favour of sharp-pointed conductors, that such steeples of churches, and edifices in general, as are terminated by pointed metallic ornaments, have very seldom been known to be struck by lightning; whereas others that have flat or blunt terminations, and have a great quantity of metal in a manner insulated on their tops, are often struck by it, and it is but seldom that they escape without great damage. However, it happened not long ago, that a building furnished with many sharp conductors was struck by lightning. Besides these considerations, a sharp-pointed conductor, by the same property of attracting electricity more than a blunt one, may actually prevent a stroke of lightning, to do which a blunt-ended one is absolutely incapable. For an edifice of a moderate size, one conductor is perhaps sufficient; but, in order to secure a large building from sustaining any damage by lightning, there should be two, three, or more, conductors, in proportion to the extent of the building. In ships a chain has often been used for this purpose, which, on account of its pliability, has been found very convenient, and easy to be managed among the rigging of the vessel; but as the electricity finds a great obstruction in going through the several links, for which reason chains have been actually broken by the lightning, so their use has now been almost entirely laid aside; and, in their stead, copper-wires a little thicker than a goose-quill have been substituted, and found to answer very well. One of these wires should be elevated two or three feet above the highest mast in the vessel; this should be continued down the mast, as far as the deck, where, by bending, it should be adapted to the surface of such parts, over which it may most conveniently be placed, and, by continuing it down the side of the vessel, it should be always made to communicate with the water of the sea.

In regard to personal security, in case a thunder-storm were to happen while a person is in a house not furnished with a proper conductor, it is advisable not to stand near places where there is any metal, as chimnies, gilt frames, iron casements, or the like; but to go into the middle of a room, and endeavour to stand or sit upon the best non-conductor that can be found at hand, as an old chair, a stool, &c. If a storm was to happen whilst a person is in the open fields, and far from any building, the best thing he can do is to retire within a small distance of the highest tree or trees he can get at; he must by no means go quite near them, but should stop at about fifteen or twenty feet from their outermost branches; for if the lightning should fall thereabout, it will very probably strike the trees; and in case a tree was to be split, he is safe enough at that distance from it. We shall conclude this section with a short extract from the earl of Stanhope's learned work, entitled Principles of Electricity, containing the requisites necessary for the proper construction of conductors for lightning, in order to preserve buildings from its depredations; and which are quoted with approbation by Mr. Cavallo. These requisites are, "1. That the rods be made of such substances as are the best conductors of electricity. 2. That the rods be uninterrupted and perfectly continuous. 3. That they be of a sufficient thickness. 4. That they be perfectly connected with the common stock. 5. That the upper extremity of the rods be as acutely pointed as possible. 6. That it be very finely tapered. 7. That it be prominent. 8. That each rod be carried in the shortest convenient direction, from the point at its upper end to the common stock. 9. That there be neither large nor prominent bodies of metal upon the top of the building proposed to be secured, but such as are connected with the conductor by some proper metallic communication. 10. That there be a sufficient number of high and pointed rods; and, 11. That every part of the building be very substantially erected." He also advises that the upper 15 or 20 inches of the rod should be copper, as iron is subject to rust, and rust is a bad conductor.

THEORY OF ELECTRICITY.

The mind of man is not satisfied with a simple knowledge of the facts, which an attention to the phenomena of nature presents to his view. He wishes to account for them; to trace the causes from their effects; and although philosophers and sages have been repeatedly, and almost constantly, foiled in their endeavours to discover first causes, yet the same principle still excites the inquisitive investigator to build theory after theory, and to erect one hypothesis upon the ruins of another. We cannot, therefore, be surprised that the wonderful phenomena of electricity should have excited this active principle of human nature to account for them, upon the first observation of them. In fact, this was even attempted by Thales, who first observed the attractive power of amber. At this property he was so much surprised, that he reckoned the amber to be animated. With regard to the conjectures of Theophrastus on this subject, we are entirely in the dark; but, among the succeeding electricians, all the phenomena were derived from unctuous effluvia emitted by the excited electric. These were supposed to fasten upon all bodies in their way, and to carry back with them all that were not too heavy. For, at that time, effluvia of every kind were supposed to return to the bodies from which they were emitted; as nobody could otherwise account for the substance not being sensibly wasted by the constant emission. When these light bodies, on which the unctuous effluvia had fastened, were arrived at the excited electric, a fresh emission of the effluvia was supposed to carry them back again. But this effect of the effluvia was not thought of till electric repulsion, as well as attraction, had been fully observed. The discovery of a difference between conducting and non-conducting substances, threw considerable difficulties in the way of those who maintained the hypotheses of unctuous effluvia. When the Newtonian philosophy began to be pretty generally received, the terms attraction and repulsion were quickly introduced into electricity, as well as other branches of philosophy; and the electric effluvia, instead of being of an unctuous nature, were said to be of an attractive or repulsive one. At the same time, the apparent stop which is put to the progress of these effluvia by any electric substance, introduced a question not yet well decided, viz. Whether electric bodies are penetrable by the fluid or not? When M. Du Fay discovered the two opposite species of electricity, at that time distinguished

tinguished by the names of vitreous and resinous, and afterwards by those of plus and minus, or positive and negative, he formed the idea of two distinct electric fluids. Both of these were supposed to have a repulsive power with respect to themselves, but an attractive one with regard to one another. As long as electrical attraction and repulsion were the only phenomena to be accounted for, this theory served the purpose well enough. To account for attraction and repulsion by an attractive and repulsive power, was indeed no explication at all; but it afforded a change of terms, which is too frequently mistaken for an explanation both in electricity and other parts of philosophy. At last, however, M. Du Fay dropped his opinion concerning the existence of two electric fluids, and thought that all the phenomena might be accounted for from the action of a single one. The vitreous or positive electricity, which was supposed to be the stronger, he thought might attract the negative, or weaker electricity. It is indeed true, that in many experiments, the positive electricity doth manifest a superiority in strength over the negative, something like that superior degree of vigour which is observed in one of the poles of a loadstone over the other. According to M. Du Fay's own principles, however, had this been the case, a body positively electrified ought to have attracted one electrified negatively more weakly than one not electrified at all; which is contrary to experience. During all this time, it was imagined that the electric matter, whether it consisted of one or more fluids, was produced from the electric body by friction; but by a discovery of Dr. Watson's, it became universally believed that the glass globes and tubes served only to set the fluid in motion, but by no means to produce it. He was led to this discovery by observing, that, upon rubbing the glass tube, while he was standing upon cakes of wax or rosin (in order, as he expected, to prevent any discharge of the electric matter upon the floor), the power was, contrary to his expectation, so much lessened, that no snapping could be observed upon another person's touching any part of his body; but that, if a person not electrified held his hand near the tube while it was rubbed, the snapping was very sensible. The event was the same when the globe was whirled in similar circumstances. For, if the man who turned the wheel, and who, together with the machine, was suspended upon silk, touched the floor with one foot, the electric fire appeared upon the conductor; but if he kept himself free from any communication with the floor, little or no fire was produced. He observed, that only a spark or two would appear between the hand and the insulated machine, unless he at the same time formed a communication between the conductor and the floor; but that then there was a constant and copious flux of the electric matter observed between them. From these, and some other experiments of a similar kind, Dr. Watson discovered what he calls the complete circulation of the electric matter. When he found, that by cutting off the communication of the glass globe with the floor, all electric operations were stopped, he concluded that the electric fluid was conveyed from the floor to the rubber, and from thence to the globe. For the same reason, seeing the rubber, or the man who had a communication with it, gave no sparks but when the conductor was connected with the floor, he as naturally concluded that the globe was supplied from the conductor, as he had before concluded that it was supplied from the rubber. From all this he was at last led to form a new theory of electricity, namely, that, in electric operations, there was both an afflux of electric matter to the globe and the conductor, and likewise an efflux of the same electric matter from them. Some time after, however, the doctor retracted this opinion concerning the afflux and efflux, and supposed that all the electric phenomena might be accounted for by the excess or diminution of the quantity of electric matter contained in different bodies. This theory was afterwards adopted by Dr. Franklin, and continues to be generally received. One great difficulty with which the first electricians were embarrassed (and which is yet scarcely removed), was to ascertain the direction of the fluid. At first, all electric powers were supposed to reside in the excited globe or glass tube. The electric spark, therefore, was imagined to proceed from the electrified body towards any conductor that was presented to it. It was never imagined that there could be any difference in this respect, whether it was amber, glass, sealing-wax, or any thing else that was excited. This progress of the electric matter was thought to be quite evident to the senses; and, therefore, the ob-

servation of electric appearances at an insulated rubber occasioned the greatest astonishment. In this case the current could not be supposed to flow both from the rubber and the conductor, and yet the first appearances were the same. To provide a supply of the electric matter, therefore, philosophers were obliged to suppose, that, notwithstanding appearances were in both cases much the same, the electric fluid was really emitted in one case by the electrified body, and received by it in the other. But now being obliged to give up the evidence from sight for the manner of its progress, they were at a loss, whether, in the usual method of electrifying by excited glass, the fluid proceeded from the rubber to the conductor, or from the conductor to the rubber. It was, however, soon found that the electricity at the rubber was the reverse of that at the conductor, and in all respects the same with that which had before been produced by the friction of sealing-wax, sulphur, rosin, &c. Seeing, therefore, that both the electricities were produced at the same time, by one and the same electric, and by the same friction, all philosophers were naturally led to conclude, that both were modifications of one fluid; though in what manner that fluid was modified throughout the immense variety of electric phenomena, was a matter not easily to be determined. On this subject the Abbé Nollet adopted the doctrine of afflux and efflux. He supposed, that, in all electrical operations, the fluid is thrown into two opposite motions; that the afflux of this matter drives all light bodies before it by impulse upon the electrified body, and its efflux carries them back again. He was, however, very much embarrassed in accounting for facts where both these currents must be considered; as in the quick alternate attraction and repulsion of light bodies by an excited glass tube, or other excited electric. To obviate this difficulty, he supposes that every excited electric, and likewise every body to which electricity is communicated, has two orders of pores, one for the emission of the effluvia, and another for the reception of them. M. De Tour improved upon Nollet's hypothesis, and supposed that there was a difference between the affluent and effluent current, and that the particles of the fluid are thrown into vibrations of different qualities, which makes one of these currents more copious than the other, according as sulphur or glass is used. It is impossible, however, that suppositions so very arbitrary could be at all satisfactory, or received as proper solutions of electric phenomena. Various other theories were proposed and maintained by different philosophers, but the theory invented by Dr. Franklin, and which had been first suggested by Dr. Watson, is generally received, as it is more simple than any other which has been proposed, and better accounts for the most remarkable electrical phenomena. This theory may be resolved into the following axioms:

- 1st. The electric matter is one and the same in all bodies, and is not of two distinct kinds.
- 2d. All terrestrial bodies contain a quantity of this matter.
- 3d. The electric matter violently repels itself, but attracts all other matter.
- 4th. Glass and other substances, denominated electrics, contain a large portion of this matter, but are not to be penetrated by it.
- 5th. Conducting substances are permeable by it, and do not conduct it merely over their surface.
- 6th. A body may contain a superfluous quantity of the electrical fluid, when it is said, according to this theory, to be in a positive state, or electrified plus; and when it contains less than its proper share, it is said to be negative, or electrified minus.
- 7th. By exciting an electric, the equilibrium of the fluid is broken, and the one body becomes overloaded with electricity, while the other is deprived of its natural share.

Thus, according to the Franklinian theory, that electricity, which was before called vitreous, is now called positive electricity; and that which was termed the resinous, is now denominated negative electricity. This theory, however, is not without its defects, and many electrical appearances remain as yet unexplained. We shall here propose another theory more simple even than that of Dr. Franklin, though in some things agreeing with it. And we hope to shew the cause of several electrical phenomena hitherto reckoned among the arcana of electricity. The theory which we here speak of, may be expressed in the five following articles, which may be considered as axioms in electricity.

1. The phenomena of electricity depend on one extremely subtle fluid, called the electric fluid.

2. The electric fluid is attracted by all other bodies, in some inverse ratio of the distance, and there is a repulsion exerted between its own particles, varying also in some inverse ratio of their distance.

3. All bodies while undisturbed possess a certain quantity of the fluid, called their natural quantity, which is in proportion to their attraction for the fluid.

4. Electrics have a stronger attraction for the fluid than non-electrics; and each particle of an electric is capable of receiving a small additional quantity of the fluid without communicating it to the next particle.

5. Bodies or parts of bodies having a greater proportion of the fluid than the contiguous bodies, the excess being such that they are emitting the fluid, or would be emitting it if an uninsulated conductor were presented, are said to be electrified positively; and if they have a less proportion, so that they are receiving the fluid, or would be receiving it, were a conductor presented, they are said to be electrified negatively.

Hypothesis is here excluded as far as the subject will admit. That there is according to the first article a subtle fluid concerned is exceedingly evident to the senses, that there is only one fluid can hardly be called an hypothesis since we see always the same effect produced by it under the same circumstances. The second article is founded on the general principles of attraction, which are well established by physical writers; and since the electric fluid is a material substance, it must be subject to the general laws: and the force of attraction has always been observed to be less at a greater distance. And that the fluid is elastic, or that its particles repel one another, is evident from its rapid motions and diffusion, and that the repulsion is greatest when the particles are nearest together, appears from the increased intensity of its action when compressed. The third article is only a corollary from the two foregoing, for since this fluid is subtle and elastic, it will be diffused; and bodies in their natural state and undisturbed, will each detain a quantity in proportion to its attraction for the fluid. Electrics have been found to contain a greater quantity of the fluid than non-electrics, and therefore, according to the third article, they must have a greater attraction for it; hence the fourth article is true; or, its truth appears from this, that electrics retain the fluid they receive more powerfully than non-electrics do; and that different bodies have different attractions for the same body is well known to chemists. That the electric fluid is attracted and held by the particles of glass may be thus shewn by experiment. Take a plate of thin glass, apply a loose coating to each side, and charge it in the common way; remove the coatings, and apply the knobs of the discharger to the opposite sides, the discharge will be partial; apply them to other parts, and these will be likewise partially discharged. This shews that the fluid near the parts where the conductor was applied, finding, as above stated, little resistance, was carried through the conductor to restore the equilibrium, but that the more distant fluid was retained there by some force, which we can attribute to no other cause than that of the attraction of the glass, for had a conductor covered the whole of the charged surface, it would have been conveyed away at once. The fifth article states, by way of definition, what is to be understood according to this theory by positive and negative electricity; and this, we apprehend, conveys a more accurate and just idea of these terms, as applied to this science, than the explanations hitherto given; for the phenomena of electricity must depend more on the state of bodies in respect of those contiguous to them, than in respect of their own natural quantity of fluid. It is in this article chiefly that our theory differs from Dr. Franklin's above-mentioned. That this theory will solve every phenomenon which can be accounted for on Dr. Franklin's theory is very evident, and the following propositions shew its use in solving those which that theory cannot account for. The positions here laid down are exceedingly consonant to nature, and are contradicted by no phenomena that we are acquainted with, and are therefore easily admitted; indeed the greater part of them are constantly evinced by electrical experiments. We shall here notice, in the way of propositions, the principal phenomena not well accounted for by electricians, and apply our theory to the explanation of them.

PROP. I. Electrics do not admit the passage of the electric fluid through them, or they admit it very slowly, and with difficulty,

i. e. they are non-conductors; non-electrics give very little resistance to the passage of the fluid, i. e. they are conductors. This appears from innumerable experiments. The cause of these phenomena has not as yet been fully ascertained; however it has been said to depend on the attraction of the electric for the fluid. This, we apprehend, is deficient as it only assigns one part of the cause; the other part is the elasticity of the fluid, and by considering these jointly we may easily shew the reason why some bodies are conductors and others non-conductors. Thus when a non-electric, communicating with the earth, is presented to a body emitting the fluid, (ax. 5,) very little resistance will be given to its passage along the non-electric, that is, it will not detain the fluid, because its attraction to it is weak, (ax. 4,) therefore it will be propelled through it by its elastic force, (ax. 1 and 2,) hence non-electrics are conductors, and the reason is, their attraction for the fluid being weak they are not capable of detaining an additional dose, without communication to the next particles. Again, let a non-conductor be presented, it likewise receives a portion of the fluid; but since the particles presented by their strong attraction for the fluid, will retain more than their natural quantity without communication to the next particles, suppose them to have received as much as they can thus contain, and their increased atmospheres of fluid will by its repulsive force cause the fluid of the next particles to recede somewhat to the opposite side, if an additional quantity of fluid be thrown on the first particles, the next will begin to receive a portion of it, and on a still farther increase the next to these in order will begin to receive, and so on in succession, till the intensity of the fluid on the first particles; and consequently its elasticity at length becomes so increased that it effectually prevents or opposes the further entrance of the fluid; if the intensity be increased on the body emitting the fluid, it will also be soon increased proportionally on the presented electric, whence its progress is prevented, and this fully explains the cause of its being a non-conductor. It is evident from this explanation, that the more perfect the electric is, the less will be the distance that the fluid will proceed before it is arrested; which will also happen from the less intensity of the insulated conductor. It is evident also from this, and ax. 4, that conductors and non-conductors, as well as non-electrics and electrics, will be more or less perfect according to their attraction for the fluid. For an account of the order, &c. of the conductors and non-conductors see above.

SCHOLIUM. It is very probable that conductors and non-conductors of heat depend on similar principles.

PROP. II. The electric fluid is received principally, and in greatest abundance, from the earth. For when the electric and rubber are insulated it will exhibit small signs of the electrical appearances; and when the communication is made by a conductor having small interruptions, by means of electrics, the fluid will be rendered visible in its passage between the earth and the rubber. The cause of this may be thus shewn. Since the earth is a large body containing in itself a very great number of substances; which have an attraction for the fluid, (ax. 2,) it will constitute a great and general reservoir for the fluid, (ax. 3,) and since the earth contains also a great many conductors; when the rubber emits the fluid the equilibrium will be restored by means of these conductors, (Prop. I.) to the rubber. When the rubber receives the fluid it will by the same means be conveyed to the general reservoir; when the excited bodies are insulated this supply is cut off; (Prop. I.)

PROP. III. A greater or less quantity of the electric fluid may be contained in electrics or insulated conductors than naturally belongs to them. Bodies in returning to their natural state after excitation are observed in some cases to be receiving the fluid, and in other cases to be emitting it. That this should take place appears from ax. 2 and 4, and Prop. I.

PROP. IV. When bodies or parts of bodies are contiguous, and some of them have a surcharge, or deficiency of the electric fluid; or if some of them have a surcharge, and others a deficiency; or if one of them be in its natural state: and if there be a considerable difference in their proportionate quantity of fluid: then of those contiguous bodies that which has the greater quantity of the fluid in proportion to its natural quantity will communicate a part of it to the other. This is exceedingly manifest in many experiments; thus, if the air have more than its natural quantity, and be contiguous to a body having less than its natural quantity, or more than

than its natural quantity, but in a less proportion than the contiguous air, and if the difference of the proportionate quantities be sufficiently great, the body will receive part of the fluid from the air. The reverse of this is also true. The phenomenon is produced partly by the attraction of the contiguous body, and partly by the repulsive force of the fluid, (ax. 2,) by which it is propelled towards the part where it is least resisted.

Cor. From this, according to ax. 5, it follows that bodies emitting the fluid are electrified positively, and bodies receiving it are electrified negatively, and vice versa.

PROP. V. When a body is electrified either positively or negatively, the bodies which are near it will be electrified with the contrary electricity, if the bodies be not insulated. This is a phenomenon exhibited in all electrical experiments. The cause has hitherto been reckoned among the desiderata of electricity. No phenomenon in electricity seems to be more difficult to solve, than the question, Why positive electricity induces the negative kind on any body within its sphere of action, and why the negative kind produces the positive in similar circumstances? Mr. Tytler pronounces it totally insolvable, unless we give up the idea of accumulation and deficiency of the electric fluid in different bodies. On Dr. Franklin's principles no solution hath been attempted. Mr. Cavallo places this among the properties of electricity, for which he doth not pretend to account, but gives us the causes of other phenomena. On the theory here proposed this difficulty entirely vanishes, for since when one body is emitting the fluid another which is near that body must be receiving it, and vice versa. Therefore, (ax. 5, and Prop. IV.) when a body is electrified the adjacent bodies will be electrified with the contrary power, till its quantity of fluid bears a certain proportion to that of the body, by which it is electrified. Hence, if the body placed near that which is electrified be a conductor, it will continue in the opposite state.

PROP. VI. Two bodies, at liberty to move in the air, will, when electrified either positively or negatively, appear to repel each other; but when one is positive, and the other negative, they appear to attract each other. This is well known to electricians, but the cause of the repulsion of two bodies negatively electrified has not been well explained. We hope the following will be satisfactory: Let two bodies, as two cork balls, be suspended in the air, and 1, let them be electrified positively: then since they are emitting the fluid there will be a re-action of the air against the fluid which is leaving the bodies, and the air will be driven outward and react against the balls. It is evident that this re-action will be greatest between the balls, for since it proceeds from the two adjacent surfaces the air will be impelled or driven outward from both surfaces, and consequently will re-act with a greater force, and thus the balls will be repelled. 2. Let the two balls be electrified negatively, then the motion of the fluid towards the balls by its action on the air will cause a pressure at the surfaces of the balls on all sides towards the centre, that is, the fluid moving towards the balls will cause some degree of motion in the air towards them; and since this motion is towards both the adjacent surfaces, the force will be increased on each, while the opposite sides remain unaltered, and thus they will be repelled or driven asunder. And here it may be observed, that the repulsion in positive electricity is caused by the reaction of the air, which is driven outward, or from the balls: but in negative electricity it is occasioned by the action of the air, which is driven inward, or towards the balls. Also other things being the same, the effect will be greater in positive electricity than in the negative, for that is caused by an excess of fluid, and this by a deficiency of the fluid. 3. Let one of the bodies be electrified positively, and the other negatively; then, at the adjacent surfaces, the fluid which is given out from one supplies the deficiency of the other, and thus no motion of the air between them is produced either inward or outward; but the forces remain on the two opposite sides, and therefore the balls will be driven together, that is, they will apparently attract each other, with considerable force.

PROP. VII. If an insulated conductor free from points be put within a certain distance of an electrified body, the end presented will be electrified with the contrary power, and the more distant end with the same power. This appearance is observed by all electricians, but no good reason has been assigned for it. We offer the following on the principles above laid down. Let the body,

to which the insulated conductor is presented, be electrified positively, then the contiguous air is receiving the fluid, and since the air is an electric the atmospheres of fluid on the particles of the air will extend on the more distant sides of the particles, as explained in Propositions 1 and 6, and in like manner will the end of the presented conductor be influenced, but because of its weak attraction for the fluid, its particles cannot retain the atmosphere on their more distant sides, and thus it is conducted to the further end where it affects the particles of the contiguous air by its endeavour to escape; and thus the nearer end is negative and the other positive. The effect is contrary if the body, to which it is presented, be negative. This also accounts for the effects of the electrophorus.

PROP. VIII. If one side of the Leyden phial, or of a thin plate of coated glass, be presented to a conductor electrified positively, and if the other side communicate by conductors with the earth, the glass will become strongly charged, and if the two coatings be then connected by a conductor an explosion will take place. This curious phenomenon may be thus explained. Because the coating is a conductor, as it receives the fluid, it disperses it over the coated surface, and the particles of glass at this coating obtain an additional dose of the fluid by which the atmospheres of fluid on the next particles stand more to the other side, and thus, if the fluid on the positive conductor be sufficiently intense, and the glass very thin, the particles at the other coating will be affected, and since this coating is a conductor and communicates with the earth, the atmosphere propelled to this side will be carried off; and thus the pressure or resistance is partly removed from the side which is receiving the fluid; so that it will receive still more, and also more will be carried away from the side connected with the earth, and the operation being continued, the maximum of difference will be at length attained, and the glass is charged. Now if the two coatings be connected by a conducting substance the fluid will by means of its elasticity pass from the positive side to the negative, since there is nothing on either side, or in the discharger, to prevent the equilibrium from taking place. It is evident from the above principles and propositions that the maximum of difference, or greatest charge, will depend on the goodness of the electric plate, on its thickness, and on the intensity of the electrified body by which it is charged; thus, 1. If a worse electric plate be used, other things being the same, the charge will be less, for the particles which receive the fluid will not retain so great a quantity before they communicate a portion to the next in order. 2. If the thickness of the electric plate be increased other things remaining the same the charge will be less, for the fluid on the side which receives it will not so much displace the atmospheres of fluid on the other side according to what was explained in Prop. I. 3. If the intensity of the electrified conductor be less, other things being the same, the charge will be less, for the intensity of the side of the plate which receives the fluid will sooner equal it, and therefore the fluid on the other side will be less affected, and hence the charge will be less. These consequences of the above principles are found to agree with phenomena. And here we may observe that an insulated plate is in the case of a very thick electric, and therefore will not receive a charge.

PROP. IX. If the conductor, to which the coated plate as in the last proposition is presented, be negative, the plate will receive a charge. For a portion of fluid being taken away from the side presented, the pressure is taken from the next particles, and the fluid will lie towards that deficient side: now since the atmospheres of the particles at the coating connected with the earth are removed from that coating to the other side of the particles, these particles will receive an additional quantity from the earth, and the operation being continued, a maximum of difference will take place, and the glass will be charged. Note, a little reflection will shew that the whole quantity of fluid on the glass is less than in the case last mentioned, since this is by an abstraction, and that by a redundancy of fluid.

PROP. X. While an electric plate is charging positively, both sides will be in a positive state; but after it is charged, the side which is presented is positive, and the other negative. For the side which is presented receives the fluid at one part, and this fluid being dispersed over the coated surface, it will from its redundancy of fluid begin and continue to discharge it to the surrounding air, and is therefore positive. Also the other side by the pressure of the fluid on it, as above explained, parts with some of its natural quantity,

quantity, and thus it is positive; but after the charge the first side continuing to give out the fluid, because of its redundancy, is still positive, but as this is given out, the pressure is taken from the other side, and hence its deficiency begins to be supplied, or it begins to receive the fluid, or is negative.

PROP. XI. While an electric plate is charging from a negative conductor, both sides are negative, but after the charge the side which was presented is negative and the other positive. For the fluid is taken from one part of the side presented, and hence there is a deficiency as far as the coating extends; and hence it begins to receive, or is negative, and the pressure being taken from the opposite side it will also receive or be negative; and after the charge the side which had been presented will continue to receive, or will still be negative, and hence the pressure will return to the other side which will begin to give out what it had received, that is, it will be positive, however in a weak charge the positive electricity is scarcely perceptible, because in this case it had received very little during the charge.

PROP. XII. When a pointed body is strongly electrified positively the electric fluid is rendered visible in a diverging stream from the electrified point, when negatively electrified the appearance is that of a small star. The electric fluid, when sufficiently dense and in rapid motion through the air, exhibits the electric light, and the air can oppose little resistance to a point; hence the fluid will move with rapidity from the positively electrified point, and from its elasticity will tend to diverge, it is immediately followed by other fluid from the point, which forces it in ramifications through the air and renders the streams visible to some distance. The case is different at the negative point, for since the fluid is entering from the air the fluid is not impelled by that which follows, and hence will become visible only near the point, and at an equal distance from all parts, which will give the appearance of the small star. We have thought proper to explain the above phenomena to elucidate, and shew the utility of our theory, but our limits will not permit us to proceed thus to expatiate upon the very numerous electrical appearances which have been observed, we shall therefore notice the principal of them, and leave the explanation for the most part to the ingenuity of the reader.

PRACTICE OF ELECTRICITY.

OF THE ELECTRICAL APPARATUS IN GENERAL.

The practical part of electricity naturally divides itself into two branches, viz. the apparatus employed, and the experiments made with it; but the use and application of the former being best illustrated by the latter, we thought it improper to separate them. Mr. Cavallo subdivides the former into three classes, viz. 1. The instruments necessary to produce electricity: 2. Those proper to accumulate, retain, and employ it: and 3. Those necessary to measure its quantity, and ascertain its quality. The instruments principally used to produce electricity are called by way of emphasis, Electrical Machines. They are made in so many different forms, that it would be tedious and difficult to give only a very short description of them all. We shall therefore first lay down the most necessary rules for constructing electrical machines in general; and then give a particular description of those which are most generally useful, and contain the latest improvements. The principal parts of the electrical machine are the electric, the moving engine, the rubber, and the prime conductor, *i. e.* an insulated conductor, which immediately receives the electricity from the excited electric. Electrics were formerly used of different substances, as glass, rosin, sulphur, sealing-wax, &c. Their forms were also various, as globes, cylinders, spheroids, &c. The reason of this variety was, 1st, that it was not then ascertained what substance acted most powerfully; and 2dly to produce a positive or negative electricity at pleasure. At present, globes, cylinders, and plates of smooth glass, are chiefly used; for when the machine has an insulated rubber, the operator may produce positive or negative electricity at his pleasure, without changing the electric; which clearly proves the falsity of those systems of electricity, which are founded upon the supposition of a specific difference between vitreous and resinous electricity, as arising from the nature of the different substances producing them. The best cement for electrical purposes is made with two parts of rosin, two of bees-wax, and one of the powder of red ochre. These ingre-

dients are melted, and mixed together in any vessel over the fire; and afterwards kept for use. This kind of cement sticks very fast, and is much preferable to rosin only, as it is not so brittle, and at the same time insulates equally well. The cylinders are made with two necks: they are used to the greatest advantage without any axis; and their common size is from four inches diameter and eight inches long, to twelve inches diameter and two feet long. Very large cylinders should be strengthened by a glass axis, viz. a solid stick of glass from the one cap to the other. The glass generally used is the best flint; though it is not absolutely determined which kind of metal is the best for electrical machines. The thickness of the glass seems immaterial, but perhaps the thinnest is preferable. It has often happened that glass globes and cylinders, in whirling, have burst in pieces with great violence, and with no small danger to the by-standers. Those accidents, are supposed to happen when the globes or cylinders, after being blown, are suddenly cooled. The workmen should therefore be enjoined to let them pass gradually from the heat of the glass-house, to the temperature of the atmosphere. Electricians are not agreed, whether a lining of some electric substance, as rosin, turpentine, &c. on the inside surface of the glass, has any effect to increase its electrical power; but it seems pretty well determined, that if it do not increase the power of a glass globe, or cylinder, at least it considerably improves a bad one. The most improved composition for this purpose is made with four parts of Venice turpentine, one part of rosin, and one part of bees wax. This composition must be boiled for about two hours over a gentle fire, and stirred very often: afterwards it is left to cool, and reserved for use. When a globe or cylinder is to be lined with this mixture, a sufficient quantity of it is to be broken into small pieces, and introduced into glass; then, by holding the glass near the fire, the mixture is melted, and equally spread over all its internal surface to about the thickness of a sixpence. In this operation, care must be taken that the glass be made hot gradually, and be continually turned so that it may be heated equally in all parts, otherwise it is apt to break in the operation. As to the engine which is to give motion to the electric, multiplying wheels have been generally used, which, properly adapted, might give the electric a quick motion, while they are conveniently turned by a winch. However some turn the machine simply with a winch, without any accelerated motion: and this method, on account of its simplicity and easy construction, may in most cases be preferred.

The RUBBER, as it is now made, (says Mr. Cavallo,) is nothing more than a silk cushion stuffed with hair; and over this is put a piece of leather, on which some amalgam has been rubbed, so as to stick as fast as possible to the leather. Sometime ago it was generally used, and it is now customary also, to make the rubber of red Basil skin stuffed with hair; but the silk one, as above described (which is an improvement of Dr. Nouth's) is much preferable. If this silk cushion, on account of adapting it to the surface of the glass, is to be fixed upon a metal plate, then care should be taken to make the plate free from sharp points, edges, or corners, and it should be as much as possible concealed, or covered with silk. In short to construct the rubber properly, it must be made in such a manner, that the side of it, which the surface of the glass enters in whirling, may be as perfect a conductor as it can be made, in order to supply electricity as quick as possible; and the opposite part should be as much a non-conductor as possible, that none of the fluid may return back to the rubber; which has been found to be the case, when the rubber is not made in a proper manner; for which reason a piece of silk is also added to the extremity of the leather. Mr. Nairne's rubber consists of silk only put over the leather cushion, and very little amalgam is used with it. The following is still more simple; let a piece of wood be fitted to the surface intended to be subjected to friction, and covered first with two or three thicknesses of elastic cloth, then with smooth leather, and lastly with a flap of silk, pasted upon the edge at which the glass in its rotation arrives, and let it pass loose over the face of the cushion, and thence upon the surface of the glass, as far as the commencement of the prime conductor. To the line of contact of the rubber and electric, a little amalgam ought to be applied, since it renders the excitation much more active. Any metal dissolved in quicksilver, will do for an amalgam; but the one that has been generally used is made with two parts of quicksilver, and one of tin-foil, with a small quantity of powdered chalk

chalk mixed together in a mass like paste. The best kind of amalgam is that of Dr. Higgins, composed of zinc and quicksilver; if a little of the latter be added to melted zinc, it renders it easily pulverable, and more quicksilver must be added to the powder, if we want to make a very soft amalgam. It is apt to crystallize by keeping, which seems in some measure to be prevented by triturating it with a small proportion of grease: and it is always of advantage to triturate it before using. The proportion prescribed by Dr. Higgins, is one part of zinc to four or five parts of mercury. Aurum mosaicum, or mosaic gold, will answer nearly as well, though it is not quite so cleanly. The rubber should be supported by a spring; by which it will easily suit any inequalities that may be on the surface of the glass; and by a screw, it may be made to press more or less as occasion requires. It should also be insulated in the most perfect manner; as, when insulation is not required, it may be easily taken off by a chain or wire hung upon it, and thus communicate with the earth or any electrified body; but where there is no contrivance for insulating the rubber, it is impossible to perform many of the most curious electric experiments.

The PRIME CONDUCTOR, is an insulated conducting substance, furnished with one or more points at one end, to collect the electricity immediately from the electric. When it is wanted of a moderate size, it is usual to make it of hollow brass; but when it is intended to be very large, then, on account of the price of the materials, it is made of pasteboard covered with tin-foil or gilt paper. It is generally cylindrical, and should always be made perfectly free from points or sharp edges: and if holes are to be made in it, which on many accounts are very convenient, they should be well rounded, and made perfectly smooth. That end of it which is at the greatest distance from the electric ought to be made larger than the rest, as the strongest exertion of the electric fluid to escape from the conductor is always at that end. The larger the prime conductor is, the longer and denser a spark can be drawn from it, the quantity of electricity discharged in a spark, being nearly proportional to the size of the conductor. On this account, the prime conductor is now made much larger than formerly. Its size, however, may be so large, that the dissipation of the electricity from its surface, may be greater than the electric can supply; in which case, the increase of size would only render it an unwieldy and unnecessary incumbrance. Besides the above mentioned parts, it is necessary to have a strong frame to support the electric, the rubber, and the wheel. The prime conductor should be supported by pillars of glass or baked wood, and not by silk strings, which admit of continual motion. In short, the machine, the prime conductor, and any other apparatus actually used, should be made to stand as steady as possible, otherwise many inconveniences will arise. Every electrician should be provided with glass tubes of different sizes, a pretty large stick of sealing-wax, or a glass tube covered with sealing-wax, for the negative electricity. He should, at least, not be without a glass tube about three feet long, and one and a half inch in diameter. This tube should be closed at one end, and at the other end should have fixed a brass cap with a stop-cock; which is useful in case it should be required to condense or rarefy the air within the tube. The best rubber for a tube of smooth glass is the rough side of black oiled silk, especially when it has some amalgam rubbed upon it; but the best rubber for a rough glass tube, a stick of baked wood, sealing-wax, or sulphur, is soft new flannel. The most proper instruments for what is called the accumulation of electricity are coated electrics; among which, glass coated with conductors obtains the principal place: on account of its strength, it may be formed into any shape, and it will receive a very great charge. The form of the glass is immaterial with respect to the charge it will contain; its thickness only is to be considered: for the thinner it is, the more easily will it receive the utmost charge it can bear; but it is at the same time more subject to be broken. For this reason, a thin coated jar or plate may be used very well by itself, and it is very convenient for many experiments; but when large batteries are to be constructed, it is necessary to use glass a little thicker, and care should be taken to have them perfectly well annealed. The most useful jars are thin cylindrical glass vessels, about four inches in diameter, and fourteen in height, coated within and without with tin-foil, which is stuck on with gum-water, paste, or wax, excepting two inches of the rim or edge, which is left bare, to prevent the communication between the coatings. A-

bout four inches from the bottom, within, is a large cork, that receives a thick wire, ending in several ramifications, which touch the inside coating; the upper end of the wire terminating with a knob, considerably above the mouth of the jar, Plate LXIII, fig. 3. When it is required to be charged, it may be held in the hand, or placed on an uninsulated table, and the knob of the wire applied to the conductor; the inside coated surface becomes possessed of the electricity of the conductor, and the external surface acquires the contrary electricity, by means of its uninsulated coating. When a jar of this kind is highly charged, it will discharge spontaneously over the uncoated surface, and seldom through the glass, whereas, when the uncoated surface is large, it is more apt to break by that means, and become useless. Yet, there is no certainty that a jar, which has discharged itself over its surface, will not at another time break by a discharge through the glass, as the contrary often happens. If paper covered with tin-foil be used for the coating, with the paper next the glass, the jar will be less liable to break. A jar of considerable thickness, with a neck like a bottle, in which is cemented a thick tube to receive the wire, will sustain a very high charge, and produce much greater effects than one of the last description. The charging wire being inserted loosely into the tube, will fall out on inverting the jar, and the charge will remain for several weeks without much loss. A jar thus charged, may be put into the pocket, and applied to many purposes that the common jar cannot be used for. If the inside of the jar be considerably damped, by blowing into it, through a tube reaching to the bottom, it will take a charge nearly one-third greater than in the ordinary state.

If A BATTERY be required of no very great power, as containing about eight or nine square feet of coated glass, common pint or half-pint phials may be used. They may be easily coated with tin-foil, sheet lead, or gilt paper, on the outside, and brass filings on the inside: they occupy a small space, and, on account of their thinness, hold a very good charge. But when a large battery is required, these phials cannot be used, for they break very easily; and for that purpose, cylindrical glass jars of about 15 inches high, and four or five inches in diameter, are the most convenient. See Plate LXIII, fig. 4. In coating glass plates or jars, which have a sufficiently large opening, the best method is to coat them with tin-foil on both sides, which may be fixed upon the glass with varnish, gum water, bees wax, book-binder's paste, &c. but if the jars have not an aperture large enough to admit the tin-foil, and an instrument to adapt it to the surface of the glass, then brass filings may be advantageously used. These may be stuck on with gum water, bees wax, &c. but not with varnish, for this is apt to be set on fire by the discharge. Care must be taken that the coatings do not come very near the mouth of the jar, for that will cause the jar to discharge itself. If the coating be about two inches below the top, it will in general do very well: but there are some kinds of glass, especially tinged glass, that when coated and charged, have the property of discharging themselves more easily than others, even when the coating is five or six inches below the edge. When a jar discharges itself, the electric fluid runs from the inside to the outside coating over the surface of the glass where it leaves an indelible mark all along its path, generally of a zig-zag form. There is another sort of glass, like that of which Florence flasks are made, which, on account of some unvitrified particles in its substance, is not capable of holding the least charge. On these accounts, therefore, when a great number of jars are to be chosen for a large battery, it is advisable to try some of them first, so that their quality and power may be ascertained. Many attempts have been made by electricians to find some other electric, which might answer better than glass for this purpose, at least in point of cheapness; but, except Father Beccaria's method, which may be used very well, no remarkable discovery has been made relating to this point. He took equal quantities of very pure colophonium, and powder of marble, sifted exceedingly fine, and kept them in a hot place a considerable time, where they became perfectly free from moisture: he then mixed them, and melted the composition in a proper vessel over the fire; and, when melted, poured it upon a table, upon which he had previously stuck a piece of tin-foil, reaching within two or three inches of the edge of the table. He then, with a hot iron spread the mixture all over the table as equally as possible, to the thickness of one-tenth of an inch: he afterwards coated it with another piece of tin-foil reaching within about two inches of the edge of the mixture: in short, he coated a plate of this mixture like

like a plate of glass. This coated plate seems to have had a greater power than a glass plate of the same dimensions, even when the weather was not very dry: and if it is not subject to break very easily by a spontaneous discharge, it may be very conveniently used; for it doth not very readily attract moisture, and consequently may hold a charge of electricity better and longer, than glass: besides, if broken, it may be repaired by a hot iron; which is not the case with glass. For discharging a jar, battery, or any coated electric without receiving the shock, two instruments have been contrived, one called the common Discharging Rod, (Plate LXIII. fig. 5,) which is nothing more than a semi-circular brass wire, furnished with two brass balls, one at the end of each wire. The other, which is of very extensive use in electrical experiments, is called the Jointed Discharging Rod, (fig. 6.) It is furnished with a glass handle: the legs are moveable, and may be set to any distance that may be convenient. When the electrician is to use this instrument, he holds it by the handle; and touching one of the coated sides of the charged electric with one knob, and approaching the other knob to the other coated side, or some conducting substance communicating with it, he completes the communication between the two sides, and thus discharges the electric. Henley's universal discharger consists of two wires, supported by glass feet, with a small table between them to support any thing that may be the object of the experiment. It is found to be a very useful instrument for a variety of purposes, and is composed of the following parts: A (fig. 7.) is a flat board, about fifteen inches long, four broad, and one thick. BB are two glass pillars, cemented in two holes upon the board A, and furnished at top with brass caps, each of which has a turning joint, and supports a spring tube, through which the wires DD slide. Each of the caps is composed of three pieces of brass, connected so that the wires DD, besides their sliding through the sockets, have a horizontal and vertical motion. Each of the wires DD is furnished with an open ring at one end, and at the other it has a brass ball, which, by a short spring socket, is slipped upon the pointed extremity, and may be removed. E is a circular piece of wood, having on its surface a slip of ivory inlaid, and furnished with a foot, which is fastened in the middle of the bottom A. The instruments for measuring the quantity, and ascertaining the quality, of electricity, are called Electrometers. The simplest of all is a pair of little balls of cork, or rather of the pith of the elder, which is still lighter, and suspended by silk and sometimes by linen threads. When brought into contact with an electrified body, the balls will immediately diverge, and according to the degree of divergence, a judgement is formed of the degree in which the body in question is electrified. A similar effect will be produced by a light and downy feather. The pith-balls have received the name of Canton's electrometer, from the ingenious electrician who first employed them for this purpose, and they are found useful in many experiments. See fig. 28. For a more accurate admeasurement, Henley's quadrant electrometer is in most general use. It consists of a perpendicular stem formed at top like a ball, and furnished at its lower end with a brass ferule and pin, by which it may be fixed in a hole made in the conductor, or at the top of a Leyden bottle. To the upper part of the stem, a graduated ivory semicircle is fixed, about the middle of which is a brass arm or cock, to support the axis of the index. The index is a very slender stick, which reaches from the centre of the graduated arch to the brass ferule; and to its lower extremity is fastened a small pith-ball nicely turned in a lathe. When this electrometer is in a perpendicular position, and not electrified, the index hangs parallel to the pillar; but when it is electrified, the index recedes more or less, according to the quantity of electricity. See fig. 8. Lane's discharging electrometer is employed chiefly by the practitioners of medical electricity. It is represented by FDE, in fig. 9, and is fixed to the wire that proceeds from the inside of the jar Z. The ball B touches the prime conductor A, which is supposed to stand before an electrical machine. The electrometer consists in a glass rod FD, furnished with brass caps F, D: from the latter proceeds a strong brass wire, to which is attached an horizontal spring-socket: through this, the wire CE, having the ball C at one end, and the open ring E at the other, may be slid backwards and forwards, so as to place the ball C at any required distance from the ball B. Suppose the distance between B and C to be one-eighth of an inch or less, and that by means of a chain X, a communication be formed from E

to the outside coating of the jar. When the jar is charged so high that the fluid can leap from B to C, the discharge will take place, and the stroke pass through X from the inside to the outside of the jar. When the shocks are to be given through any part of the body, as the arm, then, instead of the chain X, wires EL and IL are to be fastened, one to the ring E, and the other to a hook at I of the stand HI which communicates with the outside of the jar. The other extremities of the wire must be fastened to the directors K, L, which consist of brass wires and balls as L fastened into glass handles as shewn at K. The mode of operation is easily understood from a view of the figure, for when the chain X is away, the electric fluid must, in passing from the inside of the jar to the outside, go through the wire EL; the brass of the director; the part of the arm between the balls of the directors; and through the wire LI. By moving C nearer to, or farther from B, the strength of the shocks will be regulated to any degree. If a plate of glass be laid upon an uninsulated plate of metal, the upper surface may be rendered electric by friction, or by applying an electrified body successively to its parts. Part of this electricity may be taken off by touching the upper surface with an uninsulated metallic plate of the same dimensions as that upon which the glass is placed. After this, if a plate of metal, to which a glass handle is affixed, be laid upon the glass, this small quantity of electricity will influence the metal, and, without actually communicating the electric matter, will cause it to exhibit a similar state. If this be taken off, by drawing the spark, and the metal then removed, by means of the glass handle, it will be found possessed of the contrary state of electricity, and another spark may be obtained. The metallic plate may be then again applied to the surface of the glass, and the process again repeated, and so on for a great number of times, without any sensible difference in the event. For the electricity at the surface of the glass being almost in the natural state, as to condensation, does not disappear for a very long time, and on the very near approach of the metal it causes the fluid in the metal to recede to one side, and thus makes it capable of giving or receiving the spark according as the glass is positive or negative; and hence when it is removed, it is electrified without having affected the excited electric. It consists of two plates, (fig. 10,) made of a circular form, from eight to eighteen inches in diameter, or upwards. The upper plate is generally made of brass; but a tin plate, with a wire turned in upon its edge, will answer exceedingly well. At the centre of this plate a glass handle nine or ten inches long is fixed. A thin board, covered with tin-foil, and suspended by silken strings, will answer well, when the electrophorus is wanted of a large diameter. The under plate may be made of glass, sealing-wax, or the following composition, viz. four parts rosin, three parts pitch, three parts shell-lac, two parts Venice turpentine, melted together over a gentle fire. It may be poured and spread upon a thin linen cloth, to about one-fourth of an inch thick. The linen cloth must be stretched upon a hoop, and made as tight as possible. If the surface is a little rough, it will be no worse. The manner of using this machine is as follows: Rub the coated side of the under plate with fine new flannel, or a hare's or cat's skin; and when it is excited as much as possible, set it on a table, and place the upper plate upon it, and put your finger on the upper plate; then remove your finger, and take hold of the top of the glass handle, and apply it to the knob of a coated jar. Repeat this operation for 30 or 40 times, and the jar will become charged. Cavallo mentions one of the above kind made by him, with which he charged a coated phial several times, by once exciting, so strong as to pierce a hole through a card at every discharge. In fig. 1, Plate LXIII. A represents the glass cylinder of a machine, turned by P, the handle. Its surface rubs against C, the cushion, from which proceeds D, the silk flap, and the electricity is conveyed to E, the prime conductor. The supports of the cylinder, the cushion, and (indispensably) of the prime conductor, are made of glass or baked wood, in order that the electricity may not be conveyed to the earth, unless when the operator chooses to make the communication by some conducting body. A prime conductor is sometimes applied to the rubber. Fig. 2 shews the plate machine, with Nicholson's cylinder improvements for changing the two states at pleasure; as adapted by Dr. Van Marum, of Haerlem. The glass plate GG, is fastened to the axis BB, by means of a screw on the axis passing through a hole in the centre of the plate, and secured by a nut C, on the opposite

opposite side. The axis is supported by a single pillar A, which for this purpose is provided with a bearing piece K, on which are two brass collar pieces, that carry the axis; and on the end of the axis, opposite the glass, is a counterpoise O, of lead, to prevent too great a friction in the collar nearest the handle. The arc of the conductor EE, which carries the two small receiving conductors FF, is fixed to an axis turning in the ball H. On the other side of the plate is the other arc I, of brass wire, fixed in the bearing piece K, but so as to admit of being turned round like the arc EE. P is a copper tube, moving like a radius on the stem of the ball S, which, being screwed into the conductor H, serves to confine the arm P, in any position that may be required. The dissipation of electricity along the glass supports is prevented by a kind of cap T, of mahogany, which affords an electrical well or cavity underneath, and likewise effectually covers the metallic cap into which the glass is cemented. The lower extremity of the pillar is guarded in the same manner by a hollow piece or ring of mahogany V. The three glass pillars are set in sliding pieces WWW, adjustable by screws; at each extremity of the horizontal diameter of the plate are two rubbers X, one on each side, pressed regularly and uniformly against the plate by means of a spring Y, the force of pressure of which is regulated by means of a screw. To these rubbers are attached silk flaps ZZ, those of one pair of rubbers descending, and those of the other pair ascending, in the direction in which the plate is worked. A piece of fine dry writing paper, as long as the rubber, and half an inch broader, so as to cover the seam that fastens the silk to the leather, allows greater pressure to be employed by diminishing the friction, and prevents both the glass and silk from being soiled by the amalgam, so that the excitement is more powerful, and the amalgam requires to be renewed less frequently. As the semicircular branch of the prime conductor is moveable, it may be made to exhibit the electricity of the rubber at any time, by placing the cylindrical ends in contact with the cushions, the semicircular wire I, being at the same time turned so as to cross it at right angles, which insulates the cushions. When the conductor is required to give electricity from the glass, the arc I must be in contact with the cushions, and the arc EE perpendicular to the horizon. It may not be improper here to mention the extraordinary large and powerful machine in Teyler's Museum at Haarlem; which was constructed by Mr. John Cuthbertson, an English mathematical instrument-maker. It consists of two circular plates of glass, each 65 inches in diameter, and made to turn upon the same horizontal axis, at the distance of $7\frac{1}{2}$ inches from one another. These plates are excited by 8 rubbers, each $15\frac{1}{2}$ inches long. Both sides of the plates are covered with a resinous substance to the distance of $16\frac{1}{2}$ inches from the centre, both to render the plates stronger, and likewise to prevent any of the electricity from being carried off by the axis. The prime conductor consists of several pieces, and is supported by three glass pillars 57 inches in length. The plates are made of French glass, as this is found to produce the greatest quantity of the electricity next to the English flint, which could not be produced of sufficient size. The conductor is divided into branches which enter between the plates, but collect the fluid by points only from one side of the plate. The force of two men is required to work this machine; but when it is required to be put in action for any length of time, four are necessary. At its first construction nine batteries were applied to it, each having fifteen jars, every one of which contained about a foot square of coated glass; so that the grand battery formed by the combination of all these contained 135 square feet. Dr. Van Marum, who principally made experiments with this machine, imagining that it was still capable of charging an additional quantity of coated glass, afterwards added to it 90 jars of the same size with the former; so that it now contains a coated surface of 225 feet, and the effects are found to be proportionable.

OF THE METHOD OF USING THE ELECTRICAL APPARATUS.

Young electricians often find cause to complain that the experiments described in treatises on electricity do not succeed with them, though possessed of very good apparatus for making them. Besides the want of practice, which time and patience can only supply, this is frequently owing to their not attending to some slight and seemingly trifling circumstances; such as dust or moisture about the instruments; some small part of them being out of

order; the weather being too hot, or rainy, or the like. The following directions should therefore be particularly attended to by every student of electricity: Until he has acquired a very considerable degree of perfection by practice and habit, he should not commence his operations in all kinds of weather. When the weather is clear and the air dry, especially if it be serene and frosty, the electrical machine will always work well. In such weather the young electrician will run no risk of being disappointed. But when the weather is very hot, the machine is not very powerful; nor will it work in damp weather, unless it be brought into a warm room, and the cylinder, stands, jars, discharges, &c. be made perfectly dry. Before the electrical machine is put in motion, examine those parts which are liable to wear, either from the friction of one surface against another, or to be injured by the dirt, that may insinuate itself between the rubbing surfaces. If any grating or disagreeable noise is heard, the place from whence it proceeds must be discovered, wiped clean, and rubbed over with a small quantity of tallow; a little of which should also be occasionally applied to the axis of the cylinder itself. The screws by which the frame is fixed should also be examined, and if they are loose, they should be made tight. The machine being examined and put in order, the glass cylinder, and the pillars which support the cushion and conductor, should be well wiped with a dry old silk handkerchief, to free them from the moisture which glass attracts from the air; being particularly attentive to leave no moisture on the ends of the cylinder, as any damp on these parts carries off the electric fluid, and lessens the force of the machine: in very damp weather it will be proper to dry the whole machine, by placing it at some little distance from the fire. Particular care should be taken that no dust, loose threads, or filaments, adhere to the cylinder, its frame, the conductors, or their insulating pillars; because these will gradually dissipate the electric fluid, and prevent the machine from acting powerfully. When satisfied of this, rub the glass cylinder first with a clean, coarse, dry, warm, cloth, or a piece of wash leather, and then with a piece of dry, warm soft silk; do the same to all the glass insulating pillars of the machine and apparatus; these pillars must be rubbed more lightly than the cylinder, because, being varnished, they may be damaged by too much friction. In some cases it is proper to place a hot iron on the foot of a conductor, to evaporate the moisture which would otherwise injure the experiments. After exciting the electrical machine, greasing the cylinder, and applying Dr. Higgins's amalgam, &c. as above described, proceed to work it by turning the winch or handle. When the prime conductors and other instruments are removed from the machine, it will soon be perceived, upon holding the knuckle of the fore-finger near the surface of the cylinder, that the electric fluid comes like a wind from the cylinder to the knuckle, and if the motion be continued, sparks and cracklings will soon follow. This indicates that the machine is in good order, and the electrician may proceed with his experiments. But if no wind be found upon the knuckle, the fault will probably be in the rubbers. To remedy this, loosen the screws on the back of the rubber, remove it from its glass pillar, and keep it a little near the fire, that its silk part may be dried; then pass a little tallow from a candle over the leather of the rubber, spread a small quantity of the amalgam over it, and force it into the leather as much as possible: after which, replace the rubber upon the glass pillar, and wipe the cylinder once more, and the machine will be fit for use. The following directions of Mr. Adams, relative to exciting the machine, will be found very useful. "To excite your machine, clean the cylinder, and wipe the silk. Grease the cylinder by turning it against a greasy leather, till it is uniformly obscured. The tallow of a candle may be used. Turn the cylinder till the silk flap has wiped off so much of the grease as to render it semi-transparent. Put some amalgam on a piece of leather, and spread it well, so that it may be uniformly bright: apply this against the turning cylinder, the friction will immediately increase, and the leather must not be removed until it ceases to become greater. Remove the leather, and the action of the machine will be very strong. The pressure of the cushion cannot be too small, when the excitation is properly made." Sometimes the machine will not work well because the rubber is not sufficiently supplied with electric fluid. This happens when the table upon which the machine stands, and with which the chain of the rubber is connected, is in a bad conducting state from being too dry.

dry. Even the floor and the walls of the room are, in very dry weather, bad conductors, and cannot supply the rubber sufficiently. In this case, the chain of the rubber must be connected by a long wire with some water, moist ground, or the iron work of a water-pump; which will soon supply the rubber with a sufficiency of the electric fluid. When the heat of the cylinder exceeds 110° , it will not act properly. If the machine does not work well, when a sufficient quantity of amalgam has been accumulated upon the leather of the rubber, then, instead of adding more amalgam, it will be proper to take off the rubber, and to scrape a little off that which is already upon the leather. The cylinder, when used for some time, frequently contracts black spots, occasioned by the amalgam or some foulness of the rubber. These spots must be carefully taken off, otherwise they will increase in size, and greatly obstruct the electric power of the cylinder: which, to prevent contracting them, must be often wiped. When any experiment is to be performed which requires but a small part of the apparatus, the remaining part of it should be placed at a distance from the machine, the prime conductor, and even from the table, if that is not very large. Candles, particularly, should be placed at a considerable distance from the prime conductor, for the effluvia of their flames carry off much of the electric fluid.

OF CHARGING AND DISCHARGING ELECTRIC JARS AND BATTERIES.

The phial being placed on the table, so that the ball on the top of its wire may be about one-eighth of an inch from the ball of the prime conductor, turn the machine, and sparks will fly from the ball of the conductor to the ball of the jar. Continue turning as long as you perceive the fire pass between the conductor and ball of the jar; but when it ceases, you may leave off turning, and consider the jar as charged. This done, take hold of the discharger by the middle, and apply one knob to the outside coating near the bottom, and keeping it there, put the other to the ball of the jar, and it will be discharged of its fire with a loud snap; but the person who holds the discharger feels nothing from the discharge. If you charge the jar again, and touch the outside coating with one hand, and then bring the other to the ball of the jar, you will act the part of the wire discharger, and receive a shock through your arms and breast, and the phial will be discharged. The same will be effected if a large company form a circle, by joining their hands, and the person at one extremity of the circle touch the outside coating, while he, who is at the other extremity, touches the ball of the jar. All the persons who form this circle are struck at the same time, and with the same degree of force nearly. If you place a Leyden bottle upon the insulated stand, forming a communication between it and the conductor, and give the machine a few turns, both sides of the bottle will be electrified with the positive electricity, as may easily be proved by touching them with down, or a small ball suspended by silk; for when this is electrified by touching the outside, it will be also repelled by the ball which communicates with the inner surface. Having placed an insulated bottle so that the ball may communicate with the conductor; let a wire also be connected with the coating, so as to form a communication with the table. Next turn the machine, and, 1. On applying a cork ball, you will not find any signs of electricity in the coating, but you will find the ball (or inside) electrified with the positive power. 2. Remove the wire communicating with the table, and you will find the coating also electrified with the positive power; and this as often as you remove the wire, till the bottle is full charged. 3. When the bottle is full charged, remove its communication both with the conductor and table, touch the coating, and the cork ball will remain suspended by it, without any sign of being electrified; then touch the knob of the bottle with your hand, the cork ball will be strongly repelled from the coating, and be electrified with negative electricity. 4. Take another cork ball suspended by silk, and touch the knob of the bottle therewith, and the cork ball will be electrified with positive electricity, and be repelled. 5. Now touch the coating with your finger, and the cork ball will be repelled much further by the ball; but that which was repelled from the coating, now flies towards it, and remains at rest, till you touch the knob of the bottle with your finger; it will then be electrified as at first, and be violently repelled; the ball which

was electrified by the knob of the bottle will now fly towards it. This change takes place almost instantaneously as often as the ball or coating is touched. The knob of the bottle may be made to connect with the conductor by a wire, suspending a cork ball so as to touch the conductor; then, on touching the coating, the ball will be repelled from the conductor, while that next the coating is attracted; touch the knob of the bottle, and the ball will be repelled from the coating, and attracted by the conductor, and so on as often as you please. In charging electric jars in general, it is to be observed, that every machine will not charge them equally high. Those machines which are strongest will always charge the jars highest. If the coated jars, before they are made use of, be made somewhat warm, they will receive and retain the charge better. If several jars be connected together, among which there is one that is apt to discharge itself very soon, then the other jars will also soon be discharged with it, although they may be capable of holding a very great charge by themselves. When electric jars are to be discharged, the electrician must be cautious, lest by some circumstance not adverted to, the shock should pass through any part of his body; for an unexpected shock, though not very strong, may occasion disagreeable accidents. In making the discharge, care must be taken that the discharging rod be not placed on the thinnest part of the glass, as that may cause the breaking of the jar. When a jar, and especially a battery, has been discharged, the electrician ought not to touch its wires with his hand, before the discharging rod be applied to its sides a second and even a third time; as there generally remains a residuum of the charge, which is sometimes very considerable. All the above-mentioned phenomena are the more remarkable in proportion to the power of the machine. That used in Teyler's Museum is astonishing in its effects, which are as follows: On presenting a very sharp steel point to the prime conductor, a luminous stream of about half an inch was perceived between them. On fixing the point to the conductor so as to project three inches from it, streams of light were thrown out from the point six inches long when a ball of three inches in diameter was presented, but only two inches in length on presenting another point. The sensation, called the spider's web, on the face of the bystanders is often felt at the distance of eight feet from the prime conductor. This is a sensation always produced by strong electricity, something resembling the creeping of insects or the motion of a light body, such as a spider's web, over the skin. It seems to proceed from the attraction and electrification of the small hairs with which the body is covered. A thread six feet long was sensibly attracted at the distance of thirty feet from the prime conductor, and a pointed wire appeared luminous at the distance of twenty-eight feet; a cork ball electrometer diverged at the distance of forty feet. A single spark from the conductor melted a considerable length of gold leaf; gunpowder and other combustibles, inclosed in a paper cartridge, with a sharp point in the middle, were fired; and when another conductor communicating with the earth was placed at the distance of twenty-one, or sometimes twenty-four inches from the prime conductor of the machine, a stream of fire was perceived between them. This was crooked, and darted out many lateral brushes of a very large size. A Leyden phial, containing about one square foot of coated surface, was so fully charged, by about half a turn of the winch, as to discharge itself; and by repeated trials it was found, that in one minute it discharged itself seventy-six, seventy-eight, and frequently eighty times. Lastly, it was found, that though the conductor, which received the sparks from the prime one of the machine, communicated with the earth by a wire three-eighths of an inch in diameter, this wire would give small sparks to any conducting body brought near it, as if even this wire had not been sufficient to conduct the quantity of electricity it received from the machine very readily to the earth.

EXPERIMENTS EXHIBITING ELECTRIC ATTRACTION AND REPULSION.

THE ELECTRIFIED CORK-BALL ELECTROMETER. Fix at the end of the prime conductor a knobbed rod, and hang on it two small cork-balls suspended by threads of equal length. The balls will now touch one another, the threads hanging perpendicularly, and parallel to each other. But if the cylinder of the machine be whirled by turning the winch, then the cork-balls will repel one another, more or less according as the electricity

city is more or less powerful. If the electrometer be hung to a prime conductor negatively electrified, *i. e.* connected with the insulated rubber of the machine, the cork balls will also repel each other. If, in this state of the repulsion, the prime conductor is touched with some conducting substance not insulated, the cork balls will immediately come together. But if, instead of the conducting substance, the prime conductor is touched with an electric, as a stick of sealing-wax, a piece of glass, &c. then the cork balls will continue to repel each other; because the electric fluid cannot be conducted through that electric; hence we have an easy method of determining what bodies are conductors and what electric. This electrical repulsion is also shewn by a large downy feather, which will appear beautifully swelled by the divergency of its down.

ATTRACTION AND REPULSION OF LIGHT BODIES. Connect with the prime conductor, by the hook H, the two parallel brass plates F, G, fig. 11, Plate LXIII. at about three inches from one another: and upon the lower plate put any kind of light bodies, as bran, bits of paper, bits of leaf gold, &c.; then work the machine, and the light bodies will soon move between the two plates, leaping alternately from one to the other with great velocity. If, instead of bran or irregular pieces of other matter, small figures of men or other things cut in paper and painted, or rather made of the pith of alder, be put upon the plate, they will generally move in an erect position, but will sometimes leap one upon another, or exhibit different postures, so as to afford a pleasing spectacle to an observing company. When bran or other substances of that kind are made use of, it will be proper to inclose both plates in a glass cylinder, by which the bran will be kept from dispersing and flying about the room. The phenomena of electric attraction and repulsion may be exhibited also with a glass tube, or a charged bottle, and some of them in a manner more satisfactory than with the machine.

The ELECTRICAL SPIDER, Fig. 12, Plate LXIII. represents an electric jar, having a wire C D E fastened on its outside, which is bended so as to have its knob E as high as the knob A.—B is a spider made of cork, with a few short threads run through it to represent its legs. It is fastened at the end of a silk thread, proceeding from the ceiling of the room, or from any other support, so that it may hang mid-way between the two knobs A and E, when the jar is not charged. Let the place of the jar upon the table be marked; then charge the jar, by bringing its knob A in contact with the prime conductor, and replace it in its marked place. The spider will now begin to move from knob to knob, and continue this motion for a considerable time, sometimes for several hours. The inside of the jar being charged positively, the spider is attracted by the knob A, which communicates to it a small quantity of electricity; the spider then becoming possessed of the same electricity with the knob A, is repelled by it, and runs to the knob E, where it discharges its electricity, and is then attracted by the knob A, and so on. Thus the jar is gradually discharged; and when the discharge is nearly completed, the spider finishes its motion.

The ELECTRICAL JACK is an invention of the celebrated Dr. Franklin's, and turns with considerable force, so that it may sometimes be used for the purposes of a common jack. A small upright shaft of wood passes at right angles through a thin round board of about 12 inches diameter, and turns on a sharp point of iron fixed in the lower end, while a strong wire in the upper end, passing through a small hole in a thin brass plate, keeps the shaft truly vertical. About 30 radii, of equal length, made of window glass cut into narrow slips, issue horizontally from the circumference of the board, the ends most distant from the centre being about four inches apart. On the end of every one a brass thimble is fixed. If now the wire of an electrified bottle be brought near the circumference of this wheel, it will attract the nearest thimble, and so put the wheel in motion. That thimble, in passing by, receives a spark; and thereby being electrified, is repelled, and so driven forwards; while a second, being attracted, approaches the wire, receives a spark, and is driven after the first; and so on, till the wheel has gone once round; when the thimbles before electrified approaching the wire, instead of being attracted, as they were at first, are repelled, and the motion presently ceases. But if another bottle which had been charged through the coating, or otherwise negatively electrified, is placed near the same wheel its wire will attract the thimble repelled by the first, and thereby

double the force that carries the wheel round. The wheel therefore moves very swiftly, turning 12 or 15 times in a minute, and with such force, that a large fowl spitted on the upper shaft may be roasted by it.

The SELF-MOVING WHEEL. This appears more surprising than the last experiment, though constructed upon the same principles. It is made of a thin round plate of window glass 17 inches in diameter, well gilt on both sides, all but two inches next the edge. Two small hemispheres of wood are then fixed with cement to the middle of the upper and under sides, centrally opposite; and in each of them a strong thick wire eight or ten inches long, which together make the axis of the wheel. It turns horizontally on a point at the lower end of its axis, which rests on a bit of brass cemented within a glass salt-cellar. The upper end of its axis passes through a hole in a thin brass plate, cemented to a long and strong piece of glass; which keeps it six or eight inches distant from any non-electric, and has a small ball of wax or metal on its top to keep in the fire. In a circle on the table which supports the wheel, are fixed 12 small pillars of glass, at about 11 inches distance, with a thimble on the top of each. On the edge of the wheel is a small leaden bullet, communicating by a wire with the gilding of the upper surface of the wheel; and about six inches from it is another bullet communicating in like manner with the under surface. When the wheel is to be charged by the upper surface, a communication must be made from the under surface to the table. As soon as it is well charged, it begins to move. The bullet nearest to a pillar moves towards the thimble on that pillar: and, passing by, electrifies it, and is then repelled from it. The succeeding bullet, which communicates with the other surface of the glass, more strongly attracts that thimble on account of its being electrified before by the other bullet; and thus the wheel increases its motion, till the resistance of the air regulates it. It will go half an hour; and make, one minute with another, 20 turns in a minute; which is 600 turns in the whole; the bullet in the upper surface giving in each turn 12 sparks to the thimbles, making in all 2500 sparks; while the same quantity of fire is thought to be received by the under bullet. The whole space moved over by these bullets in the mean time is 2500 feet. If, instead of two bullets, you put eight, four communicating with the upper, and four with the under surface, the force and swiftness will be greatly increased, and the wheel will make about 50 turns in a minute; but then it will not continue moving so long. These wheels may be applied to the ringing of chimes, and the moving of small orreries, &c.

The ELECTRIFIED BELLS, Fig. 13, Plate LXIII. represents an instrument having three bells, which are made to ring by electric attraction and repulsion. B is a brass rod, furnished with a ring, A, of the same metal, by which it is suspended from another rod fixed in the prime conductor. The outer bells C and E are suspended by brass chains; but the middle bell D and the two small brass clappers G and H are suspended by silk threads. From the concave under part of the bell D a chain proceeds, which falls upon the table, and has a silk thread F, at its extremity. When this apparatus is hung to the conductor by the ring A, and the cylinder of the machine gently turned, the clappers will fly from bell to bell with a rapid motion, and the bells will ring as long as they are kept electrified. The two bells C and E being suspended by brass chains are first electrified: hence they attract the clappers, communicate to them a little electricity, and repel them to the unelectrified bell D; upon which the clappers deposit their electricity, and move again to the bells C E, from which they acquire more, and so on. If, by holding the silk thread F, the chain of the middle bell be raised from the table, the bells after ringing a little while will stop; because the bell D will have no opportunity of conveying the electricity it receives from the clappers to the ground, being insulated by the silk thread. In the dark, sparks will be seen between the clappers and bells. Fig. 14 represents a set of bells more elegantly mounted, and which produce a better sound. In these the knob a must communicate with the conductor when the apparatus is made use of. Fig. 15 represents a set of eight bells otherwise constructed. The clapper h is here suspended by a silken thread from the fly a b c d: the axis of the fly rests in a small hole on the top of a glass pillar; and its upper part moves freely in, and is confined by a hole in the brass arm g. To make use of the bells these must be applied to the cylinder of the machine, or at least brought very near it when the con-

ductor is removed: so that the fly *abcd* may be about the height of the centre of the cylinder. The latter being then put in motion, the electricity from it proceeding to the fly, will cause it to turn round and the clapper attracted by each of the bells alternately in its rotation; which, if they are properly tuned, will produce a pleasing and harmonious sound.

EXPERIMENTS EXHIBITING ELECTRIC LIGHT and FIRE.

The following experiments require to be made in the dark: for although the electric light in several circumstances may be seen in the day-light, yet its appearance in this manner is very confused; and that the electrician may form a better idea of its different appearances, it is absolutely necessary to perform such experiments in a darkened room.

THE STAR and PENCIL of ELECTRIC LIGHT. When the electrical machine is in good order, and the prime conductor is situated with the collector sufficiently near the glass cylinder, turn the winch, and you will see a lucid star at each of the points of the collector. This star is the constant appearance of the electric fluid that is entering a point. At the same time you will see a strong light proceeding from the rubber, and spreading itself over the surface of the cylinder; and if the excitation of the cylinder is very powerful, dense streams of fire will proceed from the rubber, and, darting round almost half the circumference of the cylinder, will reach the points of the collector. If the prime conductor is removed, the dense streams of fire will go quite round the cylinder; reaching from one side of the rubber to the other. If the chain of the rubber is taken off, and a pointed body, for instance the point of a needle or a pin, be presented to the back of the rubber, at the distance of about two inches, a lucid pencil of rays will appear to proceed from the point presented, and diverge towards the rubber. If another pointed body be presented to the prime conductor, it will appear illuminated with a star; but if a pointed wire or other pointed conducting body be connected with the prime conductor, it will throw out a pencil of rays.

DRAWING SPARKS. Let the prime conductor be situated in its proper place, and electrify it by working the machine; then bring a metallic rod with a round knob at each end, or the knuckle of a finger, within a proper distance of the prime conductor, and a spark will be seen between that and the knuckle or knobbed wire. The longer and stronger spark is drawn from that end of the prime conductor which is farthest from the cylinder, or rather from the extremity of the knobbed rod fixed at its end. This spark appears like a long line of fire, reaching from the conductor to the opposed body, and often (particularly when the spark is long, and different conducting substances are near the line of its direction) it will have the appearance of being bended to sharp angles in different places resembling a flash of lightning. It often darts brushes of light sideways in every direction.

THE ARTIFICIAL LIGHTNING. Let two persons, one standing upon an insulated stool, and communicating with the prime conductor, and another standing upon the floor, each hold in one of his hands a metal plate, so that the plates may stand back to back in a parallel situation, and about two inches asunder. Let the winch of the machine be turned, and the flashes of light between the two plates will appear so dense and frequent, that one may easily distinguish any thing in the room. By this experiment the electric light is exhibited in a very copious and beautiful manner, and bears a striking resemblance to lightning.

TO FIRE INFLAMMABLE SPIRITS. The power of the electric spark to set fire to inflammable spirits, may be exhibited easily thus: Hang to the prime conductor a short rod having a small knob at its end; then pour some spirits of wine, a little warmed, into a spoon of metal; hold the spoon by the handle, and place it in such a manner, that the small knob on the rod may be about one inch above the surface of the spirits. In this situation, if, by turning the winch, a spark be made to come from the knob, it will set the spirits on fire. It will generally be found more advantageous to fix the dish containing the spirits upon the prime conductor, as represented fig. 16, Plate LXIII. This experiment may be varied different ways, and may be rendered very agreeable to a company of spectators. A person standing upon an electric stool, and communicating with the prime conductor, may hold the spoon with the spirits in his hand, and another person, standing upon the floor, may set the spirits on fire by bringing his finger within a small distance of it. Instead of his finger, he may fire the spirits with a

piece of ice, when the experiment will seem much more surprising. If the spoon is held by the person standing upon the floor, and the insulated person brings some conducting substance over the surface of the spirits, the experiment succeeds as well.

THE LUMINOUS CONDUCTOR. Fig. 17, Plate LXIII. represents a prime conductor invented by Mr. Henly, which shews clearly the direction of the electric fluid passing through it, from whence it is called the luminous conductor. The middle part EF of this conductor is a glass tube about 18 inches long and three or four inches in diameter. To both ends of this tube the hollow brass pieces FD, BE, are cemented air-tight, one of which has a point C, by which it receives the electric fluid, when set near the excited cylinder of the electrical machine, and the other has a knobbed wire G, from which a strong spark may be drawn; and from each of the pieces FD, BE, a knobbed wire proceeds within the cavity of the glass tube. The brass piece FD, or BE, is composed of two parts; *i. e.* a cap F cemented to the glass tube, and having a hole with a valve, by which the cavity of the glass tube is exhausted of air; and the ball D, which is screwed upon the cap F. The supporters of this instrument are two glass pillars fastened in the bottom board H, like the supporters of the prime conductor. When the glass tube of this conductor is exhausted of air by an air-pump, and the brass ball is screwed on, as represented in the figure, then it is fit for use, and may serve for a prime conductor to an electrical machine. If the point C of this conductor is set near the excited cylinder of the machine, it will appear illuminated with a star; at the same time the glass tube will appear all illuminated with a weak light; but from the knobbed wire that proceeds within the glass tube from the piece FD, a lucid pencil will issue out, and the opposite knob will appear illuminated with a star, which, as well as the pencil rays, is very clear, and discernible among the other light that occupies the greatest part of the cavity of the tube. If the point C, instead of being presented to the cylinder, be in contact with the rubber of the machine, the appearance of light within the tube will be reversed; the knob which communicates with the piece FD appearing illuminated with a star and the opposite one with a pencil of rays; because in this case the direction of the electric fluid is just the contrary of what it was before; it then going from D to B, and now coming from B and going to D. If the wires within the tube EF, instead of being furnished with knobs, be pointed, the appearance of light is the same; but it seems not so strong in this as in the other case.

THE CONDUCTING GLASS TUBE. Take a glass tube of about two inches diameter, and about two feet long; fix to one of its ends a brass cap, and to the other a stop-cock or a valve; then exhaust it of air by an air-pump. If this tube be held by one end, and its other end be brought near the electrified prime conductor, it will appear to be full of light whenever a spark is taken by it from the prime conductor, and much more so if an electric jar be discharged through it. This experiment may also be made with the receiver of an air-pump. Take a tall receiver, clean and dry, and through a hole at its top insert a wire, which must be cemented air-tight. The end of the wire within the tube must be pointed, but not very sharp; and the other end must be furnished with a knob. Put this receiver upon the plate of the air-pump, and exhaust it. If now the knob of the wire at the top of the receiver be touched with the prime conductor, every spark will pass through the receiver in a dense and large body of light, from the wire to the plate of the air-pump. When the air-pump, or any thing not very portable, is to be touched with the prime conductor, the communication between them may be made by means of a rod furnished with an electric handle.

THE ARTIFICIAL AURORA BOREALIS. Take a phial nearly of the shape and size of a Florence flask; (fig. 18, Plate LXIII.) fix a stop-cock or a valve to its neck, and exhaust it of air as much as possible with a good air-pump. If this glass be rubbed in the common manner used to excite electrics, it will appear luminous within, being full of a flashing light, which plainly resembles the aurora borealis or northern light. This phial may also be made luminous, by holding it by either end, and bringing the other end to the prime conductor; in this case, all the cavity of the glass will instantly appear full of flashing light, which remains in it for a considerable time after it has been removed from the prime conductor. Instead of the glass phial a glass tube exhausted of air and hermetically sealed may be used, and perhaps with more advantage. The most remarkable circumstance of this experiment is,

that

that if the phial, or tube, after it has been removed from the prime conductor (and even several hours after its flashing light has ceased to appear), be grasped with the hand, strong flashes of light will immediately appear within the glass, which often reach from one end of it to the other.

The **VISIBLE ELECTRIC ATMOSPHERE**, is an experiment of Signior Beccaria. GI, fig. 19, Plate LXIII. represents the receiver with the plate of an air-pump. In the middle of the plate IF, a short rod is fixed, having at its top a metal ball B nicely polished, whose diameter is nearly two inches. From the top of the receiver, another rod AD, with a like ball A, proceeds, and is cemented air-tight in the neck C; the distance of the balls from one another being about four inches, or rather more. If, when the receiver is exhausted of air, the ball A be electrified positively, by touching the top D of the rod AD with the prime conductor, or an excited glass tube, a lucid atmosphere appears about it, which although it consists of a feeble light, is yet very conspicuous, and very well defined; at the same time, the ball B has not the least light. This atmosphere does not exist all round the ball A; but reaches from about the middle of it, to a small distance beyond that side of its surface which is next the opposite ball B. If the rod with the ball A be electrified negatively, then a lucid atmosphere, like the above described, will appear upon the ball B, reaching from its middle to a small distance beyond that side of it that is towards the ball A; at the same time, the negatively electrified ball A remains without any light. The operator in this experiment must take care not to electrify the ball A too much; else the electric fluid will pass in a spark from the one ball to the other, and the experiment will fail. "By this elegant experiment of the celebrated F. Beccaria, says Mr. Cavallo, we have an ocular demonstration of the theory of a single electric fluid. We see that electricity consists of one uniform homogeneous fluid, and not of two, viz. the vitreous and resinous, as some have supposed; for, if the positive and negative electricity were two distinct fluids, attractive of one another, there should in the above experiment always appear two atmospheres, *i. e.* one about the ball A, and another about the ball B; for when the ball A is overcharged with either fluid, it should shew that superfluous fluid on its surface, and this fluid should attract towards the ball A an atmosphere of the contrary fluid from the ball B. But this is not the case, for the lucid atmosphere is always on one ball, namely, that which is overcharged with the electric fluid: thus when the ball A is electrified positively, the superfluous fluid is visible on that part of it which is nearest to the ball B, because B, being in a contrary state of electricity, endeavours to attract it; but when the ball A is electrified negatively, it will attract the fluid proper to the ball B, which fluid on that account appears on the surface of B, just in the act of leaping to the ball A."

The **SPIRAL TUBES**. Fig. 20, Plate LXIII. represents an instrument composed of two glass tubes CD, one within another, and closed with two knobbed brass caps A and B. The innermost of these has a spiral row of small round pieces of tin-foil stuck upon its outside surface, and lying at about one-30th of an inch from each other. If this instrument be held by one of its extremities, and its other extremity be presented to the prime conductor, every spark it receives from the prime conductor will cause small sparks to appear between all the round pieces of tin-foil stuck upon the innermost tube; which in the dark affords a pleasing spectacle, the instrument appearing encompassed by a spiral line of fire. Fig. 21 represents several spiral tubes placed round a board, in the middle of which is screwed a glass pillar, and on the top of this pillar is cemented a brass cap with a fine steel point. In this a brass wire turns, having a brass ball at each end, nicely balanced on the wire. To make use of this apparatus, place the middle of the turning wire under a ball proceeding from the conductor, so that it may receive a succession of sparks from the ball; then push the wire gently round; and the balls in their relative motions will give a spark to each tube, and thereby illuminate them down to the board, which from its brilliancy and rapid motion affords a most beautiful and pleasing sight. The small pieces of tin-foil are sometimes stuck on a flat piece of glass ABCD, fig. 22, so as to represent various fanciful figures. Upon the same principle is the luminous word **LIGHT** produced. It is formed by the small separations of the tin-foil pasted on a piece of glass fixed in a frame of baked wood, as represented fig. 23. To use this, the frame

must be held in the hand, and the ball G presented to the conductor. The spark then will be exhibited in the intervals composing the word; from whence it passes to the hook at *h*, and thence to the ground by a chain. The brilliancy of this is equal to that of the spirals. A similar effect will be produced by the jar, fig. 8, Plate LXIV, coated by detached pieces of tin-foil; it will exhibit the electric light passing from piece to piece, both while charging and discharging.

TO FIRE A PISTOL OR CANNON BY INFLAMMABLE AIR. Fig. 24 represents a brass pistol for inflammable air. It consists principally of a chamber, to the mouth D of which a cork is fitted: a glass tube F is cemented into the top of the chamber, through which a brass wire passes, and is bent within side so as to approach within an 8th part of an inch of the side. On the outside end of this wire is screwed a brass ball A, which serves to receive a spark from the conductor of the machine, and conduct it in that form to the inside of the pistol. The inflammable air with which the pistol is to be charged may be made in a common stone-ware or glass bottle, by mixing a handful of iron-filings with about two wine-glassfuls of water and near one of oil of vitriol. The air, when thus made, should be kept in a bottle corked up. To use the pistol, take out the cork from the bottle, and instantly apply the mouth of the pistol to the mouth of the bottle; and in about ten seconds it will be sufficiently charged: then remove it, and cork both the pistol and bottle with the utmost expedition: then bring the ball A near the prime conductor or the knob of a charged jar; and the spark that passes through the ball, and between the end of the wire within the side of the chamber, will fire the inflammable air with a loud report, and drive the cork to a considerable distance. Instruments to fire inflammable air are often made in the form of a cannon with its carriage, as in fig. 25.

TO ILLUMINATE IVORY OR BOX-WOOD. Place an ivory ball on the prime conductor of the machine, and take a strong spark, or send the charge of a Leyden bottle through its centre, the ball will appear perfectly luminous; but if the charge be not taken through the centre, it will pass over the surface of the ball and corrode it. A spark taken through a ball of box-wood not only illuminates the whole, but makes it appear of a beautiful crimson or rather fine scarlet colour.

TO ILLUMINATE WATER. Connect one end of a chain with the outside of a charged jar, and let the other lie upon the table. Place the end of another piece of chain at about one quarter of an inch from the former; then set a decanter of water on these separated ends; and on making a discharge, the water will appear perfectly and beautifully luminous.

EXPERIMENTS WITH THE LEYDEN PHIAL.

The **LEYDEN VACUUM** is an invention of the late Mr. Henly. Fig. 26 and 27, Plate LXIII. represent two small phials coated on the outside, about three inches up the sides, with tin-foil; at the top of the neck of each, a brass cap is cemented, having a hole with a valve, and from the cap a wire proceeds a few inches within the phial, terminating in a blunt point. When this phial is exhausted of air, a brass ball is screwed upon the brass cap, which is cemented into its neck, so as to defend the valve, and prevent any air from getting into the exhausted glass. This phial exhibits clearly the direction of the electric fluid, both in charging and discharging; for if it be held by its bottom, and its brass knob be presented to the prime conductor positively electrified, it will be seen that the electric fluid causes the pencil of rays to proceed from the wire within the phial, as represented fig. 26; and if it is discharged, a star will appear in the place of the pencil, as represented in fig. 27. But if the phial is held by the brass cap, and its bottom be touched with the prime conductor, then the point of the wire on its inside will appear illuminated with a star when charging, and with a pencil when discharging. If it be presented to a prime conductor electrified negatively, all these appearances, both in charging and discharging, will be reversed.

The **APPARATUS**, represented fig. 7, Plate LXIV. will be found very convenient for the various experiments upon the luminous conductor, Leyden vacuum, jars charged positively or negatively, with their different states of insulation. A is an insulating pillar of glass, which is screwed to the wooden foot B; and on this pillar all the apparatus may be screwed alternately. CD is an exhausted tube of glass, furnished at each end with brass caps; at the

end D is a valve properly secured under the brass plate; a brass wire with a ball projects from the upper cap; a pointed wire proceeds from the bottom plate; and this tube is called the luminous conductor. The flask represented at E is called the Leyden Vacuum. It is furnished with a valve under the ball E; to come at which the more readily, the ball may be unscrewed: a wire, with a blunt end, projects to within a little of the bottom of the flask, the latter being coated with tin-foil: and a female screw is cemented to the bottom, to screw it on the pillar A.—F is a syringe to exhaust the air occasionally, either from the luminous conductor or the Leyden vacuum. To do this, unscrew the ball of the Leyden vacuum, or the plate of the luminous conductor, and then screw the syringe in the place of either of these pieces, being careful that the bottom of the female screw G bears close against the leather which covers the shoulders *ab* or *ed*; then work the syringe, and in a few minutes the glasses will be sufficiently exhausted. H and I are two Leyden bottles; each of which has a female screw fitted to the bottom, that they may be conveniently screwed on the pillar A; and the bottle H is furnished with a belt by which it may be screwed sidewise to the same. K and L are two small wires, to be screwed occasionally either into the ball E, the knobs *c* or *f*, the cap C, or the socket *g* on the top of the pillar: the balls may be unscrewed from these wires, which will then exhibit a blunt point. M is a wooden table to be screwed occasionally on the glass pillar.

TO PIERCE VARIOUS SUBSTANCES WITH THE ELECTRIC EXPLOSION. Take a card, a quire of paper, or the cover of a book, and keep it close to the outside coating of a charged jar; put one knob of the discharging rod upon the card, quire of paper, &c. so that between the knob and coating of the jar the thickness of that card, or quire of paper, only is interposed; lastly, by bringing the other knob of the discharging rod near the knob of the jar, make the discharge, and the electric matter will pierce a hole (or perhaps several) quite through the card or quire of paper. This hole has a bur raised on each side, except the card, &c. be pressed hard between the discharging rod and the jar; which shews that the hole is not made in the direction of the passage of the fluid, but in every direction from the centre of the resisting body. If instead of paper, a very thin plate of glass, rosin, sealing-wax, or the like, be interposed between the knob of the discharging rod and the outside coating of the jar, on making the discharge, this will be broken in several pieces. Small insects may also be killed in this manner. They may be held between the outside coating of the jar and the knob of the discharging rod, like the above card; and a shock of a common phial sent through them, will instantly deprive them of life, if they are pretty small; but if larger, they will be affected in such a manner, as to appear quite dead on first receiving the stroke; but will, after some time, recover: this, however, depends on the quantity of the charge sent through them.

EFFECT OF THE SHOCK SENT OVER THE SURFACE OF A CARD OR GLASS. Put the extremities of two wires upon the surface of a card, or other body of an electric nature, so that they may be in one direction, and about one inch distant from one another; then, by connecting one of the wires with the outside of a charged jar, and the other wire with the knob of the jar, the shock will be made to pass over the card or other body. If the card be made very dry, the lucid track between the wires will be visible upon the card for a considerable time after the explosion. If a piece of common writing paper be used instead of the card, it will be torn by the explosion into very small bits. If the explosion be sent over the surface of a piece of glass, it will be marked with an indelible track, which generally reaches from the extremity of one of the wires to the extremity of the other. In this manner, the piece of glass is very seldom broken by the explosion. But Mr. Henly discovered a very ingenious method to increase the effect of the explosion upon the glass, by pressing with weights that part of the glass which lies between the two wires, *i. e.* the part over which the shock is to pass. He put a thick piece of ivory upon the glass, and placed upon it a weight, from one quarter of an ounce to six pounds. The glass in this manner is generally broken by the explosion into innumerable fragments, and some of it is absolutely reduced into an impalpable powder. If the glass be very thick, and resist the force of the explosion, so as not to be broken, it will be marked with the most lively prismatic colours, which are thought to be occasioned by very thin laminæ of the glass, partly

separated from it by the shock. The weight laid upon the glass is always shaken by the explosion, and sometimes it is thrown quite off from the ivory. This experiment may be most conveniently made with the universal discharger, fig. 7, Plate LXIII. In this experiment, Mr. Cavallo says, "if small representations of houses, &c. be laid upon a board, placed on the piece of ivory, that, being shook by the explosion, will give a very natural idea of an earthquake." As to the direction of the electric fluid, the following experiments have been thought to prove directly the passage of the fluid outward from the positive and inward to the negative side of the phial. Fig. 8, Plate LXIV. represents an electric jar, whose exterior coating is made up of small pieces of tin-foil placed at a little distance from each other. It is to be charged in the usual manner, when small sparks of the electric fluid will pass from one piece of tin-foil to the other, in various directions, forming a very pleasing spectacle. The separation of the tin-foil is the cause of this visible passage of the fluid from the outside to the table, and the experiment is similar in appearance to that of the spiral tube above-mentioned. If the jar be discharged by bringing a pointed wire gradually to the knob, T, the unsealed part of the glass between the wire and knob will be agreeably illuminated with a crackling noise of the sparks. If the jar be suddenly discharged, the whole outside will be illuminated. The jar, in this experiment, must be very dry when used. Fig. 22 represents two jars, or Leyden phials, placed one over the other, by which several curious experiments may be made. Bring the outside coating of the bottle A in contact with the prime conductor, and turn the machine till the bottle is charged; then place one ball of the discharging rod upon the coating of B, and with the other touch the knob of the jar A, which will cause an explosion; now place one ball of the discharger on the knob A, and bring the other ball to its coating, and you have a second discharge. Again, apply one ball of the discharger to the coating of B, and carry the other to the coating of A, and it will produce a third discharge. A fourth is obtained by applying the discharger from the coating of A to its knob. The outer coating of the upper jar communicating with the inside of the upper one, conveys the fluid from the conductor to the large jar, which is therefore charged positively: the upper jar does not charge, because the inside cannot part with any of its electric fluid; but when a communication is formed from the outside of A to the inside of B, part of the fire on the inside of A will be conveyed to the negative coating of B, and the jar will be discharged. The second explosion is occasioned by the discharge of the jar A; but as the outside of this communicates, by conducting substances, with the positive inside of the jar B, if the ball of the discharging rod remain for a little time after the discharge on the knob of A, part of the fire of the inside of A will escape, and be replaced by an equal quantity on the outside from the jar B, by which means A is charged a second time; the discharge of this produces the third, and of B the fourth explosion. Fig. 23 is an electric jar, which serves to illustrate the direction of the fluid while charging a Leyden phial. BB is the tin-foil coating; C a stand which supports the jar; D a socket of metal, carrying the glass rod E, a bent brass wire pointed at each end, and fixed at the end of the rod G; which rod is moveable in the spring tube N at pleasure: that tube being fixed by a socket on the top of the glass rod E the jar is charged by the inside wire, which communicates with the different divisions of the inside coating by horizontal wires. Place the jar to the conductor as usual; and, when charging, a luminous speck will appear upon the upper point of the wire at F, clearly shewing, according to the commonly received opinion, that the point is then receiving the electric fluid. From the upper ring of the coating B, on the outside of the jar, a fine stream or pencil of rays will at the same time fly off, beautifully diverging from the lower point of the wire F upon the bottom ring of the coating of the jar. When the appearances cease, which they do when the jar is charged, let a pointed wire be presented towards the conductor: this will soon discharge the jar silently; during which the point will be illuminated with a small spark, while the upper point of the wire will throw off a pencil of rays diverging towards the upper ring of the coating.

TO DISCHARGE A JAR SILENTLY.

When a large jar is fully charged, which would give a terrible shock, put one of your hands in contact with its outside coating; with

with the other hold a sharp-pointed needle, and keeping the point directed towards the knob of the jar, proceed gradually near it, until the point of the needle touches the knob. This operation discharges the jar entirely; and you will either receive no shock at all, or so small a one as can hardly be perceived. The point of the needle, therefore, has silently and gradually drawn all the superfluous fluid from the inside surface of the electric jar.

THE ELECTRIFIED COTTON.

Take a small lock of cotton, extended in every direction as much as conveniently can be done; and by a linen thread about five or six inches long, or by a thread drawn out of the same cotton, tie it to the end of the prime conductor: then turn the winch of the machine, and the lock of cotton, on being electrified, will immediately swell, by repelling its filaments from one another, and will stretch itself towards the nearest conductor. In this situation let the winch be kept turning, and present the end of your finger, or the knob of a wire, towards the lock of cotton, which will then immediately move towards the finger, and endeavour to touch it; but take with the other hand a pointed needle, and present its point towards the cotton, a little above the end of the finger, and you will observe the cotton immediately to shrink upward, and move towards the prime conductor. Remove the needle, and the cotton will come again towards the finger. Present the needle, and the cotton will shrink again, which clearly proves that the needle draws off the electric fluid from the cotton.

THE ELECTRIFIED BLADDER.

Take a large bladder well blown, and cover it with gold, silver, or brass leaf, sticking it with gum-water: suspend it at the end of a single thread, at least six or seven feet long, hanging from the ceiling of the room; and electrify the bladder, by giving it a strong spark with the knob of a charged bottle: this done take a knobbed wire, and present it to the bladder when motionless; and you will perceive, that as the knob approaches the bladder, the bladder also moves towards the knob, and, when nearly touching it, gives it the spark which it received from the charged phial, and thus it becomes unelectrified. Give it another spark, and, instead of the knobbed wire, present the point of a needle towards it, and the bladder will not be attracted by, but rather recede from, the point, especially if the needle be very suddenly presented towards it. This is one of Mr. Henry's experiments.

THE DANCING BALLS.

Fix a pointed wire upon the prime conductor, with the point outward; then take a glass tumbler, grasp it with your hands, and present its inside surface to the point of the wire upon the prime conductor while the machine is in motion: the glass in this manner will soon become charged; for its inside surface acquires the electricity from the point, and the hands serve as a coating for the outside. This done put a few pith balls upon the table, and cover them with this charged glass tumbler. The balls will immediately begin to leap up along the sides of the glass as represented, fig. 1, Plate LXIV. and will continue their motion for a considerable time.

THE ELECTRIC FLIES.

These flies are composed of small brass wires, figs. 2 and 3, Plate LXIV. fixed into a cap of brass, easily moveable upon an axis of the same metal, and exactly balanced, so that they may turn with the smallest force. The ends, which ought to be very sharp, are all bent one way, with regard to one another, as those belonging to *a, b*, in the figure; though the two sets of points constituting the two flies there represented, are contrary to each other; so that the whole flies must have a contrary motion. Fixing the axle with the two flies upon the prime conductor, and working the machine, both will begin to turn very swiftly, each in a direction contrary to that of the points. In this manner, with a powerful machine, several flies may be made to turn either in the same or in contrary directions; and by their gradual increase or decrease in size may represent a cone or other figure; for the course of each will be marked by a line of fire, and thus the whole will exhibit a beautiful appearance in the dark. The light is said to be more brilliant when the ends are slightly covered with sealing-wax, grease, or other electric matter. The flies, in this expe-

rimment, turn the same way whether the electricity be positive or negative; the reason will easily be conceived from the theory above laid down, viz. that in positive electricity the fluid issues from the body electrified, and that in negative electricity it enters into it. In the former case, the force of the fluid, which acts equally on the air and on the point from whence it issues, must continually put the point the contrary way; and in negative electricity, when the point solicits a continual draught of electric matter from the air, the direct impulse of the former must also produce a motion in the point in the course in which the fluid itself moves. In vacuo no motion is produced; because there is no air on which the fluid may act when it issues from the point. In like manner, when air is inclosed in a glass vessel, the motion of the electric fly soon stops; because the air and the glass soon becomes so much electrified, that the escape of the fluid from the point is prevented, and therefore its motions are impeded, and in a little time entirely stopped. On applying a conductor to the outside of the glass, the fly renews its motion; because an opportunity is now given to the fluid to escape, by running through the glass. But this must soon cease, because, when the glass is thus charged, no more can be carried from the outside. Fig. 4 shews another fly which turns perpendicularly by the same electric power. By means of the stream of electricity issuing from a point, many other amusing experiments have been contrived: such is the electrical orrery, shewing the motion of the sun, earth, and moon. The sun and earth go round the common centre of gravity between them in a solar year; and the earth and moon go round the common centre of gravity between them in a lunar month. These motions are represented by an electrical experiment as follows: The ball *S*, fig. 5, represents the sun, *E* the earth, and *M* the moon, connected by wires *a c* and *b d*: *b* is the centre of gravity between the earth and moon. These three balls, and their connecting wires, are hung and supported on the sharp point of a wire *A*, so that the whole may turn on the point *a*. In like manner *E* and *M* are supported at the point *b*, round which they turn. And as *E* and *M* are light when compared with *S* and *E*, there is much less friction on the point *b*, than on the point *a*. The weights of the balls may be adjusted so, that *E* and *M* may go twelve times round *b*, in the time that *S* and *E* go once round *a*. This affords an amusing experiment in electricity; but it is so far from proving that the motions of the planets in the heavens are owing to a like cause, that it plainly proves they are not; for the real sun and planets are not connected by wires or bars of metal, and consequently there can be no such metallic points as *c* and *d* between them. And without such points, the electric fluid would never cause them to move; for, take away these points in the above-mentioned experiment, and the balls will continue at rest, let them be ever so strongly electrified. Fig. 6 represents a water-mill for grinding corn, turned by a stream of electricity. *A* is the water-wheel, *B* the cog-wheel on its axis, *C* the trundle turned by that wheel, and *D* the running mill-stone on the top of the axis of the trundle. It may easily be contrived and turned also by electricity, if instead of the round plate *D* for the mill-stone, there is a horizontal wheel on the trundle *C*, with spur-cogs, which will turn two trundles placed on its opposite sides: and on the top of each of these trundles' axis, may be a round plate representing a mill-stone; so that this model has all the working parts of a double water-mill, turning two mill-stones. Set the mill near the prime conductor, and place the crooked wire so that its point may be directed towards the uppermost side of the great wheel *A*. Then turn the glass globe by the winch, and the stream of fire that issues from the point of the wire will turn the wheel, and consequently all the other working parts of the mill. Small boats or swans are sometimes made of light wood or cork, and they may be attracted and made to swim in any direction, by applying a finger towards them; or they may have the addition of sails, and will then be made to sail briskly before an electrical gale from a wire held in the hand of the operator.

THE THUNDER HOUSE.

Fig. 9, Plate LXIV. is an instrument representing the side of a house, either furnished with a metallic conductor, or not; by which both the bad effects of lightning striking upon a house not properly secured, and the usefulness of metallic conductors, may be clearly represented. *A* is a board about three quarters of an

†

inch

inch thick, and shaped like the gable end of a house. This board is fixed perpendicularly upon the bottom board B, upon which the perpendicular glass pillar, C D, is also fixed in a hole about eight inches distant from the basis of the board A. A square hole I L M K, about a quarter of an inch deep, and nearly one inch wide, is made in the board A, and is filled with a square piece of wood; which is made nearly of the same dimensions, because it must go so easily into the hole, that it may drop off by the least shaking of the instrument. A wire L K is fastened diagonally to this square piece of wood. Another wire I H of the same thickness, having a brass ball H, screwed on its pointed extremity, is fastened upon the board A; so also is the wire M N, which is shaped in a ring at O. From the upper extremity of the glass pillar C D, a crooked wire proceeds, having a spring-socket F, through which a double knobbed wire slips perpendicularly, the lower knob G of which falls just above the knob H. The glass pillar D C must not be made very fast into the bottom board; but it must be fixed so as it may be pretty easily moved round its own axis; by which means the brass ball G may be brought nearer or farther from the ball H, without touching the part E F G. Now when the square piece of wood L M I K (which may represent the shutter of a window or the like) is fixed into the hole so, that the wire L K stands in the dotted representation I M, then the metallic communication from H to O is complete, and the instrument represents a house furnished with a proper metallic conductor: but if the square piece of wood L M I K is fixed so, that the wire L K stands in the direction L K, as represented in the figure, then the metallic conductor H O, from the top of the house to its bottom, is interrupted at I M, in which case the house is not properly secured. Fix the piece of wood L M I K so, that its wire may be as represented in the figure, in which case the metallic conductor H O is discontinued. Let the ball G be fixed at about half an inch perpendicular distance from the ball H; then, by turning the glass pillar D C, remove the former ball from the latter; by a wire or chain connect the wire E F with the wire Q of the jar P, and let another wire or chain, fastened to the hook O, touch the outside coating of the jar. Connect the wire Q with the prime conductor, and charge the jar; then, by turning the glass pillar D C, let the ball G come gradually near the ball H; and when they are arrived sufficiently near one another, the jar will explode, and the piece of wood L M I K will be pushed out of the hole to a considerable distance from the thunder house. Now the ball G, in this experiment, represents an electrified cloud, which, when it is arrived sufficiently near the top of the house A, the electricity strikes it; and as this house is not secured with a proper conductor, the explosion breaks off a part, *i. e.* knocks off the piece of wood I M. Repeat the experiment with only this variation, *viz.* that this piece of wood I M is situated so, that the wire L K may stand in the situation I M, in which case the conductor H O is not discontinued; and then the explosion will have no effect upon the piece of wood L M, this remaining in the hole unmoved; which shews the usefulness of the metallic conductor. Again, unscrew the brass ball H from the wire I H, so that this may remain pointed. With this difference only in the apparatus, repeat both the above experiments; and you will find that the piece of wood I M is in neither case moved from its place, nor any explosion will be heard; which not only demonstrates the preference of the conductors with pointed terminations to those with blunted ones; but also shews that a house furnished with sharp terminations, although not furnished with a regular conductor, is almost sufficiently guarded against the effects of lightning. This apparatus is sometimes made in the shape of a house, as represented fig. 10, where, for the sake of distinctness, the side and part of the roof next the eye are not represented. The gable end A C represents that of the thunder house, and may be used in the same manner with that above described, or more readily by the following method. Let one ball of the discharging rod touch the ball of the charged jar, and the other the knob A of the conductor A C of the thunder house: the jar will then of course explode, and the fluid will act upon the conductor just mentioned. The conducting wire at the windows *h h* must be placed in a line. The sides and gable, A C, of the house, are connected with the bottom by hinges; and the building is kept together by a ridge on the roof. To use this model, fill the small tube *a* with gunpowder, and ram the wire *c* a little way into the

tube; then connect the tube *c* with the bottom of a large jar, or battery. When the jar is charged, from a communication from the hook at C, on the outside, to the top of the jar, by the discharging rod; the discharge will fire the powder, and the explosion of the latter will throw off the roof, with the sides, back, and front, so that they will all fall down together. Fig. 11 represents a small ramrod for the tube *a*, and fig. 12 a pricker for the touch-hole at C. Fig. 13 represents a mahogany pyramid, by means of which the same experiment may be exhibited. It is used in a manner similar to that just now described, the piece at *a* being thrown out by the discharge; by which means the upper part falls down in three pieces. Mr. Jones of Holborn makes the front of the common thunder houses, as well as the powder house above described, with two pieces of wood or windows *h h*, which, by being placed in proper situations, the one to conduct and the other to resist the fluid, will illustrate by one discharge the usefulness of good conductors for securing buildings or magazines from the explosion of thunder, as well as the danger of using imperfect ones.

To shew that the ELECTRIC FLUID prefers a SHORT PASSAGE through the air, to a LONG one through good conductors, Dr. Priestley invented the following experiment: Bend a wire about five feet long in the form represented in fig. 14, Plate LXIV. so that the parts A and B may approach within half an inch of each other; and connect its extremities with the hook of the battery, and the discharging rod. Upon sending the explosion of a battery through it, a spark will be seen between A and B, which proves that the electric fluid, prefers the short passage through the air to the long one through or along the wire. The whole charge, however, does not run from A to B, but part of it runs through the wire, which is proved by placing a slender wire between A and B; for with only this addition to the apparatus, the small wire will be scarcely made red-hot; whereas if the large bent wire be cut at C, so as to interrupt the circuit A C B, the small wire will be melted, and even exploded, by the same charge which, before the wire was cut, hardly made it red hot. By this experiment Dr. Priestley says, the different degrees of conducting power in different metals may be tried, by using metallic circuits of equal length and thickness, and observing the difference of the passage in each through the air. Dr. Van Marum, by the grand electrical machine and battery in Teyler's Museum at Haarlem, tried to communicate magnetism to needles made out of watch springs of three, and even six, inches in length; as well as to steel bars nine inches long, from a quarter to half an inch in breadth, and about the twelfth part of an inch in thickness. The result was, that when the bar or needle was placed horizontally in the magnetic meridian, which ever way the shock entered, the end of the bar that stood toward the north acquired the north polarity, and the opposite end acquired the south. If the bar, before it received the shock, had some polarity, and was placed with its poles contrary to the usual direction, then its natural polarity was always diminished, and often reversed; so that the extremity of it, which in receiving the shock looked towards the north, became the north pole, &c. When the bar or needle was struck standing perpendicularly, its lowest end became the north pole, in any case, even when the bar had some magnetism before, and was placed with the south pole downwards. All other circumstances being alike, the bars seemed to acquire an equal degree of magnetic power, whether they were struck while standing horizontally in the magnetic meridian, or perpendicular to the horizon. When a bar or needle was placed in the magnetic equator, whichever way the shock entered, it never gave it any magnetism; but if the shock was given through its width, then the needle acquired a considerable degree of magnetism, and the end of it which lay towards the west became the north pole, and the other end the south pole. If a needle or bar, already magnetic, or a real magnet, was struck in any direction, its power was always diminished. For this experiment they tried considerable large bars; one being 7.08 inches long, 0.26 broad, and 0.05 thick. When the shock was so strong, in proportion to the size of the needle, as to render it hot, then the needle generally acquired no magnetism at all, or very little. To determine whether electricity and fire act upon metals in the same manner, Dr. Van Marum caused wires of different metals to be drawn through the same hole, of one-thirty-eighth part of an inch in diameter, and observed how many inches of each could be melted by the explosion of his battery; taking care, in all these experiments,

to charge it to the same degree as ascertained by his electrometer. The results were as follow:—Of lead he melted 120 inches; of tin 120; of iron 5; of gold $3\frac{1}{2}$; of silver, copper, and brass, not quite a quarter of an inch. These different lengths of wire, of the same diameter, melted by equal explosions, indicate, the Dr. thinks, the degree in which each metal is fusible by the electrical discharge. On comparing these with the fusibility of the same metals by fire, a very considerable difference will be observed. By the experiments of the academicians of Dijon, to melt tin required a heat of 170° of Reaumur's thermometer; lead 230; silver 430; gold 563; copper 630; and iron 696. Thus tin and lead appear to be equally fusible by electricity, but not by fire; and iron, which by fire is less fusible than gold, is much more so by the electrical explosion. From these and some other experiments of the same kind, Dr. Van Marum concludes, that, in melting metals, the electrical fluid acts upon them in a manner very different from the action of fire, and that the supposed analogy between these two powerful agents cannot be proved, either from the fusion of metals, or the ignition of combustible substances.

OF THE ELECTRICAL KITE.

The justly celebrated Dr. Franklin was the first who made use of the electrical kite, to draw the electric fluid from the clouds. Since his first successful attempt, various methods have been tried by different electricians to improve the construction of this instrument. The most convenient size is found to be about four feet in length, and two in breadth: and the best covering is common varnish, or well boiled linseed oil. Paper for the body of the kite is preferable to silk or linen, both for convenience and cheapness. But, though some eminent electricians cover the back part of the straiter with tin-foil, and furnish its upper extremity with a slender pointed wire, to draw the electricity from the clouds more effectually; yet it is acknowledged, that in general neither of these improvements affect the electricity at the string, or increase it in the smallest degree. Mr. Cavallo, who has made many experiments in atmospherical electricity, observes that the whole power of this machine lies in the string. A common school boy's kite answers the purpose as well as any other. The best method of making the string is by twisting two threads of common twine with one of that copper thread which is used for trimmings. When a kite constructed in this manner was raised, he says, he always observed the string to give signs of electricity, except once. The weather was warm, and the wind so weak, that the kite was raised with difficulty, and could hardly be kept up for a few minutes. Afterwards, however, when the wind increased, he obtained, as usual, a pretty strong positive electricity. Concerning the management of this kite he gives the following directions: "In raising the kite, when the weather is very cloudy and rainy, in which time there is danger of meeting with a great quantity of electricity, I generally use to hang upon the string AB (Plate LXIV. fig. 15,) the hook of a chain C, the other extremity of which falls on the ground. Sometimes I use another caution besides, which is to stand upon an insulated stool; in which situation, I think, that if any quantity of electricity, suddenly discharged by the clouds, strikes the kite, it cannot much affect any person. As to insulated reels, and other such like instruments, that some gentlemen have used to raise the kite without any danger of receiving a shock; fit for the purpose as they may appear in theory, they are yet very inconvenient to be managed. Except the kite be raised in the time of a thunder storm, there is no great danger for the operator to receive any shock. Although I have raised my electrical kite hundreds of times, without any caution whatever, I have very seldom received a few exceedingly slight shocks in my arms. In time of a thunder storm, if the kite has not been raised before, I would not advise a person to raise while the stormy clouds are just over head; the danger at such a time being very great, even with the precautions above mentioned: at that time the electricity of the clouds may be observed, without raising the kite, by a cork-ball electrometer held in the hand in a open place, or, if it rain, by the electrometer for rain, to be described hereafter. When the kite has been raised, I generally introduce the string through a window in a room of the house, and fasten it to a strong silk lace, the extremity of which is generally tied to a heavy chair in the room. In Plate LXIV. fig. 16, AB represents part of the string of the kite, which comes within the room; C re-

presents the silk lace; DE, a small prime conductor, which, by means of a small wire, is connected with the string of the kite; and F represents the quadrant electrometer, fixed upon a stand of glass covered with sealing-wax, which I used to put near the prime conductor, rather than to fix it in a hole upon the conductor, because the string, AB, sometimes shakes so as to pull the prime conductor down: in which case the quadrant electrometer remains safe upon the table, otherwise it would be broken, as I have often experienced before I thought of this method. G represents a glass tube, about eighteen inches long, with a knobbed wire cemented to its extremity, with which instrument I use to observe the quality of the electricity, when the electricity of the kite is so strong, that I think it not safe to come very near the string. The method is as follows:—I hold the instrument by that extremity of the glass tube which is farthest from the wire, and touch the string of the kite with the knob of its wire, which being insulated acquires a small quantity of electricity from it; which is sufficient to ascertain its quality, when the knob of the instrument is brought near an electrified electrometer." Mr. Cavallo, however, with all his caution, could not always avoid danger, even when there was no thunder; as appears from the circumstances he informs us attended some of his experiments. And other electricians have in experiments with the kite sometimes been surprised by very singular phenomena, attended with evident danger, hence the greatest circumspection is required. The general laws deduced by Mr. Cavallo, from his experiments with the kites, are as follow:

"I. The air appears to be electrified at all times; its electricity is constantly positive, and much stronger in frosty than in warm weather; but it is by no means less in the night than in the day time.

"II. The presence of the clouds generally lessens the electricity of the kite; sometimes it has no effect upon it: and it is very seldom that it increases it a little." To this the above-mentioned instance is a most remarkable exception.

"III. When it rains, the electricity of the kite is generally negative, and very seldom positive.

"IV. The aurora borealis seems not to affect the electricity of the kite.

"V. The electric spark taken from the string of the kite, or from any insulated conductor connected with it, especially when it does not rain, is very seldom longer than a quarter of an inch; but it is exceedingly pungent. When the index of the electrometer is not higher than 20° , the person that takes the spark will feel the effect of it in his legs; it appearing more like the discharge of an electric jar than the spark taken from the prime conductor of an electrical machine.

"VI. The electricity of the kite is generally stronger or weaker, according as the string is longer or shorter; but it does not keep any exact proportion to it. The electricity, for instance, brought down by a string of a hundred yards, may raise the index of the electrometer to twenty, when, with double that length of string, the index of the electrometer will not go higher than twenty-five.

"VII. When the weather is damp, and the electricity is pretty strong, the index of the electrometer, after taking a spark from the string, or presenting the knob of a coated phial to it, rises surprisingly quick to its usual place; but in dry and warm weather it rises exceedingly slow."

The principal use of the electrical kite is to shew the electricity of the atmosphere; and it is perhaps the only instrument that will do this at all times with certainty, though several others have been invented for that purpose, as will be noticed in the next section. But another use to which electrical kites have been applied, is to bring down quantities of the electric fluid from the upper regions of the atmosphere, for the purpose of supplying that deficiency of electricity, which is supposed to be hurtful to vegetation. The Abbé Bertholon advises for this purpose to erect conductors, or launch paper kites on mountains, in order to seek out and direct this fluid towards the surface of the earth. "These (he adds) will immediately and at all times obtain an electricity so much the more strong as the height of the atmosphere shall be the more considerable." With this view he even proposes to double the kites. "Upon a high mountain (says he) there were launched two electric paper kites, one of which was fixed to the inferior extremity of the other, thus gaining a double advantage in point of height;

the consequence of which was, that the electric effects were incomparably greater than those produced by a single instrument."

Several instruments have been invented for ascertaining the state of the atmosphere with respect to the quantity of electricity it may contain, at any given time. The best of them are improvements upon Canton's electrometer, which is made by inclosing the pith-balls, or rather two slips of gold leaf, in a cylindrical glass vessel, to prevent their being affected by the wind. Bennet's electrometer, Plate LXIV. fig. 18, is a very delicate instrument, and capable of distinguishing small quantities of electricity. It consists of two slips of leaf gold A, suspended in a glass B. The foot C may be of wood or metal; the cup D of metal. The cup is made flat on the top, that plates, books, evaporating water, or other things to be electrified, may be conveniently placed upon it. The cup is about an inch wider in diameter than the glass, and its rim about three quarters of an inch broad; which hangs parallel to the glass, to turn off the rain, and keep it sufficiently insulated. Within this is another circular rim, about half as broad as the other, which is lined with silk or velvet, and fits close upon the outside of the glass; thus the cap fits well, and may be easily taken off to repair any accident happening to the leaf gold. Within this rim is a tin tube, hanging from the centre of the cap, somewhat longer than the depth of the inner rim. In the tube a small peg is placed, and may be occasionally taken out. To the peg, which is made round at one end, and flat at the other, the slips of leaf gold are fastened with paste, gum-water, or varnish. These slips suspended by the peg, and that in the tube fast to the centre of the cap, hang in the middle of the glass, about three inches long, and a quarter of an inch broad. On one side of the cap there is a small hole to place wires in. It is evident, that without the glass, the leaf gold would be so agitated by the least motion of the air, that it would be useless: and if the electricity should be communicated to the surface of the glass, it would interfere with the repulsion of the leaf gold; therefore two long pieces, H H, of tin-foil are fastened with varnish on opposite sides of the internal surface of the glass, where the leaf gold may be expected to strike, and in connection with the foot. The upper end of the glass is covered and lined with sealing-wax as low as the outermost rim, to make its insulation more perfect. The sensibility of this instrument is so great as even to astonish the most experienced electricians who have been witnesses of its effects. The brush of a feather, the throwing of chalk, hair-powder, or dust, against its cap, evince strong signs of electricity. The electricity of vapour is elegantly shewn by pouring a tea-spoonful of water on an ignited coal placed in a metallic cup upon the cap of this electrometer; and a very great and pleasing variety of other experiments may be made with this excellent instrument. In performing several atmospheric-electrical experiments about the year 1776, I found," says Mr. Cavallo, "that the use of Canton's cork-ball electrometer was much obstructed by the wind, in consequence of which I attempted to inclose it in a bottle, and after a variety of trials and alterations, the instrument was, in the year 1777, brought to the state which is represented in fig. 19. The three parts of the figure represent the instrument in its case, the same out of the case, and a section of its brass cap and neck. CDMN is an open glass vessel narrower at top than at bottom, and cemented into the wooden piece A B, by which part the instrument is held when it is to be presented to the atmosphere, or it may be rested upon a table for other experiments. This wooden piece also serves to screw the instrument into its wooden case O. The upper part of CDMN is tapering like the neck of a phial; and a short glass tube is cemented into it, so as to project a little above, and a little within the neck of the former: then the upper part of the instrument from C D to L, is covered with sealing-wax, by means of heat, which gives it the appearance of one continue body. The inner part G of the small glass tube is also covered with sealing-wax. Into this tube a brass wire is cemented, the lower part H of which is flattened, and is perforated with two holes; the upper part L is formed into a screw, upon which the brass cap E F is screwed. The office of this cap is to defend the upper part of the instrument from the rain. The conical, or oval, or globular, corks P of this electrometer, are as small as can be made, and are suspended by exceedingly fine silver wires, the upper parts of which are formed in rings, which pass through the holes at H, and are thereby so loosely suspended, that they are caused to diverge

when the brass cap E is exposed to a very slightly electrified atmosphere. I M and K N are two narrow slips of tin-foil stuck to the inside of the glass, and communicating with the wooden bottom A B; they serve to carry off that electricity, which, when the corks touch the glass, is communicated to it, and if accumulated would disturb the free motion of the corks." Mr. Cavallo's electrometer for rain is represented in fig. 17. Of this he gives the following description: "In principle it is nothing more than an insulated instrument to catch the rain, and by a pith ball electrometer, to shew the quantity and quality of its electricity. A B C I is a strong glass tube about 2½ feet long, having a tin funnel D E cemented to its extremity, which funnel defends part of the tube from the rain. The outside surface of the tube from A to B is covered with sealing-wax; so also is the part of it which is covered by the funnel. F D is a piece of cane, round which brass wires are twisted in different directions, so as to catch the rain easily, and at the same time to make no resistance to the wind. This piece of cane is fixed into the tube; and a slender wire proceeding from it goes through the bore of the tube, and communicates with the strong wire A G, which is thrust into a piece of cork fastened to the end, A, of the tube. The end, G, of the wire A G, is formed in a ring, from which I suspend a more or less sensible pith ball electrometer as occasion requires. This instrument is fastened to the side of the window-frame, where it is supported by strong brass hooks at C B; which part of the tube is covered with a silk lace, in order to adapt it better to the hooks. The part F C is out of the window, with the end F elevated a little above the horizon. The remaining part of the instrument comes through a hole in one of the lights of the sash within the room, and no more of it touches the side of the window than the part C B. When it rains, especially in passing showers, this instrument, standing in the situation above described, is frequently electrified; and, by the diverging of the electrometer, the quantity and quality of the electricity of the rain may be observed without any danger of mistake. With this instrument I have observed, that the rain is generally, though not always, electrified negatively; and sometimes so strongly, that I have been able to charge a small coated phial at the wire A G. This instrument should be fixed in such a manner that it may be easily taken off from the window, and replaced again as occasion requires; for it will be necessary to clean it very often, particularly when a shower of rain is approaching." One of the best electrometers, if not the very best hitherto invented, for measuring artificial electricity, is that of Mr. A. Brook of Norwich. It is acknowledged by electricians to be constructed on the only true principle on which machines for measuring the quantity of electricity can be made. The mere attraction of any light body shews indeed that the substance which attracts it is electrified; but this property is by no means calculated to discover the comparative strength of it, on account of its continual variation. Thus, if we hold any body within the electrified atmosphere of another, though it be first attracted pretty strongly, yet that attraction will be constantly diminishing, and at last changed into a repulsive power; but the latter, after it has once taken place, continues invariable as long as any degree of electric charge remains. Fig. 20, and 21, Plate LXIV. represent an electrometer, or rather two, nearly similar to Mr. Brook's. These two instruments are used either conjoined or separately. The arms F M f k; fig. 21, when used, are placed as much as possible out of the atmosphere of a jar, battery, prime conductor, &c. The arm F M, and the ball K, are made of copper, and as light as possible. The divisions on the arm F M are each exactly a grain. They are ascertained at first by placing grain weights on a brass ball which is within the ball L; (this ball is an exact counterbalance to the arm F M, and the ball K, when the small slide on this arm is at the first division,) and then removing the slide till it, together with the ball K, counterbalances the ball L, and the weight laid on it. A, fig. 20, is a dial-plate, divided into 90 equal parts. The index of this plate is carried once round, when the arm B C has moved through 90°, or a quarter of a circle. That motion is given to the index by the repulsive power of the charge acting between the ball D and the ball B. (Phil. Trans. vol. lxxxii. p. 384.) The arm B C being repelled, shews when the charge is increasing, and the arm F M shews what this repulsive power is, between two balls of this size, in grains, according to the number the weight rests at, when lifted up by the repulsive power of the charge:

charge: at the same time the arm BC points out the number of degrees to which the ball B is repelled; so that, by repeated trials, the number of degrees answering to a given number of grains, may be ascertained, and a table formed from these experiments, by which the electrometer, fig. 20, may be used without that of fig. 21.

MEDICAL ELECTRICITY.

OF THE ORIGIN, IMPROVEMENT, AND ADVANTAGES, OF MEDICAL ELECTRICITY.

The application of the electric fluid to medical purposes took its rise not long after the discovery of the electrical machine. The first idea of its probable utility, in this respect, appears to have arisen from observing the effects produced by it, upon those who, from curiosity, submitted to be electrified; although the fear natural to persons, who first venture to make such experiments, doubtless led them to magnify these effects, and to ascribe to electricity all those consequences which probably arose from their own apprehensions; such as increase of pulsation, heat, perspiration, &c. Mr. Cavallo says, that "the number of patients electrified at that time is prodigious, and the pretended cures effected by it were wonderful indeed. Accounts of those miracles performed by electricity were published in various parts of Europe, together with the method of electrifying the patients; to which were added such theories as, allowance being made for the infancy of electricity at that time, would seem impossible ever to have been proposed to the public. These theories were usually enforced by the account of experiments which often proved false upon examination. But at present a much better acquaintance with the science of electricity than philosophers had about 30 or 40 years ago, and less faith in the accounts of the generality of those persons, whose interest it is to promote the use of electricity in medicine, has pointed out the effects of that power upon the human body, in various circumstances, and has shewn how far we may confide in it; establishing upon indisputable facts, that the power of electricity is neither that admirable panacea it was considered by some fanatical and interested persons, nor so useless an application as others have asserted; but that when properly managed, it is a harmless remedy, which sometimes instantaneously removes divers complaints, generally relieves, and often perfectly cures, various disorders, some of which could not be removed by the utmost endeavours of physicians and surgeons. When the first rumour occasioned in Europe by the accounts of many pretended, and of a few real wonders, performed by electricity, had in some measure subsided, many creditable and experienced physicians, who justly considering it as their duty, had undertaken to examine the power of this new remedy, published some unsuccessful applications of electricity in divers diseases; in which cases they had not only prescribed the electrization, but the operation had been performed either by themselves or under their inspection. These publications gave a new turn to the reputation of medical electricity; and since that time the generality of physicians and surgeons had not the least regard for its medical application; so that the practitioners of it were rather considered as fanatics and impostors. However, an attentive examination of this subject, after several trials, and after overcoming in a great measure the rooted prejudice among physicians, began to establish anew the reputation of medical electricity; and shewed that many applications of electricity, published in the above-mentioned accounts, had proved unsuccessful, because the operation was not managed properly: so that it had been the abuse, and not the use, of electricity, that had proved unsuccessful, and in some cases even detrimental; for at that time, strong shocks and strong sparks were generally administered, which a long series of experiments and observations has proved to be generally useless or hurtful. Mr. Lovet, who practised medical electricity for a long time was, as far as I know, the first who protested against the use of strong shocks; and in an essay of his intitled "Subtil Medium proved," asserts, the shocks to be used in medical electricity should be very small; by which treatment he hardly ever failed of curing or at least relieving, his patients. One thing, however, appears to be a little remarkable in favour of electricity, as a medicine, that though it has often fallen into the hands of very unskilful and injudicious persons, who have applied it at random in all cases, without being capable of distinguishing

either the nature of the disorder, or the degree in which it ought to be administered yet it has seldom been known to be attended with any bad effects; the patient has generally been relieved, and very frequently cured, but the ill consequences have been even more rare than those of inoculation. Electricity differs from other medical applications in this, that it requires not so much a thorough knowledge of the distemper, as a peculiar nicety in conducting the operation. For, however paradoxical this may appear, it is certain that the electric shock is by no means prejudicial to persons in health, and therefore to electrify a sound part of the body along with a diseased one, can do no harm. The degree of electrization must be regulated rather by the patient's feelings, than by the species of disease, and therefore nosology is not an indispensably necessary branch of science to the medical electrician. There can be no doubt, however, that medical electricity will have every chance of being best applied, as well as improved by skilful physicians or surgeons, whose knowledge of anatomy, as well as of nosology, will enable them to direct the electrical fluid, to the most proper part of the body, and to pass it through the most minute vessels, according to the nature of the disease and the part of the body affected. And it is to be hoped, that in such skilful hands, this useful branch of the science may be brought to perfection, by the discovery of easier and more certain methods of applying the electric fluid with the best effects, in different diseases. "The superiority of electricity," says Mr. Cavallo, "over other remedies, in many cases, may appear from considering, that medicines in general cannot always be confined to a particular part of the body, and to let them pass through other parts is often dangerous, for which reason they cannot be used; besides that after those medicines have exerted their required power, they are with great difficulty, if at all, separated from the body. But it is of no consequence, whether the power of electricity passes through this or that other part of the body, in order to come at the seat of the disease; and after having exerted its action, it is instantly dispersed. Hence it appears why electricity has often cured such obstinate disorders as have not yielded to any other treatment."

OF THE APPARATUS NECESSARY FOR THE MEDICAL APPLICATION OF ELECTRICITY.

The apparatus for medical electricity, besides the electrical machine, consists of the following articles: 1. An insulating stool with glass feet, or, what is much better, an arm chair, well rounded at the edges of the wooden parts, and fixed on a large stool with glass feet, which should be at least nine or ten inches in length; for the longer the feet are, the better will the insulation be. The inside part of the back of the chair should move on an hinge, that it may be occasionally let down to the stool, and the back of the patient be thus electrified more conveniently; the arms of the chair should be made longer than ordinary. 2. A Leyden bottle with a discharging electrometer. 3. A pair of directors of considerable size, with glass handles and wooden points. 4. A large metallic ball of brass or copper, with a metallic handle to receive the sparks. The ball should be unscrewed, and the wire long and sharp-pointed to receive the stream of electric fire. 5. A few glass tubes of different bores, some of them with capillary points. 6. Several yards of brass wire or chain; or, which is much better, several lengths of wires with loops at the end: the part of the wire between these being covered with some non-conducting substance, as a silk ribbon, &c. The directors are represented on Plate LXIV. fig. 24, the handles being of glass, one of them having a ball on its end represented by A; the other is without the ball, having its wire bent for the convenience of conducting the electric stream on the eye, &c. Either of the balls may be unscrewed from the wires, and the wooden point B screwed in its place, or the pointed end of the brass wire used. The glass handles should be held as far from the brass work as possible. To convey the electric fluid to the ear or throat, glass tubes with sliding brass wires through them should be made use of, such as are represented in fig. 25, and 26. Fig. 27 represents the electric forceps, which is thought by some electricians to be more convenient for giving the shock than the directors. Fig. 9, plate LXIII. is the medical jar, with an electrometer, above described, that regulates the strength of the shock, and enables the operator to give a succession of them of nearly equal force. In using this medical jar, the ball B must be placed in contact with the conductor of the electrical machine,

or at least be connected with it by a wire; after which it is to be charged in the usual manner. If wires proceed from LL, to the outside coating, the jar will be immediately discharged, as the accumulation of the electric fluid is sufficiently powerful to pass through the space of air between the two balls: hence a shock may be communicated to the arm by means of the wires and directors as in the figure, and it will be stronger in proportion as the distance of the ball C from B is augmented. This electrometer acts in the manner of the common discharging rod, and therefore has received the name of the discharging electrometer.

In fig. 28, Plate LXIV. *g* represents the BOTTLE-DIRECTOR. It is hollow, and coated like a common jar, acting as such, and in some cases is looked upon as very convenient. With this, as with the common director, it is proper to press the ends against the part where the shock is to be applied. The instrument represented in fig. 30, has been used successfully in the cure of the tooth-ach. *A* is a strong piece of box-wood in which the wires *a b* and *e f* are fixed and then bent, the tooth and gum are placed between *c* and *f*, and the circuit between the outside and inside of the jar is to be made by means of the chains *g* and *h*.

A small pocket electrical apparatus is represented on Plate LXIV. fig. 29, which may sometimes be of use for other purposes as well as medical. It is packed up in a very small size, being only five inches long, two broad, and one deep. It is capable of a tolerably strong charge of electricity, and will give a small shock to one, two, three, or a great number of persons. *A* is the Leyden phial that holds the charge; *B* is the discharger to discharge the jar when required without electrifying the person that holds it; *C* is a silk ribbon prepared by a coating of varnish, so as to be excited, and communicate its electricity to the jar; *D* are two hare skin rubbers, which are to be placed on the first and middle fingers of the left hand, and serve to excite the ribbon *C*.

In order to CHARGE the JAR, place the two finger-caps, *D*, on the first and middle finger of the left hand; hold the jar, *A*, at the same time at the joining of the red and black, *E*, on the outside between the thumb and first finger of the same hand; then take the ribbon in the right hand, and steadily and gently draw it upwards between the two rubbers *D*, on the two fingers, taking care at the same time the brass ball of the jar is kept nearly close to the ribbon while it is passing through the fingers. By repeating this operation 12 or 14 times the electrical fire will pass into the jar, which will become charged; and by placing the discharger, *C*, against it, as in the plate, a sensible spark will be seen to pass from the ball of the jar to that of the discharger. If the apparatus is dry and in good order, the crackling of the fire will be heard when the ribbon is passing through the fingers, and the jar will discharge at some distance.

OF THE DIFFERENT METHODS OF APPLYING THE ELECTRICAL FLUID TO THE HUMAN BODY.

It appears somewhat remarkable, that, when a small power of medical electricity is to be used, large machines should be recommended; whereas not long ago when strong shocks were administered, small machines were used. The reason is, that when shocks are given, a very small electrical machine can charge a Leyden phial much stronger than is necessary; whereas, when the stream is used, which is now found to be most efficacious in the cure of diseases, then the small machines are mostly useless. In general the power of the machine should be so regulated, as to apply every degree of it with ease and readiness; beginning with the more gentle operations, by a stream issuing from a metal point; next using a wooden point; then small sparks, stronger sparks, and lastly small shocks, in proportion to the strength and constitution of the patient, and the nature of the disease. The common method of electrifying a person is well known. Desire the patient to take the jar in one hand, and with the other touch the knob of it: or, if diversion is intended to accompany the medical effect, desire him to smell at the knob, *A*, in expectation of smelling the scent of a rose or a pink. This last method has occasioned it to be sometimes called the magic smelling bottle. But the principal methods by which electricity may be applied to the human body with a medical intention, are the following:

I. By placing the patient in an insulated chair, and connecting him with the prime conductor. When the machine is in action, he will thus be filled with the electric fluid, which will be continually dis-

sipated from the points and edges of his clothes: and though the effects of this are probably too slow to be rendered very advantageous, yet a sedentary person may derive some benefit from sitting in an insulated chair, having before him an insulated table, the chair to be connected with the ball of a large charged jar or battery; by which means a small quantity of the fluid will be continually passing through those innumerable capillary vessels, on the right state of which our health very much depends.

II. By throwing the fluid upon, or extracting it from, a patient, by means of a wooden point. This may be effected in a twofold manner: 1st, By insulating the patient, and connecting him either with the cushion or the positive prime conductor, the operator presenting the point. 2d, Let the patient stand upon the ground, and the wire of the director be connected either with the positive or negative parts of the machine. The sensation produced by the fluid when acting in this manner is mild and pleasing, resembling the soft breezes of a gentle wind; generating a genial warmth, and promoting the secretion and dissipation of tumours, inflammations, &c.

III. By the electric friction. Cover the part to be rubbed with woollen cloth or flannel. The patient may be seated in an insulated chair, and rubbed with the ball of a director that is in contact with the conductor; or he may be connected with the conductor, and rubbed with a brass ball which communicates with the ground. The friction thus produced is evidently more penetrating, more active, and more powerful, than that which is communicated by the flesh brush; and there is very little fear of being thought too sanguine. This, when used but for a few minutes, will be found more efficacious than the other after several hours application. Electricity applies here with peculiar propriety to spasm, pleurisy, and some stages of the palsy; and in every case answers the end of blistering, where the discharge is not wanted, being the most safe and powerful stimulant we know.

IV. By taking strong sparks from the patient. Here, as in every other case, the operator may connect the ball of the director with the positive or negative conductor, or he may connect the patient with either of these and the ball with the ground. Now it is clear from what has been already observed, that if the director be connected with the positive conductor, the fluid is thrown upon the patient; if with the cushion the fluid is extracted from him. Let the patient be insulated, and the action is in some measure reversed; if he is joined to the negative conductor or cushion, he will receive a spark from a person standing on the floor; but if he communicates with the positive conductor, he will give the spark to the person on the ground.

V. By causing a current of the electric fluid to pass from one part of the body, and thus confining and concentrating its operation without communicating the shock. Place the patient in an insulated chair, and touch one part of the body with a director, joined to a positive conductor; then with a brass ball communicating with the ground touch another part; and when the machine is in action the fluid will pass through the required part from the conductor to the ball; the force of the stream will be different according to the strength of the machine, &c. Or connect one director with the cushion, and the other with the positive conductor, and apply these to the part through which the fluid is to pass, and when the machine is in action the electricity will pass from one ball to the other. It is not necessary to insulate the patient in this case.

VI. By the electrical shock. The shock may be given to any part of the human body, by introducing that part of the body into the circuit which is made between the outside and inside of the bottle. This is conveniently effected, by connecting one director by a piece of wire with the electrometer, and the other with the outside of the bottle; then hold the directors by their glass handles, and apply the balls of them to the extremity of the parts through which the shocks are to be passed. The force of the shock is augmented or diminished by increasing or lessening the distance between the two balls, which must be regulated by the operator to the strength and sensibility of the patient. Instead of the common bottle, we may have a small one with a glass tube proceeding from it, through which proceeds a wire and hook to hang it upon the machine, with a longer one from the outside coating, and which is to be carried by means of a director to the patient. When this is used as a common bottle, both wires are to

be left there, and the shock is communicated by two directors, one connected with the bottom, the other with the top. The operator will often find himself embarrassed in giving small shocks, the fluid passing from the conductor to the ball of the electrometer, instead of going through the circuits he desires: when this happens, which may be known by the chattering noise of the sparks, the resistance formed to the discharge is so great, that the fluid cannot force its way through the circuit: to remedy this, pass two metallic pins through the cloathing, so that they may be in contact with the skin, which will lessen the resistance, and conduct the fluid.

VII. By a sensation between a shock and the spark, which does not communicate that disagreeable feeling attending the common shock. This is effected by taking out the long wire from the small medical bottle, and leaving the shorter one which is connected with the tube in its place, the directors to be connected and used as before. The effect of this species of shock, if it may be called one, is to produce a great vibration in the muscular fibres, without inducing that pungent sensation which the shock effects. It is therefore applicable to some stages of palsy and rheumatism; it may also serve as an artificial means of exercise.

VIII. By the bottle director. Insulate the patient, and place the ball *g*, (Plate LXIV. fig. 28,) in contact with him; by which means this director is charged. If a wire is conveyed from the bottom of this to the top of another director, the bottle director will be discharged whenever the other ball *h* is brought in contact with the patient; so that by bringing it down with rapidity, any number of small shocks may be procured in a minute; or connect the insulated patient with the top or inside of a large charged jar, and then this apparatus used in the foregoing manner will discharge from the large jar at each spark its own contents, and by repetition it will discharge the whole jar: thus a number of shocks may be given without continually turning the machine or employing an assistant.

IX. By passing the whole fluid contained in the Leyden phial through a diseased part without giving the shock. Connect a director, by means of a wire, with the ball of a Leyden jar; charge the jar either completely or partially, and then apply the ball or point of the conductor to the part intended to be electrified, and the fluid which was condensed in the phial will be thrown on the part in a dense slow stream, attended with a pungent sensation which produces a considerable degree of warmth. If a wire that communicates with the ground is placed opposite to the end of the director, the passage of the fluid will be rendered more rapid, and the sensation stronger. Or insulate the patient, connect him with the top of a jar, charge this, and then apply a metal wire or piece of wood to the part through which you wish to make the fluid pass. It is obvious, that in this case the circuit between the inside and the outside of the jar is not completed, therefore the shock will not be felt. The condensed fluid passes in a dense slow stream through the required part, while the outside acquires a sufficient quantity from substances near it to restore the equilibrium.

GENERAL RULES FOR THE ADMINISTRATION OF MEDICAL ELECTRICITY.

It is impossible to prescribe the exact degree of electrization requisite for various diseases. Persons of different constitutions, though afflicted with the same disease, often require different degrees of electrification. The following general rules for practice are laid down by that learned electrician Mr. Cavallo:

"I. It should be attentively observed, to employ the smallest force of electricity that is sufficient to remove or alleviate any disorder. Thus the shocks should never be used, when the cure may be effected by sparks; the sparks should be avoided, when the required effect can be obtained by only drawing the fluid with a wooden point; and even this last treatment ought to be omitted, when the fluid drawn by a metal point may be thought sufficient. The difficulty consists in distinguishing the proper strength of electric power that is required for a given disorder, the sex and constitution of the patient being considered.—The surest rule is to begin by the most gentle treatment. When this has been found ineffectual for a few days, which is denoted by the disease not abating, and the application of electricity not causing any warmth, then the operator may gradually increase the force of electricity till he finds the proper degree of it.

"II. In judging of cases proper to be electrified, experience

shews, that in general all kinds of obstructions, whether of motion, of circulation, or of secretion, are very often removed, or alleviated by electricity. The same may also be said of nervous disorders; both which include a great variety of diseases. The application of electricity has seldom intirely cured diseases of a long standing, although it generally relieves them. To persons afflicted with the venereal disease, or to pregnant women, electrization has been thought to be pernicious; but even in those cases it may be used without fear, if judiciously managed. When pregnant women are to be electrified, the shocks should be forbidden; and even when the other more gentle treatments are used, a constant attention should be given to any phenomena that may appear in the course of the electrization; the method of which should be increased, diminished, or suspended, as circumstances may indicate.

"III. In cases of gathering tumours, the best method is to draw the fluid by means of a wooden point; or, if that prove painful, by a metal point. Sparks in these cases, and also shocks, are often hurtful. In stiffnesses, paralyties, and rheumatism, small sparks, especially through a double flannel, and also very small shocks (as most of one tenth of an inch) may be used. Stronger shocks may be sometimes, though seldom, administered for a violent tooth-ach, and for some internal spasm of no long standing.

"IV. When any limb of the body is deprived of motion, it must be observed, that the privation of motion is not always occasioned by a contraction of the muscles; but that it is often the effect of relaxation. Thus for instance, if the hand is bent inwardly, and the patient has no power of straightening it, the cause of it may be a weakness of the outward muscles, as well as a contraction of the inward ones. In such cases, as it is often difficult, even for good anatomists to discover the real cause, the surest method is to electrify not only those muscles, which are supposed to be contracted, but also their antagonists; for to electrify a sound muscle is by no means hurtful.

"V. When the stream of electric fluid is thrown either with a wooden or metal point, the length of the operation should be from three to ten minutes, more or less, according as occasion may require. When shocks are administered, their greatest number should not exceed a dozen or 14, except when they are to be given to the whole body in different directions. The number of sparks, when they are used, may generally exceed the number of shocks mentioned above.

"VI. Lastly, when children must be electrified upon the insulating chair, as it is difficult to let them remain quiet, the most convenient method is, to let another person sit in the insulating chair, and hold the child while the operator is electrifying him." On the whole, the electric fluid, issuing from a wooden point (which should not be split, or too short,) has a power intermediate between that of the stream proceeding from a metal point, and that of the spark; and is therefore in general the most proper and effectual method of electrification. It consists of a vast number of exceedingly small sparks, accompanied with a little wind, which gently stimulates the part affected, and gives a degree of warmth very agreeable to the patient. Even this gentle method of electrifying, however, is sometimes too strong when applied to open sores upon delicate parts. In such cases, therefore, the metal point must be used instead of the wooden, and the director must be kept at a greater distance, than when the wooden piece was upon it. The electric fluid issuing out of this pointed wire of the director, occasions only a very gentle wind upon the part to which it is directed, which proves agreeable even to persons of the utmost delicacy. Mr. Cavallo says, "it might naturally be suspected, that so gentle and nearly insensible a treatment could hardly be of any efficacy; but my reader may be assured, that to my certain knowledge, deduced from the practice of persons who have had long experience in this subject, this method of electrization, viz. the throwing of the fluid with a metal point, has often mitigated pains, and cured obstinate and dangerous diseases, which could not be removed by any other remedy that was tried. The stream, (he adds,) issuing both out of the wooden and of the metal points acts even through the cloaths, if they are not too thick. Hence it may be used without incommoding the patient; but when it is convenient to uncover the part which is to be electrified, it is much preferable to direct the fluid immediately upon the skin."

OF THE ADMINISTRATION OF MEDICAL ELECTRICITY IN PARTICULAR DISEASES.

Although it belongs properly to the article Medicine, to treat of the

the cure of diseases by electricity, as well as by other means, yet there would be a manifest defect in this branch of our subject, were we not to mention the particular method of applying the electric fluid in several of the most common diseases, in which medical electricity has been found efficacious.

"**RHEUMATIC** disorders even of long standing, "says Mr. Cavallo, "are relieved, and generally quite cured by only drawing the electric fluid with a wooden point from the part, or by drawing sparks through flannel. The operation should be continued for four or five minutes, repeating it once or twice every day.

"**DEAFNESS**, except when occasioned by obliteration, or other improper configuration of the parts, is either intirely or partly cured by drawing the sparks from the ear with the glass tube director, or by drawing the fluid with a wooden point. Sometimes it is not improper to send exceedingly small shocks from one ear to the other. Whenever the ear is electrified, the discharge of the wax is considerably promoted.

"The **TOOTH-ACH**, occasioned by cold rheumatism, or inflammation, is generally relieved by drawing the electric fluid with a point, immediately from the part, and also externally from the face. But when the body of the tooth is affected, electrization is of no use.

"**SWELLINGS**, in general, which do not contain any matter, are mostly cured by drawing the electric fluid with a wooden point. In some cases of white swellings, quite cured by electricity, even the bones and cartilages were disfigured. The operation should be continued for three or four minutes every day.

"**INFLAMMATIONS** of every sort are generally relieved by a very gentle electrization.

"In **INFLAMMATIONS OF THE EYES**, the throwing of the electric fluid by a wooden point is constantly attended with great benefit; the pain being quickly abated and the inflammation generally dissipated in a few days. In these cases, the eye of the patient must be kept open, and care taken not to bring the point very near it. Sometimes it is sufficient to throw the fluid with a metal point; for in these cases too great an irritation should be avoided. After throwing the fluid for about half a minute, a short time may be allowed to the patient to rest, and to wipe his tears: then the operation may be continued for another half minute, and so on for four or five times every day.

"The **GUTTA SERENA** has been sometimes cured by electrization; but electricity has proved ineffectual in many such cases. The best method of administering electricity in such cases, is first to draw the fluid with a wooden point for a short time, and then to send about half a dozen shocks of one-20th of an inch, from the back and lower part of the head to the forehead, very little above the eye.

"All the cases of **FISTULA LACHRYMALIS**, as far as I am informed, that have been electrified by persons of ability for a sufficient time, have been entirely cured. The method generally practised has been that of drawing the fluid with a wooden point; and to take very small sparks from the part. The operation may be continued for about three or four minutes every day.

"**PALSIES** are seldom effectually cured by electricity, but are generally relieved to a certain degree. The method is to draw the fluid with a wooden point, and to draw sparks through flannel, or through the usual coverings, if not too thick, for about five minutes per day.

"**ULCERS** or open sores of every kind, even of long standing, are generally disposed to heal by electrization. The general effects are a diminution of the inflammation; and a discharge of matter, which gradually lessens till the sore is quite cured. The gentlest electrization must be used. To draw or throw the fluid with a wooden or metal point, for three or four minutes per day, is quite sufficient.

"**CUTANEOUS ERUPTIONS** have been successfully treated with electrization, but if the wooden point is kept too near the skin, so as to cause any considerable irritation, the eruption will sometimes spread more: but if kept at about six inches distance, the eruptions will be gradually diminished till they are quite cured. A warmth about the electrified part is a sign that the electrization is rightly administered.

"The application of electricity has perfectly cured various cases of **St. Vitus's Dance**, or of that disease commonly called

so. Shocks of about one-10th of an inch may be sent through the body in various directions, and sparks may be taken.

"**SCROFULOUS TUMOURS**, when just beginning, are generally cured by drawing the electric fluid with a wooden or metal point from the part.

"In **CANCERS**, the pains only are mostly alleviated by drawing the electric fluid with a wooden or metal point. I know of one case only, in which a most confirmed cancer of very long standing, on the breast of a lady, has been much reduced in size. This patient was so far relieved by drawing the fluid with a metal point from the part, that the excruciating pains she had suffered for many years, did almost entirely disappear. When the electric fluid was drawn by a wooden point, the pains rather increased. This person, when I heard of her last, was still under the electricity, and the cancer seemed not unlikely to be perfectly cured, contrary to the expectations even of the judicious physician who electrified her.

"**ABSCESSSES**, when beginning, and when there is any tendency to form matter, electrization dispersed. Lately, in a case in which matter was formed upon the hip, called the lumbar abscess, the disease was perfectly cured by electricity. The sciatica has also been often cured by it. In all such cases the electric fluid must be sent through the part, by means of two directors applied to opposite parts, and in immediate contact either with the skin, or with the coverings, when very thin.

"In cases of **PULMONARY INFLAMMATIONS**, when beginning, electrization has sometimes been beneficial; but in confirmed diseases of the lungs, I do not know that it ever afforded any unquestionable benefit.

"**NERVOUS HEAD-ACHS**, even of long standing, are generally cured by electrization. The electric fluid must be thrown with a wooden and sometimes even with a metal point, all round the head successively. Shocks can seldom be used, because the nerves of persons subject to this disease are so very irritable, that the shocks, the sparks, &c. throw them into convulsions.

"The application of electricity has often been found beneficial in the **DROPSY** when just beginning, but it has never been of any use in advanced dropsies. The electric fluid is sent through the part in various directions; and sparks are drawn across the flannel, or cloaths, for at least ten minutes. Perhaps a simple electrization, (viz. to insulate the patient, and connect him with the prime conductor, while the machine is in action,) continued for an hour or two, would be more beneficial.

"The **GOUT** has been cured by electricity in various instances. The pain has been generally mitigated, and sometimes the disease has been removed so effectually as not to return. In those cases the electric fluid has been thrown by a wooden point, though sometimes, when the pain was too great, a metal point only was used.

"**AGUES** very seldom fail of being cured by electricity, so that sometimes one electrization or two have been sufficient. The most effectual method is drawing sparks through flannel or the cloaths for about ten minutes, either at the time of the fit, or a short while before it is expected.

"The **SUPPRESSION OF THE ORDINARY PERIODICAL FLUXES** of women has often been cured by electricity, even when the disease has been of long standing, and after the most powerful medicines have proved ineffectual. Small shocks of one-20th of an inch may be sent through the pelvis; sparks may be taken through the cloaths from the parts adjacent to the seat of the disease; and the electric fluid may be transmitted by applying the metallic or wooden extremities of two directors to the hips, in contact with the cloaths. The number of shocks may be about 12 or 14. The other applications may be continued for two to three minutes, repeating the operation every day. But strong shocks should be avoided."

We shall conclude this account of medical electricity with observing that there are two general effects of electricity on the human body, of which it should seem, that physicians might greatly avail themselves. These are, that it promotes insensible perspiration and glandular secretion. The former is effected by simple electrification, and the latter by taking sparks from the glands or parts contiguous to them on which it acts like a stimulus.

ELECTRICS,

ELECTRICS, substances which by rubbing exhibit electrical appearances, or the presence of the electrical fluid. See **ELECTRICITY**.

ELECTRIDES, in ancient geography, islands in the Adriatic sea, so named from the quantity of amber which they produced. They were at the mouth of the Po, according to Apollonius of Rhodes, but some historians doubt their existence.

ELECTRIFICATION, or **ELECTRIZATION**, the state of being electrified.

ELECTRIFY, to communicate to a body the powers of attraction and repulsion, or any other electrical property. To electrify a person, signifies to give one a flash, spark, or shock, of electricity.

ELECTROMETER, and **ELECTROPHORUS**, instruments used in electrical experiments. See **ELECTRICITY**.

ELECTUARY, a form of medicine made of conserves and powders, in the consistence of honey. Vossius observes, that all the remedies prescribed for the sick, as well as the confections taken by way of regale, were called by the Greeks *ἐλεκτάρια*, and *ἐλεκτα*, of the verb *ἐλεγχω*, I lick; whence, says he, was formed the Latin *electarium*, and afterwards *electuarium*. This conjecture he supports from the laws of Sicily. See **PHARMACY**.

ELEEMOSYNA ARATRI, **ELEEMOSYNA CARUCARUM**, or **PRO ARATRIS**, in our ancient customs, a penny which king Ethelred ordered to be paid for every plough in England towards the support of the poor. It is also called *elemosyna regis*, because first appointed by the king.

ELEEMOSYNARIUS, in old records, the almoner, or officer who received the eleemosynary rents and gifts, and distributed them to charitable uses.

ELEGANCE, in oratory and composition, an ornament of politeness and agreeableness, with such a choice of rich and happy expressions, as to rise above the common manners, so as to strike people of a delicate taste. It has been observed, that elegance, though irregular, is preferable to regularity without elegance; and that, by being too scrupulous about grammatical construction, we lose certain licences wherein the elegance of language consists. But, on the other hand, it is to be feared, that an affectation of such elegance is in danger of corrupting a language, by introducing ambiguity of expression and other improprieties.

ELEGIAC, in ancient poetry, any thing belonging to elegy. Elegiac verses are alternately hexameter and pentameter, as in the following verses of Ovid.

Flexilis indignos, elegeia, solve capillos;
Ah nimis ex vero nunc tibi nomen erit.
Sometimes, though very rarely, the pentameter preceded the hexameter, as in the following verses of Athenæus.

Ποδαίρων Χερσίν, καὶ Μελανίππῳ, φρεσὶ καὶ νομῇ, καὶ
Θυγῶν ἀνίστηναι ἀφ' ἑμῶν ψυχῶν.

Who was the inventor of elegiac poetry, is not known. Horace professes himself quite ignorant of it. The principal writers of elegiac verse, among the Latins, were Propertius, Ovid, and Tibullus, the latter whereof Quintilian esteems the best elegiac poet; but Pliny the younger gives the preference to the first. The chief writers of elegy among the Greeks were Callimachus, Parthenius, and Euphorion.

ELEGIA, a genus of the dioecia triandria class and order. There is one species, a native of the Cape, which has the habit of a rush.

ELEGIT, in law, a writ of execution, which lies for a person who has recovered debt or damages; or upon a recognizance in any court, against a defendant that is not able to satisfy the same in his goods.

ELEGY, a mournful and plaintive kind of poem. See **ELEGIAC**, and **POETRY**.

ELEMENTS, in astronomy, are those principles deduced from astronomical observations and calculations; and those fundamental numbers which are employed in the construction of tables of the planetary motions. Thus, the elements of the theory of the sun, or rather of the earth, are his mean motion and eccentricity, and the motion of the aphelia. The elements of the theory of the moon are its mean motion; that of its node and apogee, its eccentricity, the inclination of its orbit to the plane of the ecliptic, &c.

ELEMENTS, in physics, the first principles of which all bodies in

the system of nature are composed. These are supposed to be few in number, unchangeable, and by their combinations to produce that extensive variety of objects to be met with in the works of nature. There seems to be in reality some foundation for this doctrine; for there are some principles evidently exempted from every change or decay, but which can be mixed or changed into different forms of matter. The ancient philosophers generally reckoned four elements, viz. fire, air, water, and earth. The former chemists admitted five elements or principles, viz. 1. Spirit, or mercury. 2. Sulphur, or oil. 3. Salt. 4. Water, or phlegm. 5. Earth. That both these are wrong is well known to modern chemists, who have decomposed several of the above substances. See **CHEMISTRY**. Though we have reason to think that there are in nature a few simple substances, from the combinations of which the various bodies that surround us are composed, yet what these elements or principles are is not fully ascertained; however, considerable advances towards such a discovery, have been made by the researches of modern chemistry, and a wide field is now opened in this department, which promises plentifully to reward the labours of the experimental philosopher. Chemists have now agreed to consider those substances, which, in the present state of the science, they cannot decompose, as elements or principles, until they shall discover their component parts in case they be compound bodies. For an enumeration of these elements see **CHEMISTRY**.

ELEMI, a resin, commonly called gum elemi, is supposed to be the produce of a large tree, called in the Linnaean arrangement *amyris elemifera*, a native of Carolina, and the warmer parts of America. The true elemi is supposed to come from Ethiopia. It is used in medicine as a liniment, and is employed in the arts as an ingredient in some varnishes.

ELEPHANT, in zoology. See **ELEPHAS**.

ELEPHANT, KNIGHTS OF THE, an order of knighthood in Denmark, conferred upon none but persons of the first quality and merit. It is also called the order of St. Mary. Its institution is said to have been owing to a gentleman among the Danish croises having killed an elephant, in an expedition against the Saracens, in 1184; in memory of which, king Canute instituted this order, the badge of which is a towered elephant, with an image of the holy virgin encircled with rays, and hung on a watered sky-coloured ribbon, like the George in England.

ELEPHANTIA, a small island on the W. coast of Hindostan, 5 miles from Bombay.

ELEPHANTIASIS, the **LEPRA OF THE ARABIANS**, in medicine, a chronic disease, one of the two species of leprosy which affects the whole body, where even the bones as well as the skin are covered with spots and tumours, which being red at last turn black.

ELEPHANTINE, in Roman antiquity, an appellation given to the books wherein were registered the transactions of the senate and magistrates of Rome, of the emperors or generals of armies, and even of the provincial magistrates; the births and classes of the people, and other things relating to the census.

ELEPHANTOPHAGI, an ancient people of Ethiopia, who are said to have fed on elephants' flesh.

ELEPHANTOPUS, a genus of the polygamia segregata order, and syngenesia class of plants; natural order, Compositæ. Calyx four-flowered; corolla tubular, hermaphrodite; receptacle naked; down bristle-form. There are four species.

ELEPHAS, the **ELEPHANT**, in zoology, a genus of the class and order mammalia bruta. No fore-teeth in either jaw; tusks of the upper jaw elongated, none in the lower; proboscis very long and prehensile; body with few hairs. This animal is not to be met with in its natural state throughout Europe or America, and is to be found in its greatest perfection of size and strength between the river Senegal and the Cape of Good Hope in Africa. See Plate LXVI. There is but one species. The elephant is the largest of all land animals. From the front to the origin of the tail he is generally about 16 feet long, from the end of the trunk 25 feet, and about 14 feet high. The circumference of the neck is 17 feet, and the circumference of the body at the grossest part 25 feet 10 inches; the tail is about 6 feet long, and 2½ in circumference. The circumference of the legs is about 6 feet. These are the largest dimensions. But the animal differs in size in different countries; in some not exceeding 7 feet in height. The eyes

eyes are small in proportion to the size of the head. The muzzle is very different from that of any other quadruped: it is nothing but the origin of a long trunk which hangs between the two large tusks; the mouth appears behind the trunk, which serves in place of an upper lip, and the under lip terminates in a point. The ears are so large, that from the shoulder of a middle-sized man they will extend to the ground. In a state of tranquillity these are pendulous, but during the agitation of passion they are erected, and pointed forwards with extreme intension. The feet are short, round, clumsy, and only distinguishable by the toes. The trunk is, properly speaking, the nose extended, and terminated by a couple of nostrils. But, besides serving as an organ of smell, the trunk performs all the functions of a strong and dexterous arm. The trunk of an elephant is about 8 feet long, 5½ feet in circumference near the mouth, and one foot and a half near the extremity: it is a pipe of an irregular conical figure, and widened at the end; the superior side of the trunk is convex, and furrowed transversely; and the inferior side is flat, and has two longitudinal rows of small protuberances resembling the tentacula of the silkworm and most other caterpillars. The upper part of the trunk corresponds with the extremity of the nose in other quadrupeds, and answers the same intention; the inferior part serves as an upper lip, including the nostrils at the same time. For the trunk is a continued canal, divided into two cavities by a longitudinal partition: these cavities ascend along the fore-part of the upper jaw, where they make a turn inward, and descend into the palate, terminating in two separate orifices; they have likewise each a separate orifice at the end of the trunk. At the place where these cavities make a turn, and before they enter into the bones of the head, there is a moveable cartilaginous plate situated in such a manner as enables the animal to shut the canal, and to prevent the water, with which it occasionally fills the trunk, from entering into the passage of the nose where the organs, serving for the sensation of smell, are placed. The elephant can move the trunk in all directions; he can extend or shorten it at pleasure, without altering the diameters of the two canals within. By this means respiration is not interrupted, whatever be the situation of the trunk; and the water is allowed to remain till the animal chooses to throw it out by an expiration. It is by this organ that the animal lays hold of food or other substances; which he manages with as much dexterity as a man does his hand, taking up grains of corn, or the smallest piles of grass, and conveying them to his mouth. When he drinks, he thrusts his trunk into the water, and fills it by drawing in his breath and exhausting the air: when the trunk is thus filled with water, he can either throw it out to a great distance, or drink it by putting the end of the trunk in his mouth. The two large tusks, which some call the horns of the elephant, are of a yellowish colour, and extremely hard. The bony substance of which they are composed is known by the name of ivory, and much used in different branches of manufacture. Elephants, even in a savage state, are peaceable and gentle creatures. They never use their weapons but in defence of themselves or their companions. Their social dispositions are so strong, that they are seldom found alone, but march always in large troops: the oldest and most experienced lead the van; the young and the lame keep in the middle; and those of the middle age, walk in the rear. The females carry their young on their tusks, embracing them at the same time with their trunk. They seldom march in this regular order but when they reckon the journey dangerous, such as an expedition to cultivated lands, where they expect to meet with resistance. On other occasions they are less cautious; some of them falling behind or separating from the rest, but seldom so far as to be beyond the reach of assistance from their companions. It is dangerous to offer them the least injury; for they run straight upon the offender; and although the weight of their body be great, their steps are so large, that they easily outrun the swiftest man, whom they either pierce with their tusks, or seize with their trunk, dart him in the air, and then trample him under their feet. But they never attack any person unless when provoked. However, as they are extremely delicate with regard to injuries, it is always prudent to keep out of their way. Travellers who frequent these countries kindle large fires, and beat drums during the night, to prevent their approach. After being once attacked by men, or falling into any ambush, they never forget the injury, but search for every opportunity of revenge. As they are probably endowed with a more exquisite sensation of smell than

any other animal, owing to the great extent of their nose, they can scent a man at a very great distance, and trace him by his footsteps. Elephants are peculiarly fond of the banks of rivers, deep valleys, and marshy grounds, especially when well shaded with trees. They delight in drawing up water into their trunks, even when they do not drink it, and amuse themselves in dashing it around. They cannot endure cold, and are equally averse to heat. To avoid the scorching heat of the sun, they retire to the thickest and most shady parts of the forest. The bulk of their bodies is so enormous, that they do not choose to go into deep waters so frequently as some other quadrupeds; although the length of their trunk, which they can raise straight up to respire, is a great advantage in swimming. Their ordinary food is roots, herbs, leaves, the tender branches of trees, fruits, and grains; but they abhor flesh or fish. When any of them discovers a fine pasture, he immediately calls his companions to come and eat with him. As they devour a large quantity of food in a short time, they often shift their pasture; when they meet with cultivated grounds, they make a prodigious desolation, and destroy more plants by their feet than they use for nourishment: which last is very considerable, amounting to 150 pounds of herbage every day: by this means, as they constantly graze in large troops, they lay waste whole fields in an hour. The Indians and negroes employ every art to prevent them from visiting their cultivated lands, making great noises, and burning large fires round their fields. However, these precautions are not always sufficient to prevent the elephants from visiting them. They chase away the domestic animals, put the men to flight, and sometimes even throw down their timber huts. Elephants are hardly susceptible of fear: the only method to stop their course is by fires, squibs, and crackers, the effects of which being sudden and quickly repeated, the elephants frequently turn back; and when one runs, all the rest instantly follow him. Although the social disposition in the elephant be exceeding strong; yet whenever the females come in season, it immediately gives place to the stronger and more interesting passion of love. They observe the greatest delicacy in their amours, abhorring nothing so much as to be seen by their companions. The elephant, when tamed, is the most friendly and obedient of all animals: he is entirely attached to the person who feeds and takes care of him. In a short time he understands signs, and the sound of his master's voice. He distinguishes the language of passion, of command, of satisfaction; and acts accordingly. He receives his orders with attention, and executes them with alacrity, but without precipitation. He easily learns to bow his knees and lower his body, for the convenience of those who mount him. He caresses his friends with his trunk. He lifts burdens with his trunk, and assists those who are loading him in laying them on his back. He delights in shining harness and trappings. When yoked in a cart or waggon, he pulls equally and cheerfully, unless he be abused by injudicious chastisements. His guide is generally mounted on his neck, with a small rod of iron sharp at the point in his hand; he directs his motion by pricking him on the ears and head; but for the most part, a word is sufficient. A tame elephant will do more labour than six horses, but he requires a proportional quantity of food. They are the principal beasts of burden in many parts of Africa and the East Indies. They carry sacks and bundles of all kinds on their necks, backs, and tusks. They never lose or damage any thing committed to their care; they will stand on the edge of a river, take bundles off their necks and tusks, lay them carefully in a boat wherever they are desired, and try with their trunk whether they are properly situated; if they be loaded with casks, they go in quest of stones to prop them, and prevent them from rolling. When the elephant is properly managed, he lives very long even in a state of slavery and labour. That some have lived in this state 130 years, is pretty well authenticated. In a natural state, they often exceed 200 years, and propagate their species till they are 120. It is 30 years before they come to their full growth. The elephants inhabit India, and some of its greater islands, Ceylon, China, and some of the provinces of China. They abound in the southern parts of Africa, from the river Senegal to the Cape; and from thence as high as Ethiopia on the other side. They are found in the greatest numbers in the interior parts, where there are vast forests, near the sides of rivers. The wild elephants of Ceylon live in troops or families distinct and separate from all others, and seem to avoid the strange herds with peculiar care.

When a family removes from place to place, the largest-tusked males put themselves at the head; and if they meet with a large river, are the first to pass it. On arriving on the opposite bank, they try whether the landing-place is safe: if it be, they give a signal of a note from the trunk, as if it were the sound of a trumpet, on which the remaining part of the old elephants swim over; the little elephants follow, holding one another by locking their trunks together; and the rest of the old ones bring up the rear. In the woods is often seen a solitary male elephant, wandering like an outlaw banished from the herd and all the race. In this solitary state, as if in a state of desperation, they are very dangerous. A single man will put to flight whole herds of social elephants: the solitary one fears not his presence, but will stand firm, putting his power to defiance. Elephants are not domesticated in Africa, as in the more civilized parts of Asia, although they are much more numerous. In some parts of Africa they swarm so, that the negroes are obliged to make their habitations under ground for fear of them. They are killed and eaten by the natives, and the trunk is said to be a delicious morsel. All the teeth are brought from Africa; they are frequently picked up in the woods; so that it is uncertain whether they are shed teeth, or those of dead elephants. The African teeth which come from Mosambique are ten feet long; those of Malabar only three or four; the largest in Asia are those of Cochin China, which even exceed the size of the elephants of Mosambique. They are often so large as to weigh 150 pounds each. The skin is thick, and, when dressed, proof against a musket ball. The flesh, the gall, the skin, and the bones, are said to be used medicinally by the Chinese. Mr. Kerr says some elephants have been found so large as to weigh 4,500 pounds. They were formerly used for the purposes of war, but were frequently more formidable to their owners than to the enemy, and, when wounded, exhibited a scene of extreme turbulence and confusion: and the invention of gunpowder appears to have precluded that advantage from their efforts in actual combat, which might, in some instances, in former ages, be occasionally derived from them. Both the Greeks and Romans soon discovered the way to prevent danger from these monstrous animals, they did not attempt to hurt them, but opened their ranks, and suffered them to pass through, while they employed themselves in throwing darts, &c. at their guides.

ELEVATION, [from *elevo*, I lift up,] the altitude of any thing.

ELEVATION, ANGLE OF, in gunnery, that comprehended between the horizon and the line of direction of a cannon or mortar, or it is that which the chase of a piece, or the axis of its hollow cylinder, makes with the plane of the horizon.

ELEVATION, in architecture, the same with an orthographic, or upright draught of a building.

ELEVATION OF THE HOST, in the church of Rome, that part of the mass where the priest raises the host above his head for the people to adore.

ELEVATOR, in anatomy, the name of several muscles, so called from their serving to raise the parts of the body to which they belong.

ELEVATORY, in surgery, an instrument for raising depressed or fractured parts of the skull, to be applied after the integuments and periosteum are removed. See **SURGERY**.

ELEUSINIA, in Grecian antiquity, a festival held in honour of Ceres, every fourth year by some states; by others every fifth. The Athenians celebrated it at Eleusis, whence the name. Ceres, says Isocrates, wandering in quest of her daughter Proserpine, came into Attica, where some good offices were done her, which it is unlawful for those who are not initiated to hear. In return she conferred two unparalleled benefits; to wit, the knowledge of agriculture, by which the human race is raised above the brute creation; and the mysteries, from which the partakers derive sweeter hopes than other men enjoy, both as to the present life and to eternity. It was the popular opinion, that the Eleusinian goddesses suggested prudent counsel to their votaries, and influenced their conduct; that these were respected in the infernal regions, and had precedence in the assemblies of the blessed; while the unhallowed were in utter darkness, wallowing in mire, or labouring to fill a leaky vessel. The Athenians were solicitous to secure these advantages to their children, by having them initiated, as soon as was allowed. Ceres was supposed to be particularly partial to Eleusis, and its vicinity. There

stood the memorials of her presence and of her bounty; the well, Callichorus, by which she had rested, in the reign of Erectheus; the stone on which she sat, named the sorrowful; the Rharian plain, where barley was first sown; and the threshing floor and altar of Triptolemus, a herdsman whom she instructed in the culture of that grain, the use of which succeeded to acorns. Her mysteries continued to possess a pre-eminence in holiness, and to be accounted as much superior to all other religious festivals as the gods were to the heroes. Even the garments worn at the solemnity were supposed to partake of their efficacy, and to be endued with signal virtues. It was usual to retain them until they were perishing; and then to dedicate them in the temple, or to reserve them for enwrapping new-born children.

ELEUSIS, in ancient geography, a town in Attica between Megara and the Piræus, celebrated for the festivals of Ceres.

ELEUTHERA, or **ALABASTER ISLAND**, one of the Bahama islands. Lon. 76. 31. W. Lat. 25. 14. N.

ELEUTHERIA, a festival celebrated at Plataea, in honour of Jupiter Eleutherius, or the assessor of liberty, by delegates from almost all the cities of Greece. Its institution originated from the victory obtained by the Grecians under Pausanias, over Mar-donius the Persian general, in Plataea: an altar and statue were erected to Jupiter Elutherius, who had freed the Greeks from the tyranny of the barbarians. It was further agreed upon in a general assembly, by the advice of Aristides the Athenian, that deputies should be sent every fifth year, from the different cities of Greece, to celebrate Eleutheria, festivals of liberty. The Plataeans celebrated also an anniversary festival in memory of those who had lost their lives in that famous battle.

ELGIN, or **MORRAYSHIRE**, a county of Scotland.

ELGIN, or **ELGYN**, the capital of the above county, about 6 miles N. of the Spey, 30 E. of Inverness. Lon. 2. 25. W. Lat. 57. 40. N.

ELI, [עֵלִי, Heb. *i. e.* offering,] high priest of Israel, and the last of the judges, except Samuel, succeeded Samson, about A.M. 2865; and B.C. 1139. His piety, with the wickedness of his sons, and the consequent misfortunes of his family and the commonwealth, are recorded in 1 Sam. iv. xiv. and xxii. He died in the fortieth year of his government, and ninety-eighth of his age, A. M. 2905, and B. C. 1099.

ELIAS, or **ELIJAH**, [from *אל*, God, and *יה*, the Lord,] an eminent prophet of Israel, who escaped the common lot of mankind, by not suffering death; being translated about A. M. 3108, B. C. 896. His miracles, persecutions, and final exit, are recorded in 1 Kings xvii.—xxi. 2 Kings i. and ii. He appears to be the first person on record who made use of that part of rhetoric called irony, 1 Kings xviii. 27.

ELICIT, [*elicitus*, Latin,] in ethics, is applied to an act of the will immediately produced by, and of, the will, and received within the same: as to be willing, unwilling, loving, hating, &c. Acts of which nature are termed elicit, because that, being before in the power of the will, they are now brought forth into act. But they are so far intrinsic, that some authors consider them as the will itself, and deny that they ought to be distinguished from it any more than light is to be distinguished from the sun.

ELIHU, [from *אלי*, and *יהוה*, Heb. *i. e.* he is my God,] the son of Barachel the Buzite, a descendant of Buz, the son of Nahor, Abraham's brother, and the youngest of Job's friends who visited him in his affliction. His remarkable speech to Job and his senior friends, is recorded in the thirty-second and five following chapters. From some passages in that speech, particularly in chapter xxxiii. ver. 4 and 6, as well as from the propriety of the sentiments expressed in it, and the signification of the name Elihu, and more especially from the Almighty himself being introduced as the next speaker, some commentators have supposed that our Saviour is meant by this personage. But the particular mention that is made of Elihu's parentage, and ancestors, seems to carry a decisive refutation of this conjecture. Another conjecture, that Elihu was, in fact, the author of the book of Job, appears to be much better founded, from the 15th and 16th verses of chapter xxxii. where he seems to speak of himself as the writer of the narrative, and of the effect of his words upon Job's three senior friends. These two verses are indeed evidently a parenthesis, and cannot, by any construction of language, be reckoned a part of the speech, which precedes and follows them.

ELIJAH. See **ELIAS**.

ELIOTT, or **ELLIOT**, **GEORGE AUGUSTUS**, Lord Heathfield, was the youngest son of the late Sir Gilbert Elliott, Bart. of Stobs, in Roxburghshire; and was born at Stobs in 1718. He received the first rudiments of his education under a private tutor; and was early sent to the university of Leyden, where he made considerable progress in classical learning, and spoke with fluency and elegance the German and French languages. Being designed for a military life, he was sent from thence to the celebrated *Ecole Royale du Genie Militaire* conducted by the great Vauban, at La Fere in Picardy; where he laid the foundation of what he so conspicuously exhibited at the defence of Gibraltar. He completed his military course on the continent by a tour, for the purpose of seeing in practice what he had studied in theory. Prussia was the model for discipline, and he continued some time as a volunteer in that service. He returned to Scotland in 1735, in the seventeenth year of age. In 1740 his uncle Col. Elliott appointed him his adjutant of the second troop of horse grenadiers. With these troops he went upon service to Germany, and was with them in a variety of actions. At the battles of Dettingen and Fontenoy, he was wounded. In this regiment he bought the rank of captain and major, and afterwards purchased the lieutenant-colonelcy from Colonel Brewerton, who succeeded to his uncle. Soon after this he was appointed aid-de-camp to George II. and was distinguished for his military skill and discipline. In March 1759, he quitted the second troop of horse grenadier guards, being selected to raise, form, and discipline, the first regiment of light horse, called after him, Elliott's. As soon as they were raised and formed, he was appointed to the command of the cavalry in the expedition on the coast of France, with the rank of brigadier general. After this he passed into Germany, where he was employed on the staff, and greatly distinguished himself in a variety of movements. On the peace in 1763, his gallant regiment was reviewed by the king, when they presented to his majesty the standards which they had taken from the enemy. Gratified with their fine discipline and high character, the king asked General Elliott what mark of his favour he could bestow on his regiment equal to their merit? He answered, that his regiment would be proud if his majesty should think, that, by their services, they were intitled to the distinction of Royals. It was accordingly made a royal regiment, with this flattering title, "The fifteenth, or King's Royal Regiment of Light Dragoons." At the same time the king expressed a desire to confer some honour on the general himself; but the latter declared, that the honour and satisfaction of his majesty's approbation of his services was his best reward. During the peace he was not idle. His great talents in the various branches of the military art gave him ample employment. He was appointed to the command of Gibraltar in a fortunate hour for the safety of that important fortress. The system of his life, as well as his education, peculiarly qualified him for his trust. He was perhaps the most abstemious man of the age; neither indulging himself in animal food nor wine. He never slept more than four hours at a time; so that he was up later and earlier than most other men. He so inured himself to habits of hardness, that the things which are difficult and painful to other men were to him his daily practice and rendered pleasant by use. It could not be easy to starve such a man into a surrender, nor possible to surprise him. The example of the commander in chief in a besieged garrison had a most persuasive efficacy in forming the manners of the soldiery. Like him his brave followers came to regulate their lives by the most strict rules of discipline before there arose a necessity for so doing; and severe exercise, with short diet, became habitual to them by choice. The military system of discipline which he introduced, and the preparations which he made for his defence, were contrived with so much judgement, and executed with so much address, that he was able with a handful of men to preserve his post against an attack, the constancy of which, even without the vigour, had been sufficient to exhaust any common set of men. Collected within himself, he in no instance destroyed, by premature attacks, the labours which would cost the enemy time, patience, and expence, to complete; he deliberately observed their approaches, and seized on the proper moment, with the keenest perspection, in which to make his attack with success. He never spent his ammunition in useless parade, or unimportant attacks. He never relaxed from his discipline by the appearance of security, nor hazarded the lives of his garrison by

wild experiments. By a cool and temperate demeanour, he maintained his station for three years of constant investment in which the powers of Spain were employed. All the eyes of Europe were on this garrison; and his conduct has justly exalted him to the most elevated rank in the military annals of Britain. On his return to England, the gratitude of the British senate was as forward as the public voice in giving him that distinguished mark his merit deserved. Both houses of parliament voted an unanimous address of thanks to the general. The king conferred on him the honour of Knight of the Bath, with a pension during his own, and a second life, of his own appointment; and on June 14, 1787, his majesty advanced him to the peerage by the title of Lord Heathfield, Baron Gibraltar, permitting him to take, in addition to his family arms, the arms of the fortress he had so bravely defended, to perpetuate to futurity his noble conduct. Lord Heathfield died on the 6th July, 1790, at his chateau at Aix-la-chapelle.

ELIPHAZ, [from *עֵלִיפָאז*, *i. e.* the strength of God,] the eldest of Job's three uncharitable friends. From his being stiled the Temanite, it is evident that he was a descendant of Esau, by Teman, the son of Eliphaz, and grandson of Esau, the first duke of Edom; which contributes to assist the chronologist in fixing the period when Job lived.

ELIQUATION, in chemistry, an operation by which a more fusible substance is separated from one that is less so, by means of a heat sufficiently intense to melt the former, but not the latter. Thus an alloy of copper and lead may be separated by a heat capable of melting the latter, but not the former.

ELIS, or **ELEA**, in ancient geography, a fertile district of Peloponnesus, famous for raising flax, which equalled that of Judæa in fineness, though not so yellow, and grew nowhere else in Greece.

ELIS, the capital of the above district, situated on the Peneus, which ran through it. It was the country of Phædo the friend of Plato, and of Pyrrho the founder of the Pyrrhonists.

ELISHA, [from *עִישָׁא*, *i. e.* the salvation of God,] or Eliseus, the son of Shaphat, an eminent prophet of Israel, the disciple and successor of Elijah. His call, with his various miracles and prophecies are recorded in 1 Kings, xix. xxi. 2 Kings, ii.—viii. and xiii. He died much lamented by Joash, king of Israel, about A. M. 3165.

ELISHAH, the son of Javan, and grandson of Japhet, is supposed by chronologists to have been the progenitor of the inhabitants of Æolia, in lesser Asia, and of Elis and Alisium in Peloponnesus.

ELISION, in grammar, the cutting off, or suppressing of a vowel at the end of a word, for the sake of sound, or measure, the next word beginning with a vowel.

ELISIONS, are pretty frequently met with in English poetry, but more frequently in the Latin, French, &c. They are chiefly used in suppressing the *a*, *e*, and *i*; though they may also suppress any of the other vowels.

ELIXIR, in medicine, a compound tincture extracted from many efficacious ingredients. The difference between a tincture and an elixir seems to be this, that a tincture is drawn from one ingredient, sometimes with an addition of another to open it, and to dispose it to yield to the menstruum; whereas an elixir is a tincture extracted from several ingredients at the same time.

ELIZABETH, queen of England, was the daughter of Henry VIII. by Anne Boleyn, and born in 1533. She was educated in the Protestant religion, and in the reign of Mary was sent to the Tower, from whence she was afterwards removed to Woodstock. On the death of her sister in 1558 she was proclaimed queen, to the great joy of the nation. Philip of Spain made her an offer of marriage, which she civilly declined. In restoring the reformation she conducted herself with great prudence and moderation. One of the first measures of her reign was to send succours to the reformed party in Scotland, which produced the treaty of Edinburgh, and the departure of the French from that country. Elizabeth was now considered as the head of the Protestant interest, and she gave her assistance to the French Hugonots, who put Hayre de Grace into her hands. At home rigorous measures were adopted against the Roman Catholics and puritans. Dudley, earl of Leicester, became the queen's favourite, and had the ambition to aspire to her hand. She, however, made an ineffectual effort to unite him to Mary, queen of Scots. That unfortunate princess took

took refuge in England from her subjects in 1568, and was kept in confinement till 1586, when she was basely tried and executed. Elizabeth endeavoured to clear herself of the odium of this transaction, by causing her secretary, Davison, to be prosecuted for issuing a warrant for the execution without her knowledge. The French and Spaniards having formed a league for the extirpation of heresy, induced Elizabeth to protect the Protestants, and this she did so effectually as to separate the United Provinces from the dominion of the latter power. The king of Spain, in return, sent a body of troops to invade Ireland, but they were all cut off by lord Grey, the deputy. In the mean time various offers of marriage were made to the queen, the most remarkable of which was that of the duke of Anjou, who came to England for the purpose, but after staying some time, the affair was broken off. In 1588 Philip sent against England his famous armada, to which the pope gave the appellation of invincible. On this occasion the queen distinguished herself by her great presence of mind, and inflexible courage. She rode on horseback in the camp at Tilbury, and inspired her people with heroism by her deportment and her speeches. The English fleet, however, assisted by the winds, prevented the Spaniards from landing, and their boasted armada was destroyed. On the death of Leicester, Robert Devereux, earl of Essex, became the queen's favourite, who was, however, executed for treason in 1601. Her attention to government, did not suspend her pursuit of learning. Ascham, in his Schoolmaster, tells us, that about 1563, five years after her accession, she being then at Windsor, besides her perfect readiness in Latin, Italian, French, and Spanish, she read more Greek in one day than some prebendaries of that church read Latin in a whole week. She employed Sir John Fortescue to read to her Thucydides, Xenophon, Polybius, Euripides, Æschines, and Sophocles. She was also skilled in the art of poetry, as appears from the several scraps which have been preserved, from the testimony of Puttenham, a contemporary writer. Mr. Walpole mentions as an instance of her genius, and knowledge of Latin, her extempore reply to an insolent prohibition delivered to her from Philip II. by his ambassador, in this tetrastich:

Te veto, ne pergas bello defendere Belgas:
Quæ Dracus eripuit, nunc restituantur oportet:
Quas pater evertit, jubeo te condere cellas:
Religio papæ fac restituat ad unguem.

"She instantly answered him, with as much spirit as she used to return his invasions."

Ad Græcas, bone rex, fient mandata kalendas.

Being pressed by a Romish priest, during her persecution, to declare her opinion concerning the real presence of Christ's body in the wafer, she answered,

Christ was the Word that spake it;
He took the bread, and brake it;
And what that Word did make it,
That I believe, and take it.

Fuller.

She died at Richmond, the 24th March 1603, aged 70, having reigned 44 years; and was interred in the chapel of Henry VII. in Westminster Abbey. Her successor James erected a magnificent monument to her memory. Several of her letters, prayers, translations, &c. written with her own hand, are extant.

ELIZABETH, empress of Russia, daughter of Peter the Great, (whence her patronymic title of Petrovna,) distinguished herself by her signal clemency. She made a vow, that no person should be put to death in her reign, and she strictly observed it. The example was followed, and confirmed by law, under the late Catharine II. Elizabeth died in 1762, in the 21st year of her reign, and 52d of her age.

ELIZABETH ISLANDS, 16 small islands of Massachusetts bay, on the S. E. side of Buzzard's Bay, extending S. W. from Barnstable county, and bearing N. W. from Martha's vineyard. Cattahunk, Nashawin, Nashawenna, Pasqui, and Pinequese, are the chief of them. They are situated between Lon. 70. 38. and 70. 56. W. and between Lat. 41. 24. and 41. 32. N.

ELIZABETH-TOWN, a post-town of N. Carolina, capital of Bladen county, 47 miles N. W. of Wilmington.

ELIZABETH-TOWN, a town of New Jersey, in Essex county, 6 miles S. of Newark, and 15 S. W. by W. of New York.

ELIZABETH-TOWN, a post town of Maryland, capital of Wash-

ington county, formerly called Hagar's town, seated in the vale of Conecocheaque, 6 miles from the Potomac.

ELK, in zoology. See CERVUS.

ELK, a navigable river of the United States in Maryland.

ELKHOLM, a sea-port of Sweden, in Bleking, on the Baltic, 24 miles W. of Carlsroon.

ELKRIDGE, a town of Maryland, 8 miles S. W. of Baltimore, and 19 N. W. of Annapolis.

ELKTON, a town of Maryland, in Cecil county, 47 miles S. W. of Philadelphia.

ELL, [*eln*, Sax.] a measure containing 45 inches, or a yard and a quarter.

ELL, is a measure, which obtains, under different denominations, in most countries, whereby cloths, stuffs, linens, silks, &c. are usually measured; answering nearly to the yard of England, the canna of Italy, the vara of Spain, the palm of Sicily, &c. The ells most frequently used with us are the English and Flemish; the former containing three feet nine inches, or one yard and a quarter; the latter only 27 inches, or three quarters of a yard. The ell in Scotland contains 37½ English inches.

ELLERENA, or ELERENA, a town of Spain, in Estremadura, 55 miles N. of Seville.

ELLEDON, a town of Northumberland, 28 miles N. W. of Newcastle. Lon. 1. 49. W. Lat. 55. 20. N.

ELLESMERE, a town and fertile district, in Shropshire, 16 miles N. N. W. of Shrewsbury.

ELLICHPOUR, a city of Hindostan, and capital of a circar of the same name, in the county of Berar, 144 miles N. E. of Aurungabad.

ELLIPSIS, [from *ἐλλειψις*, of *ἐλλείπω*, *I want*,] in geometry, a figure produced from the section of a cone. The reason of the name is this: let BA, ED, be any two conjugate diameters of an ellipsis, (fig. 16. Plate LIV, where they are the two axes,) at the end A, of the diameter AB, raise the perpendicular AF, equal to the latus rectum, or parameter, being a third proportional to AB, ED, and draw the right line BF; then if any point P be taken in BA, and an ordinate PM be drawn, cutting BF in N, the rectangle under the absciss AP, and the line PN will be equal to the square of the ordinate PM. Hence drawing NO parallel to AB, it appears that this rectangle, or the square of the ordinate, is less than that under the absciss AP, and the parameter AF, by the rectangle under AP and OF, or NO and OF; on account of which deficiency, Apollonius first gave this curve the name of an ellipsis, from *ἐλλείπειν*, to be deficient.

ELLIPSIS, in grammar, a figure of syntax, wherein one or more words are not expressed; and from this deficiency it has got the name ellipsis.

ELLIPSIS, [*ἐλλειψις*,] in rhetoric, a figure nearly allied to preterition, when the orator, through transport of passion, passes over many things; which had he been cool, ought to have been mentioned. In preterition, the omission is designed; which, in the ellipsis, is owing to the vehemence of the speaker's passion, and his tongue not being able to keep pace with the emotion of his mind.

ELLIPTIC, or ELLIPTICAL, something belonging to an ellipsis. Thus we meet with elliptical compasses, elliptic conoid, elliptic space, elliptic stairs, &c. The elliptic space is the area contained within the curve of the ellipsis, which is to that of a circle described on the transverse axis, as the conjugate diameter is to the transverse axis; or it is a mean proportional between two circles, described on the conjugate and transverse axis.

ELLIPTOIDES, in geometry, a name used by some to denote infinite ellipses, defined by the equation $ay^{\frac{m+n}{n}} = bx^{\frac{m+n}{n}}$.

($a - x$). Of these there are several sorts: thus, if $ay^3 = bx^2$ ($a - x$) it is a cubical elliptoid; and if $ay^4 = bx^2 (a - x)^3$, it denotes a biquadratic elliptoid, which is an ellipsis of the third order in respect of the Apollonian ellipsis.

ELLISIA, a genus of the monogynia order, and pentandria class of plants; natural order, Luride. Corolla monopetalous, funnel-shaped; berry carnosous, bilocular; seeds two, mucicated or set with small raised points, the one higher than the other. One species, a native of Virginia.

ELM, [*ulmus*,] in botany. See ULMUS. The elm is very serviceable

serviceable in places where it may lie continually dry, or wet in extremes. Accordingly, it is proper for water-works, mills, the ladles and soles of the wheel-pipes, pumps, aqueducts, pales, and ship-planks beneath the water-lines. It is also of use for wheel-wrights, handles for single saws, axle-trees, and the like. The clearness of the grain, makes it also fit for all kinds of carved works, and most ornaments relating to architecture. This wood may be propagated by the seed, and by layers or suckers taken from the roots of old trees: those raised from layers always strike better roots, thrive more quickly than the other, and do not shoot forth so many suckers; for which reason this method deserves to be more generally practised. The elm naturally delights in a stiff, strong soil, where it grows comparatively slow; but if it be planted in rich, light land, it vegetates most luxuriantly. In the latter case, however, its wood is light, porous, and of little value, compared with that produced on richer soils: the latter is of a closer and stronger texture, and possesses, near the heart, the colour and almost the weight and hardness of iron. On such lands, therefore, the elm becomes very profitable, and is one of those deciduous trees, which ought to be industriously cultivated. This beautiful tree is of great value; and well adapted for planting shady walks, as it does not destroy the grass, and its leaves are relished by horses, cows, goats, hogs, and sheep, all of which eat them eagerly. Its wood, being hard and tough, is used for making axle-trees, mill-wheels, keels of boats, chairs, and coffins: it is also frequently changed by art, so as completely to resemble mahogany; for this purpose, it is sawed into thick planks, stained with aqua-fortis, and rubbed over with a tincture, of which alkannet, aloes, and spirit of wine, are the principal ingredients. Silkworms eat the leaves with avidity.

ELMACINUS, **GEORGE**, author of a History of the Saracens, was born in Egypt towards the middle of the 13th century. His history comes down from Mohammed to the year of the Hegira 512, answering to A. D. 1134; in which he sets down year by year, in a very concise manner, whatever regards the Saracen empire, intermixed with some passages relating to the eastern Christians. His abilities must have been considerable; since, though he professed Christianity, he held an office of trust near the persons of the Mohammedan princes. He was son to Yaser Al Ahmid, secretary to the council of war under the sultans of Egypt for 45 years; and in 1238, when his father died, succeeded him in his place. His history of the Saracens was translated from Arabic into Latin by Erpinus; and printed in these two languages in folio, at Leyden, in 1625. Erpinus died before the publication; but Golius took care of it, and prefixed a preface. It was dedicated by Erpinus's widow to Dr. Andrew's, bishop of Winchester.

ELNIA, a town of Russia, in the government of Smolensko, 32 miles E. S. E. of Smolensko.

ELOCUTION, [*elocutio*, Lat.] generally speaking, signifies the selecting and adapting of words and sentences, to the things or sentiments intended to be expressed. It is also used to denote the just and graceful management of the voice, countenance, and gesture, when speaking: in which sense it is synonymous with what is variously called a good delivery, eloquence, or the art of speaking and writing with accuracy, elegance, and perspicuity. True eloquence depends principally on the vivacity of the imagination; for it not only communicates grace and ornament, but also life and motion to discourse. See **ORATORY**.

ELOGY, [*elogium*,] a praise, or panegyric, bestowed on any person or thing, in consideration of its merit.

ELOGY, or **EULOGIUM**, should not have so much as one epithet, properly so called, nor two words synonymous: it should strictly adhere to truth; for extravagant and improbable elogies rather lessen the character of the person or thing they would extol. The beauty of elogy consists in expressive brevity.

ELOHI, **ELOHIM**, or **ELOI**, [עֲלֹהִים, Heb. אֱלֹהִים, Syr.] in scripture, one of the names of God. But it is to be observed, that angels, princes, great men, judges, and even false gods, are sometimes called by this name. The sequel of the discourse, is what assists us in judging rightly concerning the true meaning of this word. It is the same as Eloha. The one is the singular, and the other the plural. Nevertheless Elohim is often constructed in the singular number, particularly when the true God is spoken of; but when false gods are spoken of, it is construed rather in the plural.

ELOINED, in law, signifies restrained or hindered from doing something: thus it is said, that if those within age be eloined, so that they cannot sue personally, their next friend shall sue for them.

ELONGATION, in astronomy, the digression or recess of a planet from the sun, with respect to an eye placed on our earth. The term is chiefly used in speaking of Venus and Mercury, the arch of a great circle intercepted between either of these planets and the sun being called the elongation of that planet from the sun. See **ASTRONOMY**.

ELONGATION, **ANGLE OF**, is an angle contained under lines drawn from the centres of the sun and planet, to the centre of the earth.

ELONGATION, in surgery, is an imperfect luxation, occasioned by the stretching or lengthening of the ligaments of any joint. See **SURGERY**.

ELOPEMENT, is when a married woman of her own accord departs from her husband, and dwells with an adulterer; for which without voluntary reconciliation to the husband, she shall lose her dower by the statute of Westminster, ii. c. 34. If a wife willingly leaves her husband, and goes away and continues with her avouter, she shall be barred for ever of action to demand her dower that she ought to have of her husband's lands, if she is convicted thereof; except that her husband willingly and without coercion of the church, reconciles her, and suffers her to dwell with him; in which case she shall be restored to her action. 13 Ed. I. st. i. c. 34. See **ADULTERY**.

ELOPS, [ελος], a genus of fishes of the order abdominales. Tail armed above and beneath; body long, and differing from the salmon in wanting the fleshy back-fin. Head large, smooth, shining, compressed, and flattened; eyes half-covered with the skin of the head; body slender, covered with large angular scales; tail deeply cleft, with a bony scale or spine, above and beneath, before it. It has one species, generally about fourteen inches long, it is found on the coasts of Carolina.

ELORA, a town of Hindostan, in the country of Aurungabad; 13 miles N. of Aurungabad.

ELOTZ, a town of Russia, in the government of Orloff, 112 miles E. N. E. of Orel.

ELPHIN, a town of Ireland, in the county of Roscommon, 8 miles N. of Boyle, and 25 N. of Dublin.

ELRICH, a town of Germany, in Upper Saxony.

ELSIMBURG, or **HELSIMBURG**, a port town of Sweden, in the province of Gothland, and territory of Schonen, 7 miles E. of Elsinore. Lon. 13. 20. E. Lat. 56. 2. N.

ELSINEUR, **ELSINOOR**, **ELSNORE**, or **HELSINGOER**, a port town of Denmark, seated on the Sound, in the isle of Zealand. Every vessel, as she passes, lowers her top-sails, and pays a toll at Elsinore. Lon. 12. 37. E. Lat. 56. 3. N.

ELTMAN, a town of Germany, in Franconia, and bishopric of Wurzburg, 8 miles W. N. W. of Bamberg.

ELTZ, a town of Lower Saxony, 10 miles S. W. of Hildesheim. Lon. 10. 5. E. Lat. 50. 5. N.

ELVAS, a large town, and one of the most important in Portugal, in the province of Alentejo, a few miles from the frontiers of Spanish Estramadura. It is built on a mountain, and is strongly fortified with works of free-stone. It is 50 miles N. E. of Evora, and 100 E. of Lisbon. Lon. 7. 3. W. Lat. 38. 43. N.

ELVELA, in botany, a genus of the natural order of fungi, belonging to the cryptogamia class of plants. The fungus is turbinate, or like an inverted cone.

ELUL, [אֱלּוּל] in chronology, the 12th month of the Jewish civil year, and the 6th of the ecclesiastical: it consisted of only 29 days, and answered pretty nearly to our August.

ELUTRIATION, in chemistry, an operation performed by washing solid substances with water, stirring them well together, and hastily pouring off the liquid, while the lighter part remains suspended in it, that it may thereby be separated from the heavier part. By this operation metallic ores are separated from earth, stones, and other unmetallic particles adhering to them.

ELWANGEN, a principality of Germany, in Suabia, bordering on the late duchy of Wurtemberg.

ELWANGEN, the capital of the above late principality, 25 miles S. W. of Anspach, and 32 N. of Ulm.

ELY, a city and bishop's see of Cambridgeshire, about 17 miles N. of

N. of Cambridge. It is a county of itself, including the territory around; and has a judge who determines all causes civil and criminal within its limits.

ELY, ISLE OF, a fenny district in Cambridgeshire, near Bedford Level, which comprehends the town and diocese of Ely, and is partly overflowed by water in winter. Immense numbers of wild fowls are taken in it.

ELYMAIS, in ancient geography, the capital of Elam, or Persia.

ELYMUS, LYME-GRASS, a genus of the digynia order, and triandria class of plants; natural order, Gramina. The calyx is lateral, bivalved, aggregate, and multilorous. It has eleven species.

ELYOT, SIR THOMAS, a gentleman eminent for learning in the 16th century, who was educated at Oxford, travelled into foreign countries. Henry VIII. conferred the honour of knighthood on him, and employed him in several embassies; particularly in 1532, to Rome, about the divorce of queen Catharine, and afterwards to Charles V. about 1536. He wrote, "The Castle of Health," "The Governor," "Banquet of Sapience," "Of the Education of Children," "De Rebus memorabilibus Angliæ," and other books; and was highly esteemed by all his learned contemporaries.

ELYSIAN FIELDS. See the next article.

ELYSIUM, [ΕΛΥΣΙΟΣ,] in the ancient mythology, was represented as a place in the inferi or lower world, furnished with fields, meads, agreeable woods, groves, shades, rivers, &c. whither the souls of good people were supposed to go after this life. Orpheus, Hercules, and Aeneas, were said to have descended into Elysium in their life-time, and to have returned again: (Virg. lib. vi. ver. 638, &c.) Tibullus (lib. i. eleg. 3.) gives us fine descriptions of the Elysian fields. Virgil assigns Elysium to patriots who died for their country, to those of pure lives, to truly inspired poets, to the inventors of arts, and to all who have done good to mankind. Some authors take the fable of Elysium to have been borrowed from the Phœnicians; and suppose the name Elysium formed from the Phœnician אלז alaz, or אלז alats, or אלז alas, to rejoice, or to be in joy; the letter a being only changed into e. Others derive the word from the Greek ελυω, solvo, I let loose, or disengage; because here men's souls are freed or disincumbered from the fetters of the body.

ELZEVIUS, LEWIS, BONAVENTURE, ABRAHAM, LEWIS, and DANIEL, five celebrated printers at Amsterdam and Leyden, who greatly adorned the republic of letters by many beautiful editions of the best authors of antiquity. They fell somewhat below the Stephensens in point of learning, as well as in their editions of Greek and Hebrew authors; but as to the choice of good books, they seem to have equalled, and in the neatness and elegance of their small characters, greatly to have excelled them. Their Virgil, Terence, and Greek Testament, have been reckoned their master-pieces; and are indeed so very fine, that they justly gained them the reputation of being the best printers in Europe. The first Lewis Elzevir began to be famous at Leyden in 1595, and was remarkable for being the first who observed the distinction between the *v* consonant and *u* vowel, which had been recommended by Ramus and other writers long before, but never regarded. Daniel died in 1680 or 1681; and though he left children who carried on the business, is esteemed the last of his family who excelled in it. The Elzevirs have printed several catalogues of their editions; but the last, published by Daniel, is considerably enlarged, and abounds with new books. It was printed in 12mo, at Amsterdam, in 1674, and divided into 7 volumes.

EMANCIPATION, in the Roman law, the setting free a son from the subjection of his father; so that whatever moveables he acquires belong in property to him, and not to his father, as before emancipation. Emancipation puts the son in a capacity of managing his own affairs, and of marrying without his father's consent, though a minor. There were two kinds of emancipation, viz.

1. EMANCIPATION, EXPRESS, where the father declared before a judge, that he emancipated his son.

2. EMANCIPATION, TACIT, by the son's being promoted to some dignity, by his coming of age, or by his marrying, in all which cases he became his own master of course.

EMARGINATED, among botanists, an appellation given to such leaves as have a little indenting on their summits: when this

indenting is terminated on each side by obtuse points, they are said to be obtusely emarginated; whereas when these points are acute, they are called acutely emarginated.

EMBALMING is the opening of a dead body, taking out of the intestines, and filling of the place with odoriferous and desiccative drugs and spices, to prevent its putrefying. The Egyptians excelled all other nations in the art of preserving bodies from corruption; for some, that they have embalmed upwards of 2000 years ago, remain whole to this day, and are often brought into other countries as great curiosities. Their manner of embalming was thus: they scooped the brains with an iron scoop out at the nostrils, and threw in medicaments to fill up the vacuum: they also took out the entrails, and having filled the body with myrrh, cassia, and other spices, except frankincense, proper to dry up the humours, they pickled it in nitre, where it lay soaking for 70 days. The body was then wrapped up in bandages of fine linen and gums, to make it stick like glue; and so was delivered to the kindred of the deceased, entire in all its features, the very hairs of the eye-lids being preserved. They used to keep the bodies of their ancestors, thus embalmed, in little houses magnificently adorned, and took great pleasure in beholding them, alive as it were, without any change in their size, features, or complexion. The Egyptians also embalmed birds, &c. The prices for embalming were different; the highest was a talent, the next 29 minæ, and so decreasing to a very small matter; but they who had not wherewithal to answer this expence, contented themselves with infusing, by means of a syringe, through the fundament, a certain liquor extracted from the cedar; and leaving it there, wrapped up the body in salt of nitre: the oil thus preyed upon the intestines, so that when they took it out, the intestines came away with it, dried, and not in the least putrefied: the body being enclosed in nitre, grew dry, and nothing remained besides the skin glued upon the bones. The method of embalming used by the modern Egyptians, according to Maillet, is to wash the body several times with rose water, which he elsewhere observes, is more fragrant in that country than with us; they afterwards perfume it with incense, aloes, and other odours, of which they are by no means sparing; and then they bury the body in a winding sheet, made partly of silk and partly of cotton, and moistened, as is supposed, with some sweet scented water or liquid perfume, though Maillet uses only the term moistened; this they cover with another cloth of unmixed cotton, to which they add one of the richest suits of clothes of the deceased. The expence, he says, on these occasions, is very great, though nothing like what the genuine embalming cost in former times.

EMBARCADERO, in commerce, a Spanish term, much used along the coasts of America, particularly those on the South Sea; signifying a place which serves some other city farther within land, as a port, for embarking and disembarking commodities. Thus Calamo is the embarcadero of Lima, the capital of Peru; and Arica the embarcadero of Potosi.

EMBARGO, in commerce, an arrest on ships or merchandise, by public authority; or a prohibition of state, commonly on foreign ships, in time of war, to prevent their going out of port, sometimes to prevent their coming in, and sometimes both for a limited time. The king may lay embargoes on ships, or employ those of his subjects, in time of danger, for the service and defence of the nation: but they must not be for the private advantage of a particular trader or company; and therefore a warrant to stay a single ship is no legal embargo. No inference can be made from embargoes which are only in time of war, and are a prohibition by advice of council, and not at prosecution of parties. If goods be laden on board, and after an embargo or restraint from the prince or state comes forth, and then the master of the ship breaks ground, or endeavours to sail, if any damage accrues, he must be responsible for the same; the reason is, because his freight is due, and must be paid, even though the goods be seized as contraband.

EMBASSADOR, or AMBASSADOR, a public minister sent from one sovereign prince, as a representative of his person, to another.

EMBDEN, a county of Germany, in the late circle of Westphalia, called also EAST FRIESLAND, containing several towns and villages.

EMBDEN, a strong city, the capital of the above county, 23 miles N. E. of Groningen.

EMBER-DAYS. See **EMBER-WEEKS.**

EMBERIZA, a genus of the class and order aves passeress. Bill conical, the mandibles recede from each other towards the base; inferior mandible has the sides narrowed inwards, upper one is still narrower. There are about threescore species.

E. CITRINELLA, the **YELLOW-HAMMER**, has a blackish tail, only the two outward side-feathers are marked on the inner edge with a sharp white spot. It builds its nest on the ground in meadows.

E. HORTULANA, the **ORTOLAN**, has black wings; the first three feathers on the tail are white on the edges, only the two lateral are black outwardly. The orbits are naked and yellow: the head is greenish, and yellow towards the inferior mandible. It feeds principally upon the panic grass; grows very fat; and is reckoned a delicate morsel by certain epicures, especially when fattened artificially. These birds are found in several parts of Europe, but are not met with in Britain.

E. NIVALIS, the great pyed mountain finch of Ray, and the snow bird of Edwards, has white wings, but the outer edge of the prime feathers are black; the tail is black, with three white feathers on each side. These birds are called in Scotland **Snow-Flakes**, from their appearance in hard weather and in deep snows. Their appearance is a certain fore-runner of hard weather, and storms of snow, being driven by the cold from their common retreats. Their progress southward is supposed to be thus; Spitzbergen and Greenland, Hudson's Bay, the Lapland Alps, Scandinavia, Iceland, the Ferroe Isles, Shetland, Orkneys, Scotland, and the Cheviot hills. They visit at that season all parts of the northern hemisphere, Prussia, Austria, and Siberia. They arrive lean, and return fat. In Austria, they are caught and fed with millet, and, like the Ortolan, grow excessively fat.

E. ORYZIVORA, or the **RICE BIRD**, is peculiar to America, where its depredations on the rice and maize, subject it to the peculiar aversion of the farmer. These birds often mingle with birds of other species, as the red winged oriole, and the blue jay. They are occasionally kept for the sake of their music. See Plate LVIII.

EMBER WEEKS, by the canonists are called *quatuor anni tempora*, the four cardinal seasons, on which the circle of the year turns: and hence Henshaw takes the word to have been formed, viz. by corruption, from *tempora*. They are now chiefly taken notice of, on account of the ordination of priests and deacons; because the canon appoints the Sundays next succeeding the ember weeks, for the solemn times of ordination; though the bishops may ordain on any Sunday or holiday.

EMBEZZLEMENT, in law, by stat. 39 G. 3. c. 35, for protecting masters against embezzlements by their clerks and servants; servants or clerks, or persons employed for the purpose, or in the capacity of servants or clerks, who shall by virtue of such employment receive, or take into their possession, any money, goods, bond, bill, note, banker's draft, or other valuable security or effects, for or in the name, or on account of their master or employer; or who shall fraudulently embezzle, secrete, or make away with the same, or any part thereof; every such offender, shall be deemed to have feloniously stolen the same from his master or employer, for whose use, or on whose account, the same was delivered to, or taken into the possession of such servant, clerk, or other person, so employed, although such money, goods, bond, bill, note, banker's draft, or other valuable security, was or were not otherwise received into the possession of his or their servants, clerk, or other person so employed; and every such offender, his adviser, procurer, aider, or abettor, being thereof lawfully convicted or attainted, shall be liable to be transported beyond seas.

EMBLEM, [*εμβλημα*], a kind of painted ænigma, which, representing some obvious history, with reflections underneath, instructs us in some moral truth. See **ÆNIGMA**, **DEVISE**, &c. Such is that very significant image of Scævola holding his hand in the fire; with the words, "*Agere et pati fortiter Romanum est*. To do and suffer courageously is Roman." The emblem is somewhat plainer than the ænigma. Gale defines emblem an ingenious picture, representing one thing to the eye, and another to the understanding. The Greeks also gave the name *Emblems*, [*εμβλημα*], from [*εμβαλλειν*, to insert], to inlaid or Mosaic works, and even to all kinds of ornaments of vases, moveables, garments,

&c. And the Latins used *emblemata* in the same sense. Accordingly, Cicero reproaching Verres with having plundered statues and fine wrought works from the Sicilians; calls the ornaments, fixed to them (and which on occasion might be separated,) *emblemata*. Latin authors frequently compare the figures and ornaments of discourse to these *emblemata*. With us, emblem ordinarily signifies no more than a painting, basso-relievo, or other representation, intended to hold forth some moral or political instruction. What distinguishes an emblem from a devise is, that the words of an emblem have a full complete sense of themselves; nay, all the sense and signification which they have together with the figure. But there is a yet further difference between emblem and devise: for a devise is a symbol appropriated to some person, or that expresses something which concerns him particularly; whereas an emblem is a symbol that regards all the world alike. These differences will be more apparent, from comparing the emblem above quoted, with the devise of a candle lighted, and the words *Aliis in serviendo consumor*, "I waste myself in serving others."

EMBLEMETS, in law, signify the profits of land sown; but the word is sometimes used more largely, for any profits that arise and grow naturally from the ground, as grass, fruit, hemp, flax, &c.

EMBOLISMIC, or intercalary, [*εμβολισμος*] a term used by chronologists in speaking of the additional months and years, which they insert to bring the lunar to the solar year. Since the common lunar year consists of twelve synodic months, or 354 days nearly, and the solar consists of 365 days (throwing away the odd hours and minutes) it is plain that the solar year will exceed the lunar by about 11 days; and consequently in the space of about 33 years, the beginning of the lunar year will be carried through all the seasons, and hence it is called the moveable lunar year. This form of the year is used at this time by the Turks and Arabians; and because in three years' time the solar year exceeds the lunar by 33 days, therefore, to keep the lunar months in the same seasons and times of the solar year, or near it, chronologists added a whole month to the lunar year every third year, and so made it consist of 13 months; this year they called the embolismic year, and the additional month the embolismic, or embolimean, or intercalary month. This form of the year is called the fixed lunar year, and it was used by the Greeks and Romans till the time of Julius Cæsar.

EMBOSSING, or **IMBOSSING**, in architecture and sculpture, the forming or fashioning of works in relievo, whether cut with a chissel or otherwise. Embossing is a kind of sculpture, wherein the figures stick out from the plane whereon it is cut: and according as the figures are more or less prominent, they are said to be in alto, mezzo, or basso, relievo; or high, mean, or low, relief. See **ENCHASING**.

EMBOTHERIUM, in botany, a genus of the monogynia order, and tetrandria class of plants. No calyx; petals four, linear, oblique; follicle, round, unilocular, sharpened at both ends; seeds four or five, egg-shaped, compressed. It has four species.

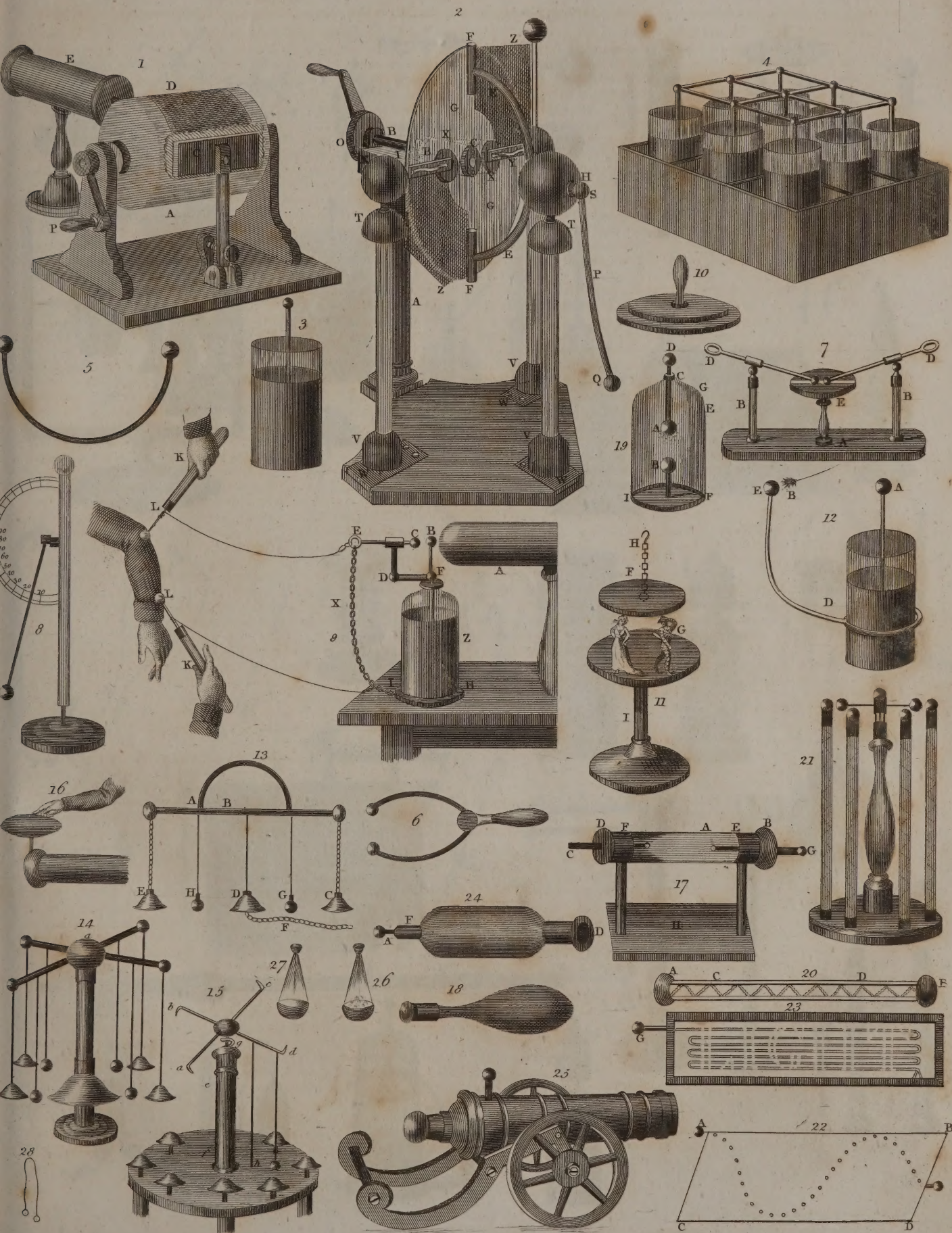
EMBRACE THE VOLT, in the manege. A horse is said to embrace a volt, when working upon volts, he makes a good way every time with his fore-legs.

EMBRACEOR, among lawyers, a person, who, having received a reward so to do, comes to the bar with one of the parties, and speaks in the case; or privily labours the jury, or stands in court to over-look them, whereby they are awed or put in fear. Actions of this kind will be embracery, whether the jurors give verdict on the side of the party or not. The penalty of this offence is 20*l.* and imprisonment of the party at the discretion of the court; and may be prosecuted either by indictment at common law, as well as by action on the statute. But attorneys and other lawyers are excepted.

EMBRASURE, in architecture, the enlargement made of the aperture of a door or window, on the inside of the wall; its use being to give the greater play for the opening of the door, or casement, or to admit the more light. When the wall is very thick, they sometimes make embrasures on the outside.

EMBRASURE, in fortification, a hole or aperture in a parapet, through which the cannon are pointed to fire into the moat or field. See **FORTIFICATION**.

EMBROCATION, in surgery and pharmacy, is an external kind of remedy, which consists of an irrigation of the part affected, with





with some proper liquor, as oils, spirits, &c. by means of a woollen or linen cloth, or a sponge, dipped in the same.

EMBROIDERY is a work in gold, silver, or silk thread, wrought by the needle upon cloth, stuffs, or muslin, into various figures. In embroidering stuffs, the work is performed in a kind of loom; because the more the piece is stretched, the easier it is worked. As to muslin, they spread it upon a pattern ready designed; and sometimes, before it is stretched upon the pattern, it is starched, to make it more easy to handle. Embroidery on the loom is less tedious than the other, in which, while they work flowers, all the threads of the muslin, both lengthwise and breadthwise, must be continually counted; but, on the other hand, this last is much richer in points, and susceptible of greater variety. Cloths too much milled are scarce susceptible of this ornament, and in effect we seldom see them embroidered. The thinnest muslins are left for this purpose; and they are embroidered to the greatest perfection in Saxony: in other parts of Europe, however, they embroider very prettily, and especially in France. There are several kinds of embroidery: as, 1. Embroidery on the stamp; where the figures are raised and rounded, having cotton or parchment put under them to support them. 2. Low embroidery; where the gold and silver lie low upon the sketch, and are stitched with silk of the same colour. 3. Guimped embroidery: this is performed either in gold or silver; they first make a sketch upon the cloth, then put on cut vellum, and afterwards sew on the gold and silver with silk thread: in this kind of embroidery they often put gold and silver cord, tinsel, and spangles. 4. Embroidery on both sides, that which appears on both sides of the stuff. 5. Plain embroidery; where the figures are flat and even, without cords, spangles, or other ornaments.

EMBROIDERY, FOREIGN, STATUTES RESPECTING. By stat. 22. Geo. II. c. 36, no foreign embroidery, or gold and silver brocade, shall be imported, upon pain of being forfeited and burnt, and penalty of 100l. for each piece. No person shall sell, or expose to sale, any foreign embroidery, gold or silver thread, lace, fringe, brocade, or make up the same into any garment, on pain of having it forfeited and burnt, and penalty of 100l. All such embroidery, &c. may be seized and burnt; and the mercer, &c. in whose custody it was found, shall forfeit 100l.

EMBRYO. [*ἐμβρυον*.] See **FÆTUS**, and **GENERATION**.

EMBRYOTHLASTES, [from *ἐμβρυον*, an embryo, and *θλαω*, to break,] in surgery and midwifery, an instrument for breaking the bones of a dead child in the uterus, that it may be the more easily extracted.

EMBRYOTOMY, [from *ἐμβρυον*, and *τομή*, cutting,] the art or act of dissecting a fœtus.

EMBRYULCUS, [from *ἐμβρυον*, and *ελκυω*, to draw,] in surgery, an instrument for extracting a dead fœtus from the uterus.

EMBS, a river of Germany, which rises in Westphalia; and falls into Dolart Bay, a little below Embden.

EMBS, or **HOHEN-EMBS**, a small county of Germany, in Suebia, S. of the lake of Constance.

EMBS, or **EMS**, the capital of the above county, ten miles S. of Bregentz.

EMERALD, in lithology, a genus of precious stones belonging to the order of siliceous earths. The name is derived, according to some, from the Italian *smeraldo*, or the Arabian *zomorrad*. Cronstedt says, the emerald is the softest of all the precious stones, but other naturalists place it the next after the diamond in hardness. It is perhaps the most beautiful of all the gems, and according to Wallerius, when heated in the fire, changes its colour to a deep blue, and becomes phosphorescent; but recovers its green when cold. When pulverised it has a white appearance, and, with borax, melts to a very thin and colourless glass. It becomes electric by being rubbed, and some have the property of the tourmalin, viz. of being electrified by heat; and in that state attracting ashes or other light substances; though after having attracted the ashes, they retain them without any signs of repulsion. Hitherto it has been found only crystallized. The primitive form of its crystals is a regular six-sided prism; and the form of its integrant molecules is a triangular prism, whose sides are squares, and bases equilateral triangles. The most common variety of its crystals is the regular six-sided prism, sometimes with the edges of the prism, or of the bases, or the solid angles, or both wanting, and small faces in their place. Crystals short; lateral planes smooth, terminal planes rough; colour emerald green of all intensities; vitreous;

fracture small, imperfect, conchoidal, with a concealed foliated fracture, and fourfold cleavage; fragments sharp-edged; causes double refraction; scratches quartz with difficulty. Specific gravity from 2.600 to 2.7755. Emeralds are divided by jewellers into two classes or kinds, namely, the oriental and the occidental. The former is at present extremely scarce, being found only in the kingdom of Cambay, in India. The occidental emeralds are chiefly imported from Peru, in South America. A very inferior sort is also obtained from Silesia, which, however, is little esteemed. Genuine emeralds being seldom to be met with, several experiments have been made, and directions given for imitating them; from which we select the following: Take of natural crystal of and of red lead, each four ounces; verdigrease 48 grains; and of crocus martis, prepared with vinegar, eight grains. The whole is to be finely pulverized, sifted, and put into a crucible, the space of one inch being left empty. It is then to be well luted, set in a potter's furnace, and left for the same space of time as earthenware. When cool, the crucible is to be broken, and these ingredients will be found converted into a mass of a fine emerald colour; which, after being cut and set in gold, will at least be equal, if not superior, to genuine oriental emeralds. See also **PASTES**.

EMERITI, in Roman antiquity, soldiers who served out their time, and had received marks of favour for their merits.

EMERODS, or **EMEROIDS**, [corrupted by ignorant pronunciation from *hemorrhoids*, *αιμορροειδες*,] painful swellings of the hemorrhoidal veins; piles.

EMERSION, in astronomy, is used when the sun, moon, or other planet, begins to re-appear, after its having been eclipsed, or hid by the interposition of the moon, earth, or other body. The difference of longitude is sometimes found by observing the immersions and emersions of the first of Jupiter's satellites. The immersions are observed from the time of Jupiter's being in conjunction with the sun to his opposition; and the emersion from the opposition to the conjunction; which two intervals are usually six months each, and divide the year between them. But when Jupiter is in conjunction with the sun, and 15 days before and afterwards, there is nothing to be observed; the planet, with his satellites, being then lost in the light of the sun.

EMERSON, in physics, the rising of any solid above the surface of a fluid specifically heavier than itself, into which it had been violently immersed or thrust.

EMERSON, **WILLIAM**, a late eminent mathematician, born in June 1701, at Hurworth, a village about three miles south of Darlington; at least it is certain that he resided here from his childhood. His father Dudley Emerson was a tolerable proficient in mathematics; and without his books and instructions, perhaps his own genius (most eminently fitted for mathematical disquisitions) would have never been unfolded. He was instructed in the learned languages by a young clergyman, then curate of Hurworth, who was boarded at his father's house. In the earlier part of his life he attempted to teach a few scholars; but whether from his concise method (for he was not happy in explaining his ideas), or the warmth of his natural temper, he made no progress in his school; he therefore soon left it off; and, satisfied with a moderate competence left him by his parents, devoted himself to a studious retirement. Towards the close of 1781, he disposed of the whole of his mathematical library to a bookseller at York, and on May 20th 1782, he died of a lingering and painful disorder at his native village, aged 81. In size he was rather short, but strong and well made, with an open countenance and ruddy complexion. He was exceedingly singular in his dress. He had but one coat, which he always wore open before, except the lower button; no waistcoat; his shirt quite the reverse of one in common use, no opening before, but buttoned close at the collar behind; a kind of flaxen wig which had not a crooked hair in it, and probably had never been combed from the time it was made. He always walked up to London when he had any thing to publish, revising sheet by sheet himself: To trust no eyes but his own, was always a favourite maxim with him. He never advanced any mathematical proposition that he had not first tried in practice, constantly making all the different parts himself on a small scale, so that his house was filled with all kinds of mechanical instruments together or disjointed. He would frequently stand up to his middle in water while fishing, a diversion he was remarkably fond of. He used to study incessantly for some time, and then for relaxation take a ramble to any alehouse where he could get any person to drink with

with and talk to. The duke of Manchester was highly pleased with his company, and often came to him in the fields, and accompanied him home, but could never persuade him to get into a carriage. He was married, and his wife used to spin on an old fashioned wheel, whereof a very accurate drawing is given in his mechanics. He was deeply skilled in music, the theory of sounds, and the various scales both ancient and modern, but was a very poor performer. He wrote, 1. The Doctrine of Fluxions: 2. The Projection of the Sphere, orthographic, stereographic, and gnomonical: 3. The Elements of Trigonometry: 4. The Principles of Mechanics: 5. A Treatise of Navigation on the Seas: 6. A Treatise of Algebra, in two books: 7. The Arithmetic of Infinites, and the differential Method, illustrated by examples: 8. Mechanics; or, the Doctrine of Motion: 9. The Elements of Optics, and Perspective: 10. A System of Astronomy: 11. The Laws of Centripetal and Centrifugal Force: 12. The Mathematical Principles of Geography: 13. Tracts, 8vo: 14. Cyclomathesis; or an easy Introduction to the several Branches of Mathematics: 15. A short Comment on Sir Isaac Newton's Principia; to which is added, A Defence of Sir Isaac against the Objections that have been made to several Parts of his Works: And, 16. A Miscellaneous Treatise, containing several Mathematical Subjects, 8vo. 1776.

EMERY, [*smiris*, Lat. *esmeril*, Fr.] an iron ore, considerably rich. It is found in the island of Guernsey, in Tuscany, and many parts of Germany. It has a near relation to the magnet. The lapidaries cut the ordinary gems on their wheels by sprinkling the wetted powder over them; but it will not cut diamonds. It is useful in cleaning and polishing steel. Emery is found in large masses of no determinate shape or size, extremely hard, and very heavy. It is usually of a dusky brownish red on the surface; but when broken, is of a fine bright iron grey, with some tinge of redness; and is spangled all over with shining specks, which are small flakes of a foliaceous talc, highly impregnated with iron. It is also sometimes very red, and then usually contains veins of gold. It makes no effervescence with any of the acid menstrua. Dr. Lewis is of opinion, that some kinds of emery may contain platina. The English are the only people who have the art of reducing emery into powder.

EMESA, or EMESSA, an ancient town of Asia, in Syria, 25 miles S. of Hama. It has several fine ruins, which give some idea of its ancient magnificence.

EMETICS are those medicines which are either given with a view to discharge the foul or poisoned contents of the stomach, or to relax the coats of that organ, and thus to produce certain changes in other parts of the animal economy, not immediately connected with the process of digestion. With the latter intention, small nauseating doses are generally administered, especially in catarrhal and other diseases of the breast. In this place, however, we shall but briefly enumerate the cases in which vomiting may be excited with a probability of success; and also, those instances in which this remedy cannot be safely adopted. Emetics may be of great service: 1. Immediately after swallowing narcotic and other poisons; 2. For the purpose of evacuating viscid, bilious, and putrid matters, or undigested food from the stomach; 3. To assist Nature, when there is a spontaneous effort to vomit; 4. To expel substances fallen into and obstructing the passage of the gullet; 5. To promote the expectoration of mucus and purulent matter, collected in the lungs and windpipe;—as well as on many other occasions. On the contrary, the greatest precaution is required in the following cases, where a precipitate use of emetics may be attended with fatal effects, from bursting a blood-vessel, &c. 1. In all plethoric persons, but especially such as perceive a strong propulsion of the blood to the head, breast, stomach, or liver; 2. In actual inflammation of the intestines; 3. In states of extreme languor and debility; 4. In every species of ruptures, and prolapses; 5. In violent pain proceeding from stones confined in the bilious or urinary passages; 6. In obstructions of the bowels, and other abdominal parts; 7. In persons of very rigid fibres, for instance, the aged and emaciated; 8. In a very weak or affected state of the lungs, liver and stomach; 9. In a deformed structure of the body, or some particular parts; for which reason emetics might prove dangerous to persons troubled with a hump-back, a very short neck, narrow chest, &c.

EMILLEGUE, one of the Pelew islands.

EMIMS, ancient inhabitants of the land of Canaan beyond

Jordan, towards the Dead Sea; who were defeated by Chedorlamer and his allies.

EMINENCE, in geography, a little hillock or ascent above the level of the adjoining campaign.

EMIR, a title of dignity among the Turks, signifying a prince. This title was first given to the caliphs; but when they assumed the title of Sultans, that of emir remained to their children; as that of Cæsar among the Romans. At length the title came to be attributed to all who were descended from Mohammed by his daughter Fatimah, and who wear the green turban instead of the white.

EMISSARY VESSELS, in anatomy, the same with those more commonly called excretory.

EMLY, an ancient city of Ireland, in Tipperary, now in ruins. It is 15 miles W. of Cashel.

EMMA, a river of the Helvetic republic, in the late canton of Bern.

EMMANUEL, [*שמעון*, Heb. *z. e.* God with us,] one of the names of our Saviour. See Isaiah vii. 14.

EMMAUS, EMAUS, or AMMAUS, in ancient geography, a village, 60 stadia N. W. of Jerusalem, or about 7 miles: it afterwards became a town, and a Roman colony, called Nicopolis. Reland mentions a village called Emmaus towards Lydda, 22 miles from Jerusalem; and another, near Tiberias.

EMMAUS, in modern geography, a Moravian settlement in Pennsylvania, 8 miles from Bethlehem.

EMMENAGOGUES, medicines so named from *em*, in, *men*, month, and *agog*, I lead, because they promote the monthly discharge.

EMMERICH, EMMERICK, or EMBRICK, a rich fortified town of Germany, in Westphalia, on the left bank of the Rhine.

EMMET. See FORMICA and TERMES.

EMMIUS, UBBO, a very learned professor, born at Gretha in East Friesland, in 1547, and chosen rector of the college of Norden in 1579. This seminary flourished exceedingly under his care; and declined as visibly after he was ejected, in 1587, for refusing to subscribe the Confession of Augsburg. In 1588, he was made rector of the college of Leer; and when the city of Groningen confederated with the United Provinces, the magistrates appointed him rector of that college: which employment he filled with the highest repute near 20 years. The college being erected into an university, he was the first rector, and one of the chief ornaments of it by his lectures, till his infirmities prevented his public appearance. His wisdom was equal to his learning; so that the governor of Friesland and Groningen often consulted him, and seldom failed to follow his advice. He wrote "Vetus Græcia illustrata," 3 vols.; "Decades Rerum Fresicarum;" and many other valuable works. He died in 1625.

EMOLLIENTS, those medicines which are supposed to soften and relax the fibres of the body, either by mechanically distending such as before were too closely, that is, preternaturally combined; or, by penetrating into the interstices of the elementary fibres, and supplying these particles, from a deficiency of which they were too intimately united. Among the remedies of the former class are chiefly heat, and all unctuous applications; such as lard, wax, fat of venison, &c.: to the latter belong all juicy, mucilaginous, and saccharine substances, serving both as nutriment and medicines. Of this description are the expressed vegetable oils, fresh butter, decoctions of marsh-mallows, infusions of linseed, &c. Emollients are indicated: 1. When the fibres are in too rigid a state; 2. When they are spasmodically contracted; 3. In all active inflammations; and 4. In obstinate costiveness, or accumulations of faeces in the intestines.

EMOLUMENT is properly applied to the profits arising daily from an office or employment. The Latin, *emolumentum*, according to some, primarily signifies the profit redounding to the miller from his mill; from *molo*, *molere*, to grind.

EMOTION, [*emotion*, Fr.] disturbance of mind; vehemence of passion, pleasing or painful.

EMOTION is thus distinguished from Passion, by the late celebrated Lord Kaimes, in his "Elements on Criticism;" vol. i. p. 41. "An internal motion or agitation of the mind, when it passeth away without desire, is denominated an emotion: when desire follows, the motion or agitation is denominated a passion, A fine

A fine face, for example, raiseth in me a pleasant feeling: if that feeling vanish without producing any effect, it is in proper language an emotion; but if the feeling, by reiterated views of the object, becomes sufficiently strong to occasion desire, it loses its name of emotion, and acquires that of passion. The same holds in all the other passions. The painful feeling raised in a spectator by a slight injury done to a stranger, being accompanied with no desire of revenge, is termed an emotion; but that injury raiseth in the stranger a stronger emotion, which being accompanied with desire of revenge, is a passion. External expressions of distress produce in the spectator a painful feeling, which being sometimes so slight as to pass away without any effect, is an emotion; but if the feeling is so strong as to prompt desire of affording relief, it is a passion, and is termed pity. Envy is emulation in excess: if the exaltation of a competitor be barely disagreeable, the painful feeling is an emotion; if it produce desire to depress him, it is a passion." See **PASSION**.

EMOUI, EMOUY, or HIA-MEN, an island and port of China, under the jurisdiction of the province of Fo-kien.

EMPALEMENT, [from *in* and *palus*, Lat. a stake,] an ancient barbarous punishment, which consisted in thrusting a stake up the fundament. It is mentioned by Juvenal. It was often inflicted under Nero, and continues to be so in Turkey.

EMPALEMENT OF A FLOWER, the same with Calyx.

EMPANNEL, [from *panne*, Fr.] the writing or entering the names of a jury into a parchment schedule, or roll of paper, by the sheriff, which he has summoned to appear for the performance of such public service as juries are employed in.—Cowel.

EMPEDOCLES, a celebrated philosopher and poet, born at Agrigentum, in Sicily. He followed the Pythagorean philosophy, and admitted the metempsychosis. He constantly appeared with a crown of gold on his head; to maintain, by this outward pomp, the reputation he had acquired of being a very extraordinary man. Yet Aristotle says, that he was a great lover of liberty, extremely averse to state and command, and that he even refused a kingdom that was offered him. His principal work was a Treatise in verse on the "Nature and Principles of Things." Aristotle, Lucretius, and all the ancients, make the most magnificent eulogiums on his poetry and eloquence. He taught rhetoric; and often alleviated the anxieties of his mind, as well as the pains of his body, with music. It is reported, that his curiosity to visit the flames of the crater of *Ætna* proved fatal to him. Some maintain that he wished it to be believed that he was a god; and that his death might be unknown, he threw himself into the crater and perished in the flames. His expectations, however, were frustrated; and the volcano by throwing up one of his sandals discovered to the world that Empedocles had perished by fire. Others reported that he lived to an extreme old age; and that he was drowned in the sea about B. C. 440.

EMPERESS, or EMPRESS, denotes either the wife of an emperor, or a woman who governs singly an empire, in her own right. See **EMPEROR** and **EMPIRE**.

EMPEROR, [*imperator*,] among the ancient Romans, signified a general of an army, who, for some extraordinary success, had been complimented with this appellation. Thus Augustus, having obtained no less than twenty victories, was as often saluted with the title emperor; and Titus was denominated emperor by his army after the reduction of Jerusalem. Afterwards, it came to denominate an absolute monarch or supreme commander of an empire. In this sense Julius Cæsar was called emperor: the same title descended with the dignity to Octavius, Tiberius, and Caligula; and afterwards it became elective. The title emperor does not, and cannot add anything to the rights of the sovereignty: its effect is only to give precedence and pre-eminence above other sovereigns; and as such, it raises those invested with it to the summit of all human greatness. It is disputed, if emperors have the power of disposing of the regal title. It is true, they have sometimes taken upon them to erect kingdoms. Thus Bohemia and Poland are said to have been raised to that dignity: thus also, the emperor Charles II. in 877, gave Provence to Boson, putting the diadem on his head, and decreeing him to be called king, "ut more priscorum imperatorum regibus videretur dominari."

EMPETRUM, BERRY-BEARING HEATH, a genus of the triandria order, and diœcia class of plants; natural order, Miscellanæ. Male, calyx three-parted; corolla three-petaled; stamens long; female, calyx three-parted; corolla three-petaled; styles

nine; berry nine-seeded. There are two species; viz. *E. album*, white-berried heath, and *E. nigrum*, black-berried heath, crow or crane berry. These are low shrubs, seldom propagated in gardens, unless for variety's sake. They are natives of wild mountains, where the soil is heathy and full of bogs.

EMPHASIS, [*εμφασις*,] a remarkable stress laid upon a word or sentence; particular force impressed by stile or pronunciation. See **DECLAMATION**, **ORATORY**, and **READING**.

EMPHRAXIS, [*εμφραξις*,] an obstruction in any part of the body.

EMPHYSEMA, [*εμφυσημα*,] a windy tumour, generally occasioned by a fracture of the ribs, and formed by the air insinuating itself, by a small wound, between the skin and muscles, into the substance of the cellular or adipose membrane, spreading itself afterwards up to the neck, head, belly, and other parts, much after the manner in which butchers blow up their veal.

EMPHYTEUSIS, [from *ϕυ*, in, and *φυτειν*, to plant, Gr.] the act of planting, or clearing lands for planting; the tenure of lands on that condition.

EMPIRE, [*imperium*,] in political geography, a large extent of land, under the jurisdiction or government of an emperor. See **EMPEROR**. In ancient history we read of four great empires, viz. 1. That of the Assyrians, Chaldeans, and Babylonians; 2. of the Medes and Persians; 3. of the Greeks; and 4. of the Romans. The first subsisted from the time of Nimrod, who founded it A. M. 1800, according to the computation of Ussher, to Sardanapalus their last king, in 3257, and consequently lasted about 1450 years. The empire of the Medes commenced under Arbaces, A. M. 3257; was united to that of the Babylonians and Persians under Cyrus, A. M. 3468, and ended with the death of Darius Codomannus in 3674. The Grecian empire lasted only during the reign of Alexander the Great, beginning in A. M. 3674, and terminating with the death of this conqueror in 3681, when his conquests were divided among his captains. The Roman empire commenced with Julius Cæsar, when he was made perpetual dictator, in A. U. C. 708, A. M. 3956, and A. D. 48. The seat of the empire was removed to Byzantium by Constantine, A. D. 334, and the east and west were still considered as united under the title of the Roman empire though mostly governed by two different series of emperors, till the total overthrow of the latter under Augustulus, by the Goths, A. D. 476. The Western empire was not revived even in name, till the year 800, when Charles the Great, of France, was proclaimed emperor by the Romans. From this epoch the east and west formed two separate empires; that of the east, governed by Greek emperors, commenced A. D. 832; and being gradually weakened, terminated under Constantine Palæologus in 1453. The western empire was afterwards known by the appellation of the empire, or German empire. Antiquaries distinguish between the medals of the upper, and lower or bas, empire. The curious only value those of the upper empire, which commences with Cæsar or Augustus, and ends A. D. 260. The lower empire comprehends near 1200 years, reckoning down to the destruction of Constantinople in 1453. They usually distinguish two ages, or periods of the lower empire: the first beginning where the upper ends, viz. with Aurelian, ending with Anastasius, including 200 years; the second beginning with Anastasius, and ending with the Palæologi, which includes 1000 years.

EMPIRIC, [*εμπειρικος*,] a trier; an experimenter; such persons as have no true education in, or knowledge of, physical practice, but venture upon hearsay and observation only.—Quincy.

EMPIS, in zoology, a genus of the class and order insectæ diptera. Proboscis horny, bivalve, reflexed under the head and breast, and longer than the thorax. They live by sucking the blood and juices of other animals, and inhabit fields and gardens. There are about 30 species.

EMPLASTIC, [*εμπλαστικος*, or *εμπλαςτος*,] medicines which conspicate and shut up the pores of the body.

EMPLEURUM, in botany, a genus of the monœcia tetrandria class and order. Male calyx four-cleft; corolla none; female calyx four-cleft, inferior; corolla none; stigma cylindric; capsule opening at the side; seed one, arilled. There is one species, a shrub of the Cape.

EMPNEUMATOSIS, [*εμπνευματωσις*, Gr.] the alternate dilatation of the chest, by which the air is inhaled and communicated to the blood.

EMPOLI, a town of Italy, in Tuscany, 17 miles S. W. of Florence. Lon. 11. 6. E. Lat. 43. 42. N.

EMPONEMA, [from *εμπονω*, Gr. to labour,] the art of improving ground by labour.

EMPORIÆ, a double city of the Hither Spain, near the Pyrenæes; separated by a wall. It is now called Ampurias.

EMPORIUM, [*εμποριον*,] a place of merchandise; a mart; a town of trade; a commercial city.

EMPORIUM, in ancient geography, the name of two cities in Italy, near Placentia. They are now thought to be Ponte Nura, in Placentia.

EMPORIUM, in medicine, is often used for the common sensory in the brain.

EMPYEMA, [*εμπτυημα*,] a collection of purulent matter in any part whatsoever; generally used to signify that in the cavity of the breast only, and which sometimes happens upon the opening of abscesses, or ulcerations of the lungs, or membranes inclosing the breast.—Quincy. See **MEDICINE**.

EMPYREAL AIR, the name given by Dr. Higgins to that which Dr. Priestley calls dephlogisticated air; other philosophers vital or pure air, and modern chemists oxygen gas.

EMPYREUM, a term used by divines for the highest heaven, where the blessed enjoy the beatific vision. The word is formed of *εμ* and *πυρ*, fire, because of its splendor.

EMPYREUM, or **EMPYREUMA**, [*εμπτεινμα*,] the burning of any matter in boiling or distillation, which gives a particular offensive smell.—Quincy.

EMULATION, a generous ardour kindled by the praise-worthy examples of others, which impels us to imitate, to rival, and, if possible, to excel them. This passion involves it in esteem of the person whose attainments or conduct we emulate, of the qualities and actions in which we emulate him, and a desire of resemblance, together with a joy springing from the hope of success. The word comes originally from the Greek *αμιλλα*, contest; whence the Latin, *amulus*, and thence our *emulation*. Plato makes emulation the daughter of envy; if so, there is a great difference between the mother, and the offspring; the one being a virtue, and the other a vice. Emulation admires great actions, and strives to imitate them; envy refuses them the praises that are their due; emulation is generous, and only thinks of equalling or surpassing a rival; envy is low, and only seeks to lessen him. It would, therefore, be more proper to suppose emulation the daughter of admiration: admiration being a principal ingredient in the composition of it.

EMULGENT, [*emulgens*, Lat.] in anatomy, two large arteries and veins which arise, the former from the descending trunk of the aorta, or great artery; the latter from the vena cava. They are both inserted into the kidneys; the emulgent arteries carrying blood with the serum to them, and the emulgent veins bringing it back again, after the serum has been separated therefrom by the kidneys. See **ANATOMY**.

EMULSION, [*emulsio*, Lat.] a form of medicine resembling milk, and which is often prescribed with a view to sheath and neutralise acrid humours, especially in heat of urine and stranguries, as well as for nervous and irritable habits in general. Emulsions are frequently made, by boiling the oily and farinaceous seeds contained in kernels; in which case they are soon decomposed, on standing. See **PHARMACY**.

EMUNCTORIES, in anatomy, are chiefly the kidneys, bladder, and most of the glands.

EMUNGS, one of the Pelew islands.

ENALLAGE, [*εναλλαγη*,] a figure in grammar, whereby some change is made of the common modes of speech, as when one mood or tense of a verb is put for another.

ENALLAGE, is also used when one word is put for another of the same part of speech: a substantive for an adjective; as *exercitus victor*, for *victoriosus*; *scelus*, for *seclustus*: a primitive for a derivative; as *Dardana arma*, for *Dardania*: an active for a passive; as *nox humida celo præcipitat*, for *præcipitatur*, &c.

ENALURON, in heraldry, according to Guillim, is a bordure charged with birds; though others will have it to signify, in orle, or form of a bordure.

ENAMEL, in general, signifies a vitrified matter, interspersed with some solid substance; and possessing all the properties of glass, excepting that of transparency. The basis of enamel is a pure crystal glass or frit, ground together with a fine calx of lead and tin, prepared for that purpose, with the addition of a small

proportion of the white salt of tartar. These form the principal ingredients of all enamels, which are made by adding various pulverized colours, and thoroughly incorporating the whole in a furnace. For white enamel, it is sufficient to add manganese to the matter which constitutes the basis; for azure, zaffre mixed with calx of brass; for green, calx of brass with scales of iron, or crocus martis; for black, zaffre, with manganese or crocus martis, or manganese with tartar; for red, manganese, or calx of copper with red tartar; for purple, manganese with calx of brass; for yellow, tartar and manganese; lastly, for violet coloured enamel, manganese with brass, that has been three times calcined. Enamels are used either for the counterfeiting or imitating of precious stones, and for painting; or by enamellers and artists working in gold, silver, and other metals. That species of enamel which jewellers employ, is imported from Holland, or Venice, in small cakes of various sizes, which are in general about four inches in diameter, and have the mark of the maker indented on them. It pays a duty of 3s. 8d. per pound on importation; and is allowed a drawback of 1s. 6d. per pound, on being again exported.

ENAMELLING, is the art of laying enamel upon metals, such as gold, silver, copper, &c. whether plain or painted. The latter process is performed on plates of gold or silver, but generally on those of copper, prepared with the white enamel; on which certain objects are delineated with the colours, and afterwards burnt in the fire, where they acquire a brightness and lustre resembling glass. Painting in enamel is held in greater estimation than any other branch of that art; on account of its peculiar and permanent vivacity, the strength of its colours not being effaced by time, but always retaining their pristine splendor. It is chiefly employed in miniature, as it cannot be easily performed on a large scale; the enamel being very liable to crack on a plain surface, so that even the smallest plates must be somewhat of a convex form.

ENANGIOMONOSPERMOUS, [from *εν* in, *αγγιον*, a vessel, *μονος*, alone, and *σπερμα*, a seed,] in botany, having but one seed in the vessel.

ENAREA, a province of Abyssinia, conquered by the troops of Negus, at the beginning of the 17th century, situated at the S. W. extremity of the empire.

ENARGEÆ, in botany, a genus of the hexandria monogynia class and order. No calyx; petals six, oblong, ovate, concave, acute, three outer, three inner, green-spotted; berry three-celled, with four or five globular seeds. It has one species, viz. *E. marginata*, a native of Terra del Fuego.

ENARTHROSIS, [*εν* and *αρθρον*,] in anatomy, the insertion of one bone into another, to form a joint. It is a species of diarthrosis. See **ANATOMY**.

ENCÆNIA, [*εγκανια*, Gr.] the name of three feasts celebrated by the Jews, in memory of the dedication, or rather purification, of the temple, by Judas Maccabæus, Solomon, and Zerobabel. The term is likewise used in church history for the dedication of Christian churches.

ENCALYPTA, in botany, a genus of the cryptogamia musci class and order. Capsule cylindrical; fringe simple, of sixteen linear erect distinct teeth; veil campanulate, inflated, lax. There are six species.

ENCANTHIS, in surgery, a tubercle arising either from the caruncula lachrymalis, or from the adjacent red skin; sometimes so large as to obstruct not only the puncta lachrymalia, but also part of the sight, or pupil itself. See **SURGERY**.

ENCARPIA, [*ενκαρπια*, Gr.] in architecture, flower-work, or fruit-work, on the corners of pillars.

ENCAUMA, [*ενκαυμα*, Gr.] a burning in any part of the body: a hot ulcer.

ENCAUSTES, [from *εν* in, and *καωω*, to burn, Gr.] an enameller.

ENCAUSTIC, [*ενκαυστικη*, Gr.] belonging to enamelling, or painting by fire.

ENCAUSTIC PAINTING, a method of painting made use of by the ancients, in which wax was employed to give a gloss to their colours, and to preserve them from the injuries of the air.

ENCEINTE, [Fr.] in fortification, the wall or rampart which surrounds a place, sometimes composed of bastions or curtains, either faced or lined with brick or stone, or only made of earth. It is sometimes only flanked by round or square towers, which is called a Roman wall.

ENCELADUS, in ancient mythology, the son of Titan and Terra;

Terra; the largest and last of the giants who conspired against Jupiter.

ENCEPHALI, [*εν*, and *κεφαλη*,] in medicine, worms generated in the head, where they cause so great a pain as sometimes to occasion distraction. The encephali are very rare; but there are some diseases wherein they swarm; from whence we are told pestilential fevers have wholly arisen. Upon the dissection of one who died of this fever, a little, short, red, worm, was found in the head, which malmsey wine, wherein horse-radish had been boiled, could alone destroy. This medicine was afterwards tried on the sick, most of whom it cured. The same species of worms have also been taken out by trepanning, and the patient cured. Worms that generate in the nose, ears, and teeth, are also called encephali.

ENCEPPE, in heraldry, denotes fettered, chained, or girt, about the middle, as is usual with monkeys.

ENCHANTER'S NIGHTSHADE, in botany. See **CIRCEÆA**.

ENCHARAXIS, [*εγχαραις*, Gr.] in surgery, the act of lancing or scarifying.

ENCHASING, INCHASING, or CHASING, the art of enriching and beautifying gold, silver, and other metal work, by some design or figures represented thereon in low relieve. Enchasing is practised only on hollow thin works, as silver punch-bowls, tea-pots, coffee-pots, gold or silver watch-cases, cane-heads, tweezer-cases, and the like. It is performed by punching or driving out the metal, to form a figure, from within, so as to stand out prominent from the plane or surface of the metal. In order to this, they provide a number of fine steel blocks or punches of divers sizes; and the design being drawn on the surface of the metal, they apply the inside upon the heads or tops of these blocks, directly under the lines or parts of the figures; then, with a small hammer, striking on the metal, sustained by the block, the metal yields, and the block makes an indention or cavity on the inside, corresponding to which there is a prominence on the outside, which is to stand for that part of the figure. Thus the enchanter proceeds to finish all the parts by the successive application of the block and hammer to the several parts of the design. By this simple piece of mechanism, the artists represent foliage, grotesques, animals, histories, &c. with the most striking propriety and beauty.

ENCHELIS, in natural history, a genus of the vermes infusoria. Worm invisible to the naked eye, very simple, cylindrical. There are fifteen species. Most of them are described in Adam's Treatise on the Microscope.

ENCHUYSEN, or ENCKHUYSEN, a town of Batavia, in the department of the Texel, and late province of N. Holland. It is 10 miles N. E. of Hoorne, and 28 miles of Amsterdam. Lat. 52° 42' N. Lon. 5° 10' E.

ENCHYMOMA, or ENCHYMOSIS, in physiology, a sudden flow of the blood, occasioned by any passion, such as anger, joy, a sense of shame, or the like. It is also used for that flow of the blood which occasions a continued blush.

ENCLAVE, in heraldry, denotes that one thing is let into another, especially when the piece, so let in, is square.

ENCLITICS, or ENCLITICA, [*ενκλιτικα*,] in grammar, particles which are so closely united with other words as to seem part of them, as in *virumque*, &c. There are three enclitic particles in Latin, viz. *que*, *ne*, *ve*: but there are a great many in the Greek, as *τι*, *τε*, *και*, *μοι*, *σι*, *σοι*, &c.

ENCOLPATE, [*εγκολπητικη*, Gr.] in antiquity, the art of making brass plates, and engraving inscriptions and laws on them.

ENCRATITE, or ENCRATITES, in church history, heretics who appeared towards the end of the second century: they were called Encratites, or Continents, because they gloried in abstaining from marriage, and the use of wine and animal food.

ENCROACHMENT, in law, an unlawful gaining upon the rights or possessions of another. It is generally applied to the unlawful occupation of wastes and commons.

ENCYCLOPEDIA, [*εγκυκλοπαιδια*,] the circle of sciences; the round of learning; a term nearly synonymous with Cyclopædia. The late learned printer, Mr. Bower, justly observes, that the preposition *in* makes the meaning of the word more precise: for Cyclopædia may denote "the instruction of a circle," as Cycropædia is "the instruction of Cyrus," whereas in Encyclopædia the preposition determines the word to be from the dative of *cyclos*, "instruction in a circle." And Vossius in his book *De Vi-*

tis Sermonis, has observed "that Cyclopædia is used by some authors, but Encyclopædia by the best." Avicenna, the celebrated Arabian physician, appears to have had the merit of being the first who compiled an Encyclopædia.

END FOR END, in the sea-language, is said of a rope that has run quite out of the block, wherein it was reeved.

ENDEAVOUR. Where one endeavours actually to commit felony, &c. he is punishable as for a misdemeanor; and an assault, with intent to rob, is punished by transportation. Stat. 7. Geo. II. c. 21.

ENDEAVOUR RIVER, a river on the N. E. coast of New Holland, with a bar at its mouth, and not depth of water for vessels to sail more than a mile above the bar. Lon. 145. 12. E. Lat. 15. 27. S.

ENDEAVOUR STRAIT, a narrow sea, between New Guinea, and New Holland.

ENDECAGON, [from *ενδεκα*, eleven, and *γωνια*, an angle,] in geometry, is a plain figure, consisting of eleven sides, and as many angles.

ENDEIXIS, [*ενδειξις*, Gr.] in medicine, an indication of the method of cure.

ENDEMIAL, ENDEMIICAL, or ENDEMIC, [*ενδημιος*,] peculiar to a country; used of any disease, proceeding from some cause peculiar to the country where it reigns: such as the scurvy to the northern climes. Quincy.

ENDICTMENT, or ENDITEMENT, a bill or declaration made in form of law, for the benefit of the commonwealth; or an accusation for some offence exhibited unto jurors, and by their verdict found to be true, before an officer can have power to punish the same offence.—*Cowel*.

ENDIVE, or SUCCORY. See **CICHORIUM**.

ENDKIOPING, a small town of Sweden, in Upland, 40 miles W. of Stockholm.

ENDLESS SCREW. See **SCREW**, and **MECHANICS**.

ENDORSE, in heraldry, an ordinary, containing the eighth part of a pale, which Leigh says is only used when a pale is between two of them.

ENDORSED, in heraldry, is said of things borne back to back, more usually called *adosse*.

ENDORSEMENT. See **INDORSEMENT**.

ENDOWMENT, in law is the widow's portion; being a third part of all the freehold lands and tenements, of which her husband was seized at any time during the coverture. Of lands not freehold, her portion varies according to the custom in different places.

ENDYMION, in fabulous history, a shepherd, son of Æthlius and Calyce. It is said that he required of Jupiter to grant to him to be always young, and to sleep as much as he would; whence came the proverb of Endymionis somnum dormire, to express a long sleep. Diana saw him naked as he slept on mount Latmos; and was so struck with his beauty, that she came down from heaven every night to enjoy his company. Endymion married Chromia, daughter of Itonus; by whom he had three sons, Pæon, Epeus, and Æolus, and a daughter called Eurydice. The fable of Endymion's amours with Diana, or the moon, arose from his knowledge of astronomy; and as he passed the night on some high mountain to observe the heavenly bodies, it came to be reported that he was courted by the moon. Some suppose that there were two of that name; the son of a king of Elis, and the shepherd, or astronomer, of Caria. The people of Heraclea maintained that Endymion died on mount Latmos, and the Eleans pretended to shew his tomb at Olympia, in Peloponnesus.

ENEMY, in law, an alien or foreigner, who in a public capacity invades any country, and who cannot be punished as a traitor, but must be subjected to martial law. An alien-residing here, under the protection of the king's peace, may be dealt with as a traitor, because he owes a qualified allegiance.

ENERGY, [*ενεργεια*,] a term signifying the power, virtue, or efficacy of a thing. It is also used, figuratively, to denote emphasis of speech.

ENERGUMENS, in church history, persons supposed to be possessed by the devil, concerning whom there were many regulations among the primitive Christians. They were denied baptism and the eucharist, in some churches; but though they were under the care of exorcists, they were allowed the public prayers of the church, and were permitted to be present.

ENERVATION,

ENERVATION, is the act of destroying the force, use, or office, of the nerves, either by cutting them, by weakening them with debauchery, or by some other violence. Excess of wine, and other strong, hot, spirituous liquors, enervate, or weaken the nerves. Too great abstinence has the same effect. A moderate use of these and other stimuli strengthen them.

ENFIELD, a town of Connecticut, in Hartford county, 17 miles N. of Harford.

ENFILADE, in the art of war, is used in speaking of trenches, or other places, which may be scoured by the enemy's shot along their whole length. In conducting the approaches at a siege, care must be taken that the trenches be not enfiladed from any work of the place. See **FORTIFICATION**.

ENFINE, formerly **ANTINOË**; a city of Egypt, built by Adrian, in honour of his infamous favourite Antinous. It is situated towards the middle of Upper Egypt, and still contains several stately monuments of antiquity. It was anciently very magnificent.

ENFRANCHISEMENT, in law, the incorporating of a person into any society, or body politic; thus, where any person is enfranchised, or made free, of any city, borough, or company, he is said to have a freehold therein during life; and cannot, for barely endeavouring any thing against the corporation, forfeit the same. Naturalization is also another kind of enfranchisement.

ENGADINA, a territory of the republic of the Grisons among the Alps; extending along the banks of the river Inn, from its source to the Tirolese. It is divided into the Upper and Lower.

ENGANNO, or **DECEIT ISLAND**, an island in the eastern sea, a little distant from the S. W. coast of Sumatra.

ENGANNO TROMPEUR, or **FALSE CAPE**, the easternmost land of Hispaniola, 16½ miles N. of Point L'Épée.

ENGASTRIMYTHI, in Pagan theology, the Pythians, or priestesses of Apollo, who delivered oracles from within, without any action of the mouth or lips. The ancient philosophers, &c. are divided upon the subject of the engastrimythi. Hippocrates mentions it as a disease; others will have it a kind of divination; others attribute it to the possession of an evil spirit; and others to art and mechanism.

ENGELHOLM, a sea-port of Sweden, E. of the Categat, 45 miles W. of Christianstadt.

ENGER, or **ENGERS**, a county of Germany, in the late circle of the Lower Rhine, and electorate of Treves.

ENGERS, the capital of the above county, 11 miles N. of Coblenz. Lon. 7. 32. E. Lat. 50. 35. N.

ENGHEIM, **ENGHIEN**, or **ENGHUIN**, a town of France, in the department of Jemappes, and late province of Austrian Hainault, 15 miles S. W. of Brussels.

ENGIA, **EGINA**, or **EYINA**, an island of European Turkey, in a gulf so named, near the coast of the Morea; anciently called Oenone, Egina, and Myrmdonia. Many fine relics of antiquity are still to be seen on it.

ENGIA, or **ENGINA**, the capital of the above island, 25 miles S. S. W. of Athens. Lon. 23. 59. E. Lat. 37. 42. N.

ENGINE, in mechanics, is a compound machine, made of one, or more, mechanical powers, as levers, pullies, screws, &c. in order to raise, cast, or sustain any weight, or produce any effect which could not be easily effected otherwise. The word is formed of the French *engin*, from the Latin *ingenium*, wit; from the ingenuity exerted in the invention of engines to augment the effect of moving powers. Engines are extremely numerous; some used in war, as the battering-ram, ballista, waggons, chariots, &c. others in trade and manufactures, as cranes, mills, presses, &c. others to measure time, as clocks, watches, &c. and others for the illustration of some branch of science, as the orrery, cometarium, and the like. See **BATTERING-RAM**, **BALLISTA**, &c. In general we may observe, concerning engines, that they consist of one, two, or more, of the simple powers variously combined together; that in most of them the axis in peritrochio, the lever, and the screw, are the constituent parts; that in all a certain power is applied to produce an effect of much greater moment; and that the greatest effect, or perfection, is when it is set to work with four-ninths of that charge which is equivalent to the power, or will but just keep the machine in equilibrio. See **MECHANICS**.

ENGINE FOR EXTINGUISHING FIRES. See **HYDROSTATICS**.

ENGINE, PILE, one contrived for driving piles. See **PILE ENGINE**, and **MECHANICS**.

ENGINE, STEAM, a machine to raise water by the force of steam. See **STEAM-ENGINE**.

ENGINEER, [*enginier*, Fr.] one who manages engines; one who directs the artillery of an army.

ENGINEER, in the art of war, is commonly applied to an officer, whose business is to inspect and contrive attacks, defences, &c. of a fortified place. He should be possessed of a perfect knowledge in mathematics, so as to delineate upon paper, or mark upon the ground, all sorts of forts, and other works proper for offence and defence. He should also understand the art of fortification, so as not only to be able to discover the defects of a place, but to find a remedy proper for them; as also how to make an attack upon, as well as to defend, the place. Engineers should, therefore, be brave as well as ingenious. When at a siege they have narrowly surveyed the place, they are to make their report to the general, by acquainting him which part they judge the weakest, and where approaches may be made with most success. Their business is also to delineate the lines of circumvallation and contravallation, taking all the advantages of the ground; to mark out the trenches, places of arms, batteries, and lodgements, taking care that none of their works be flanked, or discovered from the place.

ENGLAND, the southern and largest division of Great Britain. Including Wales, it is of a triangular form, and lies between Lon. 2° E. and 7° W. and between Lat. 49° and 56° N. extending about 400 miles in length from S. to N. and 300 on an average in breadth. From the S. Foreland in Kent, which may be termed the E. point of the triangle to Berwick on Tweed, which is the N. its length, in a straight line, is 345 miles; from Berwick to the Lands end in Cornwall, which is its W. it is 425, and from thence to the S. Foreland, it is 340 miles. It is bounded by Scotland on the N. by the English Channel on the S. which separates it from France; by the German Sea on the E. and N. E. by St. George's or the Irish Channel, on the W. At what time the island of Britain was first peopled is uncertain; nor do we know whether the southern or northern parts were first inhabited. We have no accounts that can be depended upon before the arrival of Julius Cæsar, and it is certain he found the southern parts full of people of a very warlike disposition. These people, according to Cæsar, were a colony of the Gauls; and this opinion is embraced by most of the ancient as well as modern writers. It is chiefly founded on the agreement observed by the Romans between the two nations in their customs, manners, language, religion, government, way of fighting, &c. The more northern inhabitants, according to Tacitus, came from Germany. This he infers from the make of their limbs; but Cæsar simply calls them Aborigenes. The Britons, according to the Roman historians, were very numerous, at the time of Cæsar's invasion, and had their country well stocked with cattle. Their houses resembled those of the Gauls; and they used copper or iron plates weighed by a certain standard instead of money. Their towns were a confused parcel of huts placed at a small distance from one another, generally in the middle of a wood, to which all the avenues were slightly guarded with ramparts of earth, or with trees. All the nations were in a state of the most wretched barbarism, even when compared with the barbarous Gauls on the continent. The use of clothes was scarce known in the island. Only the inhabitants of the southern coast covered their nakedness with the skins of wild beasts; and this rather to avoid giving offence to the strangers who came to trade with them, than out of any principle of decency. It was a general custom among the Britons to paint their bodies with the juice of woad. They shaved their beards, all except their upper lip, and wore long hair. They are also said to have had their wives in common; but this is denied by judicious antiquaries, who think it either a slander or a mistake of the Roman conquerors, who being themselves addicted to the most beastly vices, thought it impossible for several families to live together without having their women in common. The arms of the Britons were a sword, a sharp lance, and a shield. Breast-plates and helmets they considered as incumbrances. They usually fought in chariots, some of which were armed with scythes in the wheels; they were fierce and cruel, and exceedingly bloodthirsty. When driven to distress, they could subsist even on the bark and roots of trees; and Dion Cassius tells us, that they had ready, on all occasions, a certain kind of food, of which, if they took but the quantity of a bean, they were not troubled with hunger



ENGLAND & WALES

British Miles
10 20 30 40 50

Longitude West 4 from Greenwich

or thirst for a long time after. The southern nations were more civilized; and the Cantii, more so than any of the rest. England, including Wales, when first invaded by the Romans, was divided into 17 petty states. 1. The Damnonii, Dunmonii, or Donmonii, inhabited Cornwall and Devonshire. 2. The Durotriges possessed Dorsetshire. 3. The Beldæ Somersetshire, Wiltshire, and the greater part of Hampshire. 4. The Atrebatæ inhabited Berkshire. 5. The Regni inhabited Surrey, Sussex and part of the coast of Hampshire. 6. The Cantii inhabited and gave name to Kent. 7. The Dobuni are placed by Ptolemy on the N. side of the Thames, near its head, in Gloucestershire and Oxfordshire. 8. The Catticudani, Cattidudania, or Cathicudani, inhabited Buckinghamshire, Bedfordshire, and Hertfordshire. 9. The Trinobantes possessed Essex and Middlesex. 10. The Iceni, whose country comprehended Suffolk, Norfolk, Cambridge, and Huntingdonshire, are by Ptolemy called Simeni, and by others Tigeni. Camden is of opinion, that they were the people whom Cæsar calls Cenomagni. 11. The Coritani inhabited Northamptonshire, Leicestershire, Rutlandshire, Lincolnshire, Nottinghamshire, and Derbyshire. 12. The Cornavii possessed Warwickshire, Worcestershire, Staffordshire, Shropshire, and Cheshire. 13. The Silures inhabited Radnorshire, Brecknockshire, Glamorganshire, Herefordshire, and Monmouthshire. 14. The Demetæ inhabited part of Caermarthenshire, Pembrokeshire, and Cardiganshire. 15. The country of the Ordovices comprehended Montgomeryshire, Merionethshire, Caernarvonshire, Denbighshire, and Flintshire. 16. The Brigantes possessed Yorkshire, Durham, Lancashire, Westmoreland, and Cumberland. 17. Northumberland was held by the Ottadini, Ottadeni, or Ottalini. Their country, according to some, reached from the Tyne to the Forth; though the most common opinion is, that it reached only to the Tweed. The above names are plainly Roman, but their etymology is doubtless British, though any attempts to trace their derivation from words in the old British language, must now be attended with great uncertainty and obscurity. Dr. Aikin, in his *England Delineated*, observes, that, "with respect to climate, England is situated in the N. part of the temperate zone, so that it enjoys but a scanty share of the genial influence of the sun. Its atmosphere is inclined to chillness and moisture, subject to frequent and sudden changes; and is more favourable to the growth, than to the ripening, of the products of the earth. No country is clothed with so beautiful and lasting a verdure; but the harvests, especially in the northern parts, frequently suffer from unseasonable rains; and the fruits often fall short of their perfect maturity. The rigours of winter, however, as well as the parching heats of summer, are felt here in a much less degree than in parallel climates on the continent; a circumstance common to all islands. While the sea-ports of Holland and Germany are, every winter, locked up with ice, those of England, and even Scotland, are never known to suffer this inconvenience. The western side of the kingdom, receiving first the great clouds from the Atlantic Ocean, which are afterwards intercepted in their passage by the middle ridge of hills, is considerably more exposed to rain than the eastern; but the latter is more frequently involved in fogs and mists. The whole country, some particular spots excepted, is sufficiently healthy; and the natural longevity of its inhabitants is equal to that of almost any region." The British constitution, is a limited monarchy, or a government by the united powers of king, lords, and commons. It has long been justly celebrated as uniting the advantages and avoiding the inconveniences of absolute monarchy, aristocracy, and democracy. It originated among the Anglo-Saxons, and was brought to a high degree of perfection by the patriotic monarch, Alfred the Great. It was afterwards considerably infringed upon by William the Conqueror and his successors, but was restored by the Magna Charta; and after repeated encroachments by different monarchs, was finally ameliorated, established, and confirmed, by the glorious revolution in 1688. The executive power is vested in the king, and in the ministers, judges, juries, and other gradations of magistracy under him. The legislative authority is entrusted to the two houses of parliament. See COMMONS, KING, LAW, LIBERTY, LORDS, MAGNA CHARTA, PARLIAMENT, PEERS, RIGHTS, &c. Since the reign of Henry VIII. the sovereign of England has been called, in public writs, the supreme head of the church; but this title conveys no spiritual meaning, as it only denotes the regal power to prevent any ecclesiastical differences, or in other words,

substitutes the king in place of the pope, with regard to temporalities and the internal economy of the church. The kings of England never intermeddle in ecclesiastical disputes. They only give a sanction to the legal rights of the clergy. The church of England, under this description of the monarchical power, is governed by two archbishops, and 24 bishops, besides the bishop of Sodor and Man, who, not being possessed of an English barony, does not sit in the house of peers. See ARCHBISHOP and BISHOP. England contains about 60 archdeacons. Subordinate to them are the rural deacons, formerly styled archpresbyters, who signify the bishop's pleasure to his clergy, the lower class of which consists of rectors or vicars, deacons, and curates. See CURATE, DEACON, PARSON, and VICAR. The ecclesiastical government of England is, properly speaking, lodged in the convocation; which is a national representation or synod, and answers pretty near to the idea of a parliament. They are convoked at the same time with every parliament; and their business is to consider the state of the church, and to call those to an account who have advanced new opinions, inconsistent with the doctrines of the church of England. Some zealous clergymen during the reign of queen Anne, and in the beginning of that of George I. raised the powers of the convocation to a height that was inconsistent with the principles of religious toleration, and indeed of civil liberty: so that the crown was obliged to exert its prerogative of calling the members together, and of dissolving them; and ever since they have not been permitted to sit for any time, in which they could do business. Since the Norman conquest, England has been divided into six circuits, each containing a certain number of counties: which are subdivided into wapentakes, or hundreds, and parishes. Two judges are appointed for each circuit, which they visit in the spring and autumn, for administering justice to subjects at a distance from the capital. In holding the lent (or spring) assizes, the northern circuit extends only to York and Lancaster; the assizes at Durham, Newcastle, Carlisle, and Appleby, being held only in the autumn, and distinguished by the appellation of the long circuit. These circuits and counties are as follow: 1. The Home Circuit contains the counties of Essex, Hertford, Kent, Surry, and Sussex. 2. Norfolk Circuit contains those of Bucks, Bedford, Huntingdon, Cambridge, Suffolk, and Norfolk. 3. Oxford Circuit, Oxon, Berks, Gloucester, Worcester, Monmouth, Hereford, Salop, and Stafford. 4. Midland Circuit, Warwick, Leicester, Derby, Nottingham, Lincoln, Rutland, and Northampton. 5. Western Circuit, Hants, Wilts, Dorset, Somerset, Devon, and Cornwall. 6. Northern Circuit, York, Durham, Northumberland, Lancaster, Westmoreland, and Cumberland. Middlesex and Cheshire are not comprehended in any circuit; the former being the seat of the supreme courts of justice, and the latter a county palatine. Besides the 40 counties into which England is divided, there are counties corporate, consisting of certain districts, to which the liberties and jurisdictions peculiar to a county have been granted by royal charter. Thus the city of London is a county distinct from Middlesex; the cities of York, Chester, Bristol, Norwich, Worcester, and the towns of Kingston-upon-Hull, and Newcastle-upon-Tyne, are counties of themselves, distinct from those in which they lie. The same may be said of Berwick upon Tweed, which has within its jurisdiction a small territory of two miles on the N. side of the river; and which, though it lies in Scotland, is considered in law, as distinct from both kingdoms. For particulars respecting the polity, trade, law, civil and religious antiquities, &c. of England. See PARLIAMENT, PRIVY COUNCIL, COURT, CUSTOM-HOUSE, ADMIRALTY, &c. The lakes of England are chiefly in the N. W. counties; and those of Westmoreland and Cumberland, in particular, exhibit such varieties of beautifully romantic and picturesque scenery, as to have become, for some years past, the fashionable object of summer excursions from the metropolis. The chief mountains in England are the hills of Westmoreland, the Malvern Hills in Worcester, the Peak of Derby, Snowdon, and Plinlimmon. The inhabitants of England and Wales are computed at eight millions. The chief ports of the navy are, Portsmouth, Plymouth, Deptford, and Chatham. All the most valuable productions, both animal and vegetable, of this country, have been imported from the continent. Originally nuts, acorns, crabs, and a few wild berries, were almost all the variety of vegetable food which our woods could boast. To foreign countries, and to the efforts of culture,

we are indebted for bread, the roots and greens of our tables, and all our garden fruits. The barley and hops of our malt liquors, and apples for cider, are equally the gifts of other lands. The meanest labourer is now fed with more wholesome and delicate aliments, than the ancient petty kings of the country could obtain in its savage and uncultivated state. Originally this great island seems to have been like the wilds of America, almost entirely overrun with wood. Here formerly roamed the bear, the wolf, and the wild boar, now totally extirpated. Large herds of stags ranged through the woods, roe-bucks bounded over the hills, and wild bulls grazed in the marshy pastures. By degrees the woods were destroyed, to make way for cultivation; the marshes were drained; and the wild animals invaded in their retreats, gradually disappeared. England now possesses no other wild beasts but the fox, the wild cat, the badger, the martin, and others of the weasel kind; the otter, the hedge-hog, the hare and rabbit; the squirrel, dormouse, mole, &c. and several other species of the rat and mouse. On the other hand, every kind of domestic animal, imported from abroad, has been reared to the greatest degree of perfection. The horse has been trained up so as to excel in strength and swiftness the same animal in every other country. The horned cattle have been brought to the largest size and greatest justness of shape. The different races of sheep, in England, are variously distinguished, either for uncommon size, goodness of flesh, and plenty or fineness of wool. The rivers are numerous; but the comparatively small extent of England will not allow them to vie, in length of course, with the great rivers on the continent. The most considerable of them are the Thames, Severn, Medway, Trent, Ouse, Tyne, Tees, Eden, Avon, Derwent, Dee, Mersey, &c. which, with many others, will be found described under their respective heads. The rivers and seas of England are stocked with a great variety of fish, which yield a plentiful article of provision to all ranks of people. The river fish, from the populousness of the country, and the number of fishers, are, in many parts much diminished. But the sea is an inexhaustible source; and the whole sea-coast is enlivened by numerous inhabitants, who gain their chief subsistence from it. "The face of the country in England," says Dr. Aikin, in his *England Delineated*, "affords all that beautiful variety which can be found in the most extensive tracts of the globe. In some parts, verdant plains extend as far as the eye can reach, watered by copious streams, and covered by innumerable cattle. In others, the pleasing vicissitudes of gently rising hills and bending vales, fertile in corn, waving with wood, and interspersed with meadows, offer the most delightful landscapes of rural opulence and beauty. Some tracts abound with prospects of a more romantic kind; lofty mountains, craggy rocks, deep narrow dells, and rumbling torrents. Nor are there wanting, as a contrast to so many agreeable scenes, the gloomy features of black barren moors and wild uncultivated heaths. On the whole, however, few countries have a smaller proportion of land absolutely sterile and incapable of culture." The richest parts are, in general, the middle and southern. Towards the N. it is less fertile. The E. coast is, in many parts, sandy and marshy. A range of rude and elevated land, sometimes rising into lofty mountains, extends from the borders of Scotland to the very heart of England, running from N. to S. and forming a natural division between the E. and W. sides of the kingdom. Cornwall is also a rough hilly tract, as well as part of the adjacent counties. The established religion of England is the Reformed or Protestant, and its doctrines are contained in the 39 Articles. The liturgy, and homilies are evidently formed according to the Lutheran rather than the rigid Calvinistic doctrines. Toleration in matters of religion is allowed to all the inhabitants, so that every one is at liberty to worship God, according to the dictates of his own conscience.

ENGLAND NEW. See NEW ENGLAND.

ENGLECHERIE, ENGLISHIRE, or ENGLISHERY, an ancient word signifying the being an Englishman, which was used in the time of king Canutus, to distinguish the English from the Danes, especially in the case of murder, and its punishment.

ENGLISH, or the ENGLISH-TONGUE, the language spoken by the people of England, and, with some variation, by those of Scotland, as well as part of Ireland, and the rest of the British dominions. "Though," says Dr. Johnson, the Britons or Welsh were the first possessors of this island, whose names are recorded, and are therefore in civil history always considered as the

predecessors of the present inhabitants; yet the deduction of the English language, from the earliest times of which we have any knowledge to its present state, requires no mention of them: for we have so few words which can, with any probability, be referred to British roots, that we justly regard the Saxons and Welsh as nations totally distinct. It has been conjectured, that when the Saxons seized this country, they suffered the Britons to live among them in a state of vassalage, employed in the culture of the ground and other laborious and ignoble services. But it is scarcely possible, that a nation, however depressed, should have been mixed with another in considerable numbers without some communication of their tongue, and therefore, it may, with great reason, be imagined, that those, who were not sheltered in the mountains, perished by the sword. The whole fabric and scheme of the English language, is Gothic or Teutonic: it is a dialect of that tongue, which prevails over all the northern countries of Europe, except those where the Slavonian is spoken. Of these languages Dr. Hickes has thus exhibited the genealogy:

GOTHIC,

ANGLO-SAXON,

Dutch,
Frisic,
English.

FRANCIC,

German,

CIMBRIC,

Islandic,
Norwegian,
Swedish,
Danish.

"Of the Gothic, the only monument remaining is a copy of the Gospels somewhat mutilated, which from the silver with which the characters are adorned, is called the silver book. It is now preserved at Upsal, and having been twice published before, has been lately reprinted at Oxford, under the inspection of Mr. Lye, the editor of Junius. Whether the diction of this venerable manuscript be purely Gothic, has been doubted; it seems however to exhibit the most ancient dialect now to be found of the Teutonic race; and the Saxon, which is the original of the present English, was either derived from it, or both have descended from some common parent.

"The first poetry of the Saxons was without rhyme, and consequently must have depended upon the quantity of their syllables; but they began in time to imitate their neighbours, and close their verses with correspondent sounds. The two passages which I have selected, contain apparently the rudiments of our present lyric measures, and the writers may be justly considered as the genuine ancestors of the English poets."

"He mai him sore adreden,
That he thanne ore bidde ne mugen,
Vor that bilimfeth ilome.
Thæ is wis that bit and bote
And bet bivoren dome.
Death com on this midelard
Thurth thas defles onde,
And senne and sosge and iswinc,
On se and on lond."

"About the year 1150, the Saxon began to take a form in which the beginning of the present English may be plainly discovered; this change seems not to have been the effects of the Norman conquest, for very few French words are found to have been introduced in the first hundred years after it; the language must therefore have been altered by causes like those which, notwithstanding the care of writers and societies instituted to obviate them, are even now daily making innovations in every living language. I have exhibited a specimen of the language of this age from the year 1135 to 1140 of the Saxon chronicle, of which the latter part was apparently written near the time to which it relates."

Of this chronicle a few lines may here suffice to gratify the antiquarian:—"This zære for the king Stephne ofer sæ to Normandi. And ther wes under-fangen. forthi that he wenden that he sculde ben alsuic alse the eom wes. And for he hadde get his tresor. ac he to deld it and scatered sotlice. Micel hadde Henri king gadered gold and sylver. and ne god ne didde me for his saule thar of. Tha the king Stephne to Engla-land com tha macod

he his gadering at Oxen-ford. And thar he nam the biscop Roger of Seres-beni. And Alexander biscop of Lincoln— and te Lanceler Roger hise neves. and dide alle in perisuntil hi jafen up here castles. Tha this suikes under-gæton that he milde man was and soft and god. and na justise ne dide. tha didnen hi alle wunder. Hi hadden him manred maked and aihes sueren." &c.

"Nearly about this time (says the Dr.) the following pieces of poetry seem to have been written, of which I have inserted only short fragments: the first is a rude attempt at the present measure of eight syllables, and the second is a natural introduction to Robert of Gloucester, being composed in the same measure, which, however rude and barbarous it may seem, taught the way to the Alexandrines of the French poetry.

"FUR in see bi west spaynge.
If a lond thote cokaygne.
Ther nis lond under heuenriche.
Of wel of godnis hit iliche.
Thoy paradis be miri and briyt.
Cokaygn if of fairir siyt.
What is ther in paradis.
Bot grass and flure and generis.
Thoy ther be ioi and gret dute.
Ther nis met hote frute.
Ther nis halle bure no bench.
Bot watir man if thursto quench.
Beth ther no men but two.
Hely and enok also.
Clinglich may hi go.
Whar ther wonith men no mo." &c.

SANCTA MARGARETTA.

"OLDE ant yonge i preit ou oure folief for to lete.
Thenchet on god that yef ou wit oure sunnes to bete.
Here mai tellen ou. wid wordes feire and swete.
The vie of one meidan. was hoten Maregrete.

Hire fader was a patriac. as ic ou tellen may.
In auntioge wif echef i the false lay.
Deve godes ant doumbe. he served nitt ant day.
So deden mony othere. that singet weilaway.

Theodosius was is nome. on crist ne levede he nouht.
He levede on the false godes. that weren wid honden wrouht.
Tho that child sculde christine ben. ic com him well in thoutt.
E bed wen it were ibore. to dethe it were ibrouht."

"In these fragments, the adulteration of the Saxon tongue, by a mixture of the Norman, becomes apparent; yet it is not so much changed by the admixture of new words, which might be imputed to commerce with the continent, as by changes of its own forms and terminations; for which no reason can be given. Hitherto the language used in this island, however different in successive time, may be called Saxon; nor can it be expected, from the nature of things gradually changing, that any time can be assigned, when the Saxon may be said to cease, and the English to commence. Robert of Gloucester, however, who is placed by the critics in the 13th century, seems to have used a kind of intermediate diction, neither Saxon nor English; in his work therefore we see the transition exhibited, and, as he is the first of our writers in rhyme, of whom any large work remains, a more extensive quotation is extracted. He writes apparently in the same measure with the foregoing author of St. Margarete, which polished into greater exactness, appeared to our ancestors so suitable to the genius of the English language, that it was continued in use almost to the middle of the 17th century.

"Of the batayles of Denemarch, that hii dude in this londe
That worst were of alle othere, we mote abbe an honde.
Worst hii were. vor othere adde somwanne ydo,
As Romeyns & Saxons, & wel wuste that lond therto.
Ac hii ne kepte yt holde nogt, bote robbly, and ssende,
And destrue, & berne, & sle, and ne couthe abbe non ende.
And bote lute yt nas worth, they hii were ouercome ylome.
Vor myd spses and great poer as prest esone hii come.
Kyng Adelwolf of hys lond kyng was twenty zer.
The Deneys come by hym ryuor than he dude er," &c.

"The kyng Aldered sone tho then wey of deth nome,
As yt vel, the vyfty zer of ys kynedom.
At Wymbourne he was ybured, as God gef that cas,
The gode Alfred, ys brother, after hym kyng was.
Alfred, thys noble man, as in the zer of grace he nom
Eygte hondred and syxty and tuelue the kynedom.
Arst he adde at Rome ybe, &c, vor ys grete wysdom,
The pope Leon hym blessedde, tho he thuder com.—
Kyng Alfred was the wysost kyng, that long was bynore.
Vor they me segge the lawes beth in werre tyme vorlore,
Nas yt nogt so hys daye. vor they he in worre were,
Lawes he made rygtuollore, and strengore than er were.
Clerc he was god ynou, and zut, as me telleth me,
He was more than ten zer old, as he couthe ys abece.
Ac ys gode moder ofte smale gyftes hym tok,
Vor to byleue other ple, and loky on his boke.
So that by por clergie ys rygt lawes he wonde,
That neuere er nere y mad, to gouerny ys load.
Hys lyf eygte and twenty zer in ys kynedom ylaste.
After ys deth he was ybured at Wynchestre atte laste."

The following is a quotation from Sir John Mandeville's works who wrote, as himself informs us, in the 14th century. "IN that lond, ne in many othere bezonde that, no man may see the sterre transmontane, that is clept the sterre of the see, that is unmevabe, and that is toward the North, that we clepen the lode sterre. But men see another sterre, the contrarie to him, that is toward the Southe, that is clept Antartyk. And right as the schip men taken here avys here, and governe hem be the lode sterre, right so don schip men bezonde the parties, be the sterre of the Southe, the which sterre apperethe not to us. And this sterre, that is toward the North, that wee clepen the lode sterre, ne apperethe not to hem. For whiche cause, men may wel perceyve that the londe, and the see ben of rownde schapp and forme. For the partie of the firmament schewethe in o contree, that schewethe not in another contree. And men may well preve be experience and soyle compassement of wytt, that zif a man fond passages be schippes, that wold go to serchen the world, men myghte go be schippe all aboute the world, and aboven and benethen."

"The first of our authors, who can be properly said to have written English, was Sir John Gower, who, in his Confession of a Lover, calls Chaucer his disciple, and may therefore be considered as the father of our poetry.

"NOWE for to speke of the commune,
It is to drede of that fortune,
Which hath befall in sondrye londes:
But ofte for defaute of bondes
All sodeinly, er it be wist,
A tunne, when his lie arist
Tobreketh, and renneth all aboute,
Which els shulde noghte gone out." &c.

Dr. Johnson has given several extracts from Chaucer, of which we shall here insert the following:

CHAUCEER.

"ALAS! I wepyng am constrained to begin verse of sorowfull matter, that whilom in florishyng studie make delitable dities. For lo! rendyng muses of Poetes enditen to methinges to be written, and drerie teres. At laste no drede ne might overcome tho muses, that thei ne weren fellows, and followeden my waie, that is to saie, when I was exiled, thei that weren of my youth whilom welfull and grene, comferten now sorowfull wierdes of me olde man: for elde is comen unwarely upon me, hasted by the harmes that I have, and sorow hath commaunded his age to be in me. Heres hore aren shad overtimeliche upon my hed: and the slacke skinne tremblethe of mine emptied bodie. Thilke deth of men is welefull, that he ne cometh not in yeres that be swete, but cometh to wretches often icleped."

Fortescue was chief justice of the Common-Pleas, in the reign of king Henry VI. He retired in 1471, after the battle of Tewkesbury, and probably wrote most of his works in his privacy. The following passage is selected from his book of the "Difference between an absolute and limited Monarchy. "Hyt may peraventure be.

be marvelid by some men, why one Realme is a Lordshyp only Royall, and the Prynce thereof rulyth yt by his Law, callid Jus Regale; and another Kyngdome is a Lordschip, Royal and Politike, and the Prince thereof rulyth by a Lawe, callyd Jus Politicum & Regale; sythen thes two Princes beth of egall Astate. To this dowte it may be answeryd in this manner; The first institution of thes two Realmys, upon the Incorporation of them, is the cause of this diversyte. When Nembroth by Might, for his own Glorie, made and incorporate the first Realme, and subduyd it to hymself by Tyrannye, he would not have it governyd by any other Rule or Lawe, but by his own Will; by which and for th' accomplishment thereof he made it. And therfor, though he had thus made a Realme, holy Scripture denyd to call hym a Kyng, Quia Rex dicitur a Regendo; Whych thyng he dyd not, but oppressyd the People by Myght, and therfor he was a Tyrant, and callid Primus Tyrannorum. But holy Writ callith hym Robustus Vefiator coram Deo. For as the Hunter takyth the wyld beste for to sele and eate hym; so Nembroth subduyd to him the People with Might, to have their service and their goods, using upon them the Lordschip that is called Dominium Regale tantum. After hym Belus that was callid first a Kyng, and after hym his Sone Nynus, and after hym other Panyms; They, by Example of Nembroth, made them Realmys, would not have them rulyd by other Lawys than by their own Wills.

In the time of Sir Thomas More our language was in a great degree formed and settled, and it appears from Ben Jonson, that his works were considered as models of pure and elegant style. The following is introduced as a specimen.

A letter written with a cole by Sir Thomas More to hys daughter maistres Margaret Roper, within a whyle after he was prisoner in the Towre.

"MYNE own good doughter, our lorde be thanked I am in good helthe of bodye, and in good quiet of minde: and of worldly thynges I no more desyer then I have. I beseeche hym make you all mery in the hope of heauen. And such thynges as I somewhat longed to talke with you all, concerning the worlde to come, our Lorde put them into your myndes, as I truste he dothe and better to by hys holy spirite: who blesse you and preserue you all. Written wyth a cole by your tender louing father, who in hys pore prayers forgetteth none of you all, nor your babes, nor your nurses, nor your good husbundes, nor your good husbundes shrewde wyues, nor your fathers shrewde wyfe neither, nor our other frendes. And thus fare ye hartely well for lacke of paper.

THOMAS MORE, knight.

"Of the wits that flourished in the reign of Henry VIII. none has been more frequently celebrated than the earl of Surrey; Dr. Johnson gives among others the following extract.

Description of Spring, wherein eche thing renewes, save only the lover.

"The soote season that bud, and bloome fourth brings,
With grene hath cladde the hyll, and eke the vale,
The Nightingall with fethers new she singes;
The turtle to her mate hath told the tale:
Somer is come, for every spray now springes,
The hart hath hunge hys olde head on the pale,
The bucke in brake his winter coate he flynges;
The fishes flete with newe repayred scale:
The adder all her slough away she flynges,
The swift swallow pursueth the flyes smalle,
The busy bee her honey how she mynges;
Winter is worne that was the floures bale.
And thus I see among these pleasant thynges
Eche care decays, and yet my sorrow sprynges."

"Barclay wrote about 1550; his chief work is the "Ship of Fools" of which the following extract will shew his style.

Of Mockers and Scorners and False Accusers.

O Heartless fooles, haste hear to our doctrine,
Leave off the wayes of your enormitie,
Enforce you to my precept to encline,
For here shall I shewe you good and veritie:
Encline, and ye finde shall great prosperitie,

Ensuing the doctrine of our fathers olde,
And godly lawes in valour worth great golde.

Who that will followe the graces manyfolde
Which are in vertue, shall finde auancement:
Wherefore ye fooles that in your sinne are bolde,
Ensue ye wisdom, and leaue your lewde intent,
Wisdom is the way of men most excellent:
Therefore haue done, and shortly spede your pace,
To quanyt yourself and company with grace.

Learn what is vertue, therein is great solace,
Learn what is truth, sadnes and prudence,
Let grutch be gone, and grauitie purchase,
Forsake your folly and inconuenience,
Cease to be fooles and ay to sue offence,
Follow ye vertue, chiefe roote of godlynes
For it and wisdom is ground of clenlynes.

Wisdom and vertue two thinges are doubtles,
Whiche man endueth with honour speciall,
But suche heartes as slepe in foolishnes
Knoweth nothing, and will nought know at all:
But in this little barge in principall
All foolish mockers I purpose to reprene,
Clawe he his backe that feeleth itche or greue.

"About the year 1553, wrote Dr. Wilson, a man celebrated for the politeness of his style, and the extent of his knowledge: what was the state of our language in his time, the following may be of use to shew:

PRONUNCIATION is an apte orderinge both of the voyce, countenance, and all the whole bodye, accordyng to the worthines of suche wordes and matters as by speache are declared. The vse hereof is such for anye one that liketh to haue prayse for tellyng his tale in open assemble, that hauing a good tongue, and a comely countenance, he shal be thought to passe all other that haue the like vtterance: though they haue much better learning. The tongue geueth a certayne grace to euery matter, and beautifieth the cause in like maner, as a swete soundyng lute muche setteth forth a meane deuised ballade. Or as the sounde of a good instrumente styrrerth the hearers, and moueth much delite, so a cleare soundyng voice comforterth muche our deintie eares, with muche swete melodie, and causeth vs to allowe the matter rather for the reporters sake, then the reporter for the matters sake. Demosthenes therfore, that famous orator, beyng asked what was the chiefe point in al oratorie, gaue the chiefe and onely praise to pronounciation; being demaunded, what was the seconde and the thirde, he still mad aunswere, Pronounciation, and would make none other aunswere, till they lefte askyng, declaring hereby that arte without vtterance can dooe nothyng, vtterance without arte can dooe right muche. And no doubt that man is in outward appaunce halfe a good clarke, that hath a cleane tongue, and a comely gesture of his body. Aeschines lykwyse beyng bannished his countrie through Demosthenes, when he had redde to the Rhodians his own oration, and Demosthenes aunswere thereunto, by force whereof he was bannished, and all they marueiled much at the excellencie of the same: then (quod Aeschines) you would haue marueiled muche more if you had heard hymselfe speake it. Thus beyng cast in miserie and bannished for euer, he could not but geue such great reporte of his deadly and mortal enemy.—These few extracts may be sufficient to give some idea of the state of our language in different periods, and of its progress toward its present copiousness and elegance. For further information see LANGUAGE, GRAMMAR, RHETORIC, and LOGIC.

ENGRAILED, or INGRAILED, in heraldry, a term derived from the French *grêle*, hail; and signifying a thing the hail has fallen upon and broke off the edges, leaving them ragged, or with half-rounds or semicircles struck out of their edges.

ENGRAVING, the art of cutting metals, precious stones, woods, &c. and representing thereon figures, letters, or whatever device or design the artist fancies. Engraving is properly a branch of Sculpture, and is divided into several other branches, according to the matter whereon it is employed, and the manner of performing it. Engraving is an art chiefly of modern invention; having its rise no earlier than the middle of the 15th century. The ancients, indeed, practised engraving on precious stones and crystals with very good success; and there are still many of their works remaining equal to any production of the latter ages. But the art

of engraving on plates and blocks of wood, to afford prints or impressions, was not known till after the invention of painting in oil. Of these last, the most ancient mode is that on wood; the first impressions on paper having been taken from carved wooden blocks. For this invention we are indebted to the brief-malers, or makers of playing cards, who practised the art in Germany, about the beginning of the 15th century. From the same source may perhaps be traced the first idea of moveable types, which appeared not long after; for these brief malers did not entirely confine themselves to the printing and painting of cards, but produced also subjects of a more devout nature; many of which, taken from holy writ, are still preserved in German libraries, with the explanatory text facing the figures; the whole engraved in wood. Thus a species of books was formed; such as, "*Historia sancti Johannis, ejusque Visiones Apocalypticæ*;" "*Historia Veteris & Novi Testamenti*," known by the name of the "*Poor Man's Bible*." These short mementos were printed only on one side; and two of them being pasted together, had the appearance of a single leaf. The earliest date on any of these wooden cuts is 1423. The subject is St. Christopher carrying the infant Jesus over the Sea, preserved in a convent at Buxheim near Menningen. It is of a folio size, illuminated in the same manner as the playing cards; and at the bottom is this inscription,

Christoferi faciem die quaecunque tueris.
Illa nempe die morte mala non morieris.
Millesimo CCCC° XX° tertio.

Upon the invention of moveable types, that branch of the brief-malers business, so far as it regarded the making of books, was gradually discontinued; but the art itself of engraving on wood continued in an improving state; and towards the end of the 15th and beginning of the 16th century, it became customary for almost every one of the German engravers on copper to engrave on wood also. The works of Albert Durer in this style of engraving are justly held in the highest esteem. Italy, France, and Holland, have produced many capital artists of this kind; but for boldness and spirit, we must see the prints of Christopher Jegher, who worked under the direction of Rubens, and was without doubt assisted by that great master. The invention of that species of engraving distinguished by the appellation of *chiaro-scuro*, seems also to be justly claimed by the Germans, and first practised by Mair; one of whose prints of this kind is dated 1499. Many excellent works in *chiaro-scuro* have been produced in France; and in Italy it was honoured with the performances of Titian and Parmegiano; but the attempts of Jackson, Kirkall, and others in England, have not been equally successful. A set of excellent prints in this way have lately been published by J. Skippe, Esq. a connoisseur and dilettante. In Germany, about A. D. 1450, prints from engraved copper first made their appearance. The earliest date of a copperplate print is indeed only 1461; but however faulty this print may be with respect to the drawing, or defective in point of taste, the mechanical part of the execution of it has by no means the appearance of being one of the first productions of the graver. We have also several other engravings, evidently the work of the same master; in which the impressions are so neatly taken from the plates, and the engravings so clearly printed in every part, that, according to all appearance, they could not be executed in a much better manner in the present day, with all the conveniences which the copperplate printers now possess, and the additional knowledge they must necessarily have acquired in the course of more than three centuries. Hence we may fairly conclude, that if they were not the first specimens of the engraver's workmanship, they were much less the first efforts of the copperplate printer's ability. It is likewise to be observed, that Martin Schoen, who is said to have worked from 1460 to 1486, was apparently the scholar of Stoltzshirs; for he followed his style of engraving, and copied from him a set of prints, representing the passion of our Saviour. Now, allowing Stoltzshirs to have preceded his disciple only ten years, this carries the era of the art back to 1450, as was said above. There is no ground to suppose, that it was known to the Italians till at least ten years afterwards. The earliest prints that are known to be theirs are a set of the seven planets, and an almanack by way of frontispiece; on which are directions for finding Easter from 1465 to 1517 inclusive: and we may be assured, that the engravings were not ante-

dated, as the almanack would have thus been less valuable. These prints must therefore have been executed in 1464, which is only four years later than the Italians claim. The three earliest Italian engravers are, Finiguerra, Boticelli, and Baldini. If we are to refer these prints to any of the three, we shall naturally conclude them to be the work of Finiguerra or Baldini; for they are not equal either in drawing or composition to those ascribed to Boticelli, which we know at least were designed by him; and as Baldini is expressly said to have worked from the designs of Boticelli, it will appear most probable that they belong to Finiguerra. With respect to the invention of Etching, it seems to be not well known to whom it is to be ascribed. One of the most early specimens is the print by Albert Durer, known by the name of the Cannon, dated 1518, and thought by some, with little foundation, to have been worked on a plate of iron. Another etching by the same artist is Moses receiving the Tables of the Law, dated 1524. It was also practised in Italy soon after this by Parmegiano, in whose etchings we discover the hand of the artist working out a system as it were from his own imagination, and striving to produce the forms he wanted to express. We see the difficulty he laboured under; and cannot doubt, from the examination of the mechanical part of the execution of his works, that he had no instruction; and that it was something entirely new to him. If the story is true, that he kept an engraver by profession in his house, the novelty of the art is rendered so much the more probable. He died in 1540. As to that species of engraving in which the modes of etching and cutting with the graver are united, it must have been found necessary immediately upon the invention of etching; it was, however, first carried to perfection by G. Audran, and is now almost universally practised, whether the work is in strokes or in dots. Engraving in dots, the present fashionable method, is a very old invention, and the only mode discovered by the Italians. Agostino de Musis, commonly called Augustine of Venice, a pupil of Marc Antonio, used it in several of his earliest works, but confined it to the flesh, as in the undated print of An Old Man seated upon a Bank, with a Cottage in the back ground. He flourished from 1509 to 1536. We also find it in a print of "A single Figure standing, holding a Cup and looking upwards," by Giulio Campagnola, who engraved about the year 1516. The back ground is executed with round dots, made apparently with a dry point. The figure is outlined with a stroke deeply engraved, and finished with dots, in a manner greatly resembling those prints which Demarteau engraved at Paris in imitation of red chalk. The hair and beard are expressed by strokes. Stephen de Laune, a native of Germany, followed the steps of Campagnola; and many of his slight works are executed in dots only. John Boulanger, a French artist, who flourished in the middle of the last century, and his contemporary Nicholas Van Plattenberg, improved greatly on this method, and practised it with much success. It is only, however, of late, that it has been considered as an object worthy of general imitation. John Lutma executed this kind of work with a hammer and a small punch or chisel. Engraving in mezzotint was invented about the middle of the 17th century; and the invention has generally been attributed to Prince Rupert. Engraving in aquatinta is quite a recent invention, and seems at once to have been carried to perfection by Sandby, and other artists of the present age. Engraving with the tool was the kind originally practised, and it is yet retained for many purposes. For though etching be more easy, and other advantages attend it; yet where great regularity and exactness of the stroke or lines are required, the working with the graver is much more effectual: on which account it is more suitable to the precision necessary in the execution of portraits; as there every thing the most minute must be made out and expressed, according to the original subject, without any licence to the fancy of the designer in deviating from it, or varying the effect either by that masterly negligence and simplicity in some parts, or those bold sallies of the imagination and hand in others, which give spirit and force to history painting.

ENGRAVING ON COPPER, the making, correspondently to some delineated figure or design, such concave lines on a smooth surface of copper, either by cutting or corrosion, as render it capable, when charged properly with any coloured fluid, of imparting by compression an exact representation of the figure or design, to paper or parchment. Whether we consider this branch of engraving, with regard to its utility, the pleasure it affords, or the diffi-

culty that attends its execution, we cannot but confess, that on all these accounts it merits a distinguished rank among the polite arts. By this art the cabinets of the curious are adorned with the portraits of the greatest men of all ages and nations; and their memories, their most remarkable and most glorious actions, are transmitted to the latest posterity. By this art also, the paintings of the greatest masters are multiplied to a boundless number; and the lovers of the polite arts, however widely diffused, are enabled to enjoy those beauties, from which their distant situations would otherwise have for ever debarred them. Persons of moderate fortunes are hereby enabled to become possessed of all the spirit, and all the poetry, contained in those miracles of art, which seemed to have been reserved for the temples of Italy, or the cabinets of princes. When we reflect, that the engraver, beside the beauties of poetic composition, and the artful ordinance of design, is to express, merely by the means of light and shade, all the various tints of colours and clair-obscur; to give a relief to each figure, and a truth to each object; that he is now to paint a sky serene and bright, and then loaded with dark clouds; now the pure tranquil stream, and then the foaming, raging sea; that here he is to express the character of the man, strongly marked in his countenance, and there the minutest ornament of his dress; in a word, that he is to represent all, even the most difficult objects in nature; we cannot sufficiently admire the vast improvements in this art, and that degree of perfection to which it is at this day arrived. There are several methods of engraving on copper, viz. 1. In strokes cut through a thin wax, laid upon the copper, with a point, and these strokes bitten or corroded into the copper with aquafortis. See *ETCHING*. 2. In strokes with the graver alone, unassisted by aquafortis. In this instance, the design is traced with a sharp tool, called a dry point, upon the plate; and the strokes are cut or ploughed upon the copper, with an instrument distinguished by the name of a graver. 3. In strokes first etched, and afterwards finished with the graver: by this expedient the two former methods are united. 4. In dots without strokes, which are executed with the point upon the wax or ground, bitten in with the aquafortis, and afterwards harmonized with the graver, by which instrument small dots are made; or with the graver alone, as in the flesh and finer parts, unassisted with the point. 5. In dots first etched and afterwards harmonized with the dry point, performed by a little hammer, called *opus mallei*, or the work of the hammer, as practised by *Lutma* and others. 6. In *Mezzotinto*. 7. In *Aquatinta*. See these articles. The principal instruments used in engraving with the tool are, graters, scrapers, a burnisher, an oil-stone, and a cushion for bearing the plates. Gravers are made square, for cutting broad and deep, and lozenge for more delicate and fine strokes and hatches. *La Bosse* recommends, as the most generally useful, such as are of a form betwixt the square and lozenge: and he advises, that they should be of a good length, small towards the point, but stronger upwards. The burnisher is used to assist in the engraving on some occasions, as well as to polish the plates. It is seven inches long, and made of fine steel; well polished. The burnisher is formed at one end, and a scraper on the other, each about an inch and a half long from the point: betwixt them, about four inches of the instrument is made round, and serves as a handle. The principal application of it in engraving, besides its use in polishing the plates, is to take out any scratches, or accidental defacings, that may happen to the plates during the engraving; or to lessen the effect of any parts that may be too strongly marked in the work, and require to be taken down. A cushion, as it is called, is generally used for supporting the plate in such a manner, that it may be turned every way with ease. It is a bag of leather filled with sand, which should be of the size that will best suit the plates it is intended to bear. The dry point, or needle, which has been of late much used in engraving, is a tool like an etching point, which being drawn hard on the copper, cuts a stroke, and raises a burr; the burr is scraped off, and there remains a stroke more soft and delicate than can be produced in any other way. The cushion being laid on the table, the plate must be put upon it; and the graver being held in the hand in a proper manner, the point must be applied to the plate, and moved in the proper direction for producing the figures of the lines intended: observing, in forming straight lines, to hold the plate steady on the cushion; and where they are to be finer, to press more lightly, using greater force where they are to be broader and deeper. In

making circular, or other curve lines, hold your hand and graver steadily; and as you work, turn your plate upon the cushion against your graver, otherwise it will be impossible for you to make any circular or curved line with that neatness and command of hand you by this means may. After part of the work is engraved, it is necessary to scrape it with the scraper or graver, passed in the most level direction over the plate, to take off the roughness formed by the cutting of the graver; but great care must be taken not to incline the edge of the scraper or tool used, in such a manner that it may take the least hold of the copper, as it would otherwise produce false strokes, or scratches, in the engraving; and that the engraved work may be rendered more visible, it may afterwards be rubbed over with a roll of felt dipped in oil. In using the graver, it is necessary to carry it as level as possible with the surface of the plate; for otherwise, if the fingers slip betwixt them, the line that will be produced, whether curve or straight, will become deeper and deeper in the progress of its formation; which entirely prevents strokes being made at one cut, that will be fine at their extremities, and larger in the middle; and occasions the necessity of retouching to bring them to that state. For this reason, it is very necessary for those who would learn to engrave in perfection, to endeavour, by frequent trials, to acquire the habit of making such strokes both straight and curving, by lightening or sinking the graver with the hand, according to the occasion. If, after finishing the design, any scratches appear, or any part of the engraving be falsely executed, such scratches, or faulty parts, must be taken out by the burnisher, and further polished, if necessary, by the above-mentioned roll. The plate being thus engraved, it is proper to round off the edges, by using first a rough file, and afterwards a smoother; and to blunt the corners a little by the same means: after which, the burnisher should be passed over the edges to give it a farther polish. In the conduct of the graver and dry point consists all the art; for which there are no rules to be given; all depending on the habitude, disposition, and genius, of the artist. However, besides the explanations already given, some general observations and directions may not be improper. As the principles of engraving are the same with those of painting, a person cannot expect to attain any considerable degree of perfection in this art, who is not a good master of design; and therefore he ought to be well acquainted both with perspective and architecture: for the former, by the proper gradations of strong and faint colours, will enable him to throw backwards the figures, and other objects of the picture or design which he purposes to imitate: and the latter will teach him to preserve the due proportion of its several orders, which the painter often entrusts to the discretion of the engraver. In order to preserve equality and union in his works, the engraver should always sketch out the principal objects of his piece before he undertakes to finish them. In working, the strokes of the graver should never be crossed too much in a lozenge manner, particularly in the representation of flesh, because sharp angles produce the unpleasant effect of lattice-work, and take from the eye the repose which is to it agreeable in all kinds of picturesque designs: we should except the case of clouds, tempests, waves of the sea, the skins of hairy animals, or the leaves of trees, where this method of crossing may be admitted. But in avoiding the lozenge, it is not proper to get entirely into the square, which would give too much of the hardness of stone. In conducting the strokes, the action of the figures, and of all their parts, should be considered; and it should be observed how they advance towards, or recede from the eye; and the graver should be guided according to the risings or cavities of the muscles or folds, making the strokes wider and fainter in the light, and closer and firmer in the shades. Thus the figures will not appear jagged; and the hand should be lightened in such a manner, that the outlines may be formed and terminated without being cut too hard; however, though the strokes break off where the muscle begins, yet they ought always to have a certain connection with each other, so that the first stroke may often serve by its return to make the second, which will shew the freedom of the engraver. In engraving the flesh, the effect may be produced in the lighter parts and middle tints by long pecks of the graver, rather than by light lines; or by round dots; or by dots a little lengthened by the graver: or, best of all, by a judicious mixture of these together. In engraving the hair and the beard, the engraver should begin his work by

laying the principal grounds, and sketching the chief shades in a careless manner or with a few strokes; and he may finish it at leisure with finer and thinner strokes to the extremities. When architecture or sculpture is to be represented, except it be old and ruinous buildings, the work ought not to be made very black; because, as edifices are commonly constructed either of stone or white marble, the colour, being reflected on all sides, does not produce dark or brown shades as in other substances. White points must not be put in the pupils of the eyes of figures, as in engravings after paintings; nor must the hair or beard be represented as in nature, which makes the locks appear flowing in the air; because in sculpture there can be no such appearances. In engraving cloths of different kinds, linen should be done with finer and closer lines than other sorts, and be executed with single strokes. Woollen cloth should be engraved wide, in proportion to the coarseness and fineness of the stuff, and with only two strokes; and when the strokes are crossed, the second should be smaller than the first, and the third than the second. Shining stuffs, which are generally of silk or satin, and which produce flat and broken folds, should be engraved more hard and more straight than others, with one or two strokes, as their colours are bright or brown; and between the first strokes others smaller must be joined, which is called interlining. Velvet and plush are expressed in the same manner, and should always be interlined. Metals, as armour, &c. are also represented by interlining, or by clear single strokes. In architecture, the strokes which form the rounding object should tend to the point of sight; and when whole columns occur, it is proper to produce the effect as much as possible by perpendicular strokes. If a gross stroke is put, it should be at right angles, and wider and thinner than the first stroke. In engraving mountains, the strokes ought to be frequently discontinued and broken, for sharp and craggy objects; and they should be straight, in the lozenge manner, and accompanied with long points or dots; and rocks should be represented by cross strokes more square and even. Objects that are distant towards the horizon should be kept very tender, and slightly charged with black. Waters that are calm and still are best represented by strokes that are straight, and parallel to the horizon, interlined with those that are finer; omitting such places as, in consequence of gleams of light, exhibit the shining appearance of water; and the form of objects reflected from the water, at a small distance upon it, or on the banks of the water, are expressed by the same strokes, retouching more strongly or faintly as occasion may require, and even by some that are perpendicular. For agitated waters, as the waves of the sea, the first strokes should follow the figure of the waves, and may be interlined, and the cross strokes ought to be very lozenge. In cascades, the strokes should follow the fall, and be interlined. In engraving clouds, the graver should sport when they appear thick and agitated, in turning every way according to their form and their agitation. If the clouds are dark, so that two strokes are necessary, they should be crossed more lozenge than the figures, and the second strokes should be rather wider than the first. The flat clouds, that are lost insensibly in the clear sky, should be made by strokes parallel to the horizon, and a little waving; if second strokes are required, they should be more or less lozenge; and when they are brought to the extremity, the hand should be so lightened that they may form no outline. The flat and clear sky is represented by parallel and straight strokes, without the least turning. In landscapes, the trees, rocks, earth, and herbage, should be etched as much as possible; nothing should be left for the graver but perfecting, softening, and strengthening. The dry point produces an effect more delicate than the graver can, and may be used to great advantage in linen, skies, distances, ice, and often in water, especially in small engravings. In most things it is proper to etch the shadows, only leaving the lighter tints for the dry point, graver, &c. To imitate drawings with chalk, a mixture is used of varied and irregular dots, made more or less soft, so as to resemble the grain produced by the chalks on paper. Every stroke of the chalks on paper may be considered as an infinite number of adjoining points, which are the small eminences of the grain of the paper touched by the chalk in passing over it. When the copper-plate has been polished and varnished, or properly prepared, as in the common method of engraving, the drawing to be imitated may be counterproved on the varnish of the plate. If this cannot be conveniently done, black lead pencil, or red chalk,

must be applied to varnished or oiled paper; and by means of this chalk or pencil, all the traces of the original will be transmitted to the varnish. The outlines of the object must be formed in the etching by points, whose magnitude and distance must be determined by the quality of the strokes in the original drawing. The artist may be provided with pointed instruments or needles of various sizes with single or double points. In forming the light and shade, he should distinguish between those hatches which serve to express the perspective of the object, and those which form the ground of it. The principal hatches should be more strongly marked; the middle tints, if etched, should be marked lightly, or they may be left till the varnish is taken off, and be perfected with a greater degree of softness, by needles, or the point of the graver, as the original may require. There is nothing peculiar in the method of applying the aquafortis in this kind of engraving; but it may be observed, that it should not be left so long as to corrode the lighter parts too much; if the light parts are sufficiently corroded, they may be stopped out with turpentine, varnish, and lamp black, mixed together, and the aquafortis may be applied again to the stronger parts; for it will be no detriment to them, if the points which compose the shade burst into one another, provided the extreme be avoided. When the work of the aquafortis is finished, and the varnish taken off the copper, it will be necessary in the softest parts, such as the flesh, &c. to interstipple with proper points; as an effect will be thus produced more delicate than it is possible to attain with the aquafortis only; and the strongest shades will require additional strength to be given them with small strokes of the graver. Drawings made with chalks of different colours, may be imitated in this manner, if a plate be provided for every colour. This method of engraving is intended to form a kind of deception, so that the connoisseur may not be able, on the first inspection, to distinguish between the original drawing, and the engraving, made in imitation of it: and it is extremely useful, as it serves to multiply copies of drawings left by those masters who excelled in the use of chalks, and thus to form and improve young artists, who could not have access to the originals in the practice of drawing.

ENGRAVING ON GLASS, is performed by the same process as etching on copper; only using the fluoric instead of the nitrous acid. See ETCHING.

ENGRAVING ON PRECIOUS STONES, is the representing of figures, or devices in relief, or indented, on divers kinds of hard polished stones. The ancients excelled in this art; there being divers antique agates, cornelians, and onyxes, which surpass any thing of that kind the moderns have produced. Pyrgoteles among the Greeks, and Dioscorides under the first emperors of Rome, are the most eminent engravers we read of: the former was so esteemed by Alexander, that he forbade any body else to engrave his head; and Augustus's head, engraven by the latter, was deemed so beautiful, that the succeeding emperors chose it for their seal. All the polite arts having been buried under the ruins of the Roman empire, the art of engraving on stones met with the same fate. It was retrieved in Italy at the beginning of the 15th century, when one John of Florence, and after him Dominic of Milan, performed works of this kind no way to be despised. From that time, such sculptures became common in Europe, and particularly in Germany, whence great numbers were sent into other countries; but they came short of the beauty of those of the ancients, especially those on precious stones; for, as to those on crystal, the Germans, and after their example the French, &c. have succeeded well enough. In this branch of engraving, either the diamond or emery may be used. The diamond, which is the hardest of all stones, is only cut by itself, or with its own matter. The first thing to be done in this branch of engraving is, to cement two rough diamonds to the ends of two sticks big enough to hold them steady in the hand, and to rub or grind them against each other till they be brought to the form desired. The dust or powder that is rubbed off, serves afterwards to polish them, which is performed with a kind of mill that turns a wheel of soft iron. The diamond is fixed in a brass dish; and, thus applied to the wheel, is covered with diamond dust, mixed up with the oil of olives; and when the diamond is to be cut facet-wise, they apply first one face, then another, to the wheel. Rubies, sapphires, and topazes, are cut and formed the same way on a copper wheel, and polished with tripoli diluted in water. As to agates, amethysts, emeralds,

emeralds, hyacinths, granites, rubies, and others of the softer stones, they are cut on a leaden wheel, moistened with emery water, and polished with tripoli on a pewter wheel. Lapis lazuli, opal, &c. are polished on a wooden wheel. To fashion and engrave vases of agate, crystal, lapis lazuli, or the like, a kind of lathe, like that used by pewterers, is used to hold the vessels, which are to be wrought with proper tools; that of the engraver generally holds the tools, which are turned by a wheel; and the vessel is held to them to be cut and engraved, either in relief or otherwise; the tools being moistened from time to time with diamond dust and oil, or at least emery and water. To engrave figures or devices on any of these stones, when polished, such as medals, seals, &c. they use a little iron wheel, the ends of whose axis are received within two pieces of iron, placed upright, as in the turner's lathe; and to be brought closer, or set further apart, at pleasure; at one end of the axis are fitted the proper tools, being kept tight by a screw. Lastly, The wheel is turned by the foot, and the stone applied by the hand to the tool, and is shifted and conducted as occasion requires. The tools are generally of iron, and sometimes of brass; their form is various, but they generally bear some resemblance to chisels, gouges, &c. Some have small round heads, like buttons, others like ferrets, to take the pieces out, and others flat, &c. When the stone has been engraved, it is polished on wheels of hair brushes and tripoli.

ENGRAVING ON STEEL is chiefly employed in cutting seals, punches, matrices, and dyes, proper for striking coins, medals, and counters. The method of engraving with the instruments, &c. is the same for coins as for medals and counters: all the difference consists in their greater or less relief; the relief of coins being much less considerable than that of medals, and that of counters still less than that of coins. Engravers in steel commonly begin with punches, which are in relief, and serve for making the creux or cavities of the matrices and dyes; though sometimes they begin with the creux or hollowness; but then it is only when the intended work is to be cut very shallow. The first thing that is done, is designing the figures; the next is the moulding them in wax, of the size and depth they are to lie, and from this wax the punch is engraven. When the punch is finished, they give it a very high temper, that it may the better bear the blows of the hammer with which it is struck, to give the impression to the matrix. The steel is made hot to soften it, that it may the more readily take the impression of the punch; and after striking the punch on it in this state, they proceed to touch up or finish the strokes and lines, where, by reason of their fineness, or the too great relief, they are any thing defective, with steel gravers of different kinds, chisels, flatters, &c. being the principal instruments used in graving on steel. The figure being thus finished, they proceed to engrave the rest of the medal, as the mouldings of the border, the engraved ring, letters, &c. with little steel punches well tempered, and very sharp.

ENGRAVING ON WOOD. See **CUTTING**. It is performed in three different modes, viz. 1. With a single block, on which the design is traced with a pen, and those parts which should be white carefully hollowed out. This block is afterwards printed by the letter-press printers, in the same manner as they print a book. 2. With two, three, or more blocks; the first having the outlines cut upon it; the second is reserved for the darker shadows; and the third for the shadows which terminate upon the lights; and those are substituted in their turn, each print receiving an impression from every block. This mode of engraving is called *chiaro-scuro*, and was designed to represent the drawings of the old masters. 3. On wood and on copper: in these the outline is engraved in a bold dark style upon the copper; and two or more blocks of wood are substituted to produce the lighter and darker shadows, as before.

ENGUCHE, in heraldry, is said of the great mouth of a hunting horn, when its rim is of a different colour from that of the horn itself.

ENHARMONIC, in music. The Greeks had three different species of music; the Diatonic, the Chromatic, and the Enharmonic. This last was esteemed by much the most agreeable and powerful of the three; but the difficulty of its execution rendered its duration short, and later artists were upbraided for having sacrificed it to their indolence.

ENIGMA. See **ÆNIGMA**.

ENEISEISK, a fortified town of Russian Siberia, in the government of Tobolsk, 400 miles E. N. E. of Kollivan.

ENMANCHE, in heraldry, [from *manché*, Fr. *i. e.* a sleeve,] is when lines are drawn from the centre of the upper edge of the chief to the sides, to about half the breadth of the chief; signifying sleeved, or resembling a sleeve.

ENNA, in ancient geography, a town of Sicily, situated on an eminence S. of the Chrysas; called the centre of Sicily.

ENNEAGON, [from *ennea* and *γωνία*,] in geometry, a polygon with nine sides. See **POLYGON**.

ENNEANDRIA, in botany, [from *ennea*, nine, and *andria*, a man,] the 9th class in Linnaeus's sexual system, consisting of plants which have hermaphrodite flowers with 9 stamina or male organs. See **BOTANY**.

ENNERIS, in ancient ship-building, a galley with nine tires of oars.

ENNIS, or **CLARE**, the capital of Clare county, in Ireland. It is 112 miles S. W. of Dublin. Lon. 9. 0. W. Lat. 52. 42. N.

ENNISCORTHY, a town of Ireland, in Wexford, Leinster; 59 miles S. of Dublin.

ENNISKERRIES, two islands of Ireland, in Kilmurphy Bay, 6 miles off the coast of Clare county. Lon. 9. 35. W. Lat. 52. 40. N.

ENNISKILLEN. See **INNISKILLEN**.

ENNUI, a French word introduced into the English language, to express that listless state of insipidity and inactivity of body and mind, with which people in high life are often tormented, at those intervals of habitual dissipation, which lie heavy upon them, when, having no object that immediately interests their passions, they feel themselves totally at a loss how to employ, or, as the fashionable world express it, to kill their time; and who, of consequence spend it in drowsy yawnings, till the hour of dissipation or riot returns. In a word, Ennui is a disease of the mind, wherein the body is in some degree affected, produced by continued habits of indolence, luxury and dissipation, or frivolous amusement, and which greatly detracts from the happiness of those, who, if they were to employ the gifts of fortune in a more rational manner, would have it in their power to fill up every moment of life, in the purest and most perfect happiness that the present state of human nature affords, by enjoying felicity themselves, and dispensing it to all around them.

ENO, or **ENOS**, a town of European Turkey, in Romania, 28 miles N. W. of Gallipoli. Lon. 26. 15. E. Lat. 40. 46. N.

ENOCH, [חֵנֹךְ, Heb. *i. e.* dedicated,] the son of Cain, in honour of whom

ENOCH, the first city taken notice of in scripture, was so called by Cain, who built it. It was situated E. of Eden. Gen. iv. 17.

ENOCH, the son of Jared and father of Methuselah, was born A. M. 622. At the age of 65 he begat Methuselah, and lived 300 years after, and had several sons and daughters. Enoch walked with God; and after that he had lived 365 years, "he was not, for God took him." Some construe these last words, as if they intimated that Enoch died a natural death, because in reality he lived not near so long as the other patriarchs of those times; as if God, to secure him from corruption, had taken him early out of this world. But the generality of the fathers and commentators assert that he died not, but was translated out of the sight of men, as Elijah was. The apostle Paul shews very clearly that Enoch was translated, and did not see death, Heb. xi. 5. The eastern people, who called Enoch Edris, believe that he received from God the gift of wisdom and knowledge; and that God sent him 30 volumes from heaven, filled with all the secrets of the most mysterious sciences. The Rabbins maintain, that when Enoch was translated to heaven, he was admitted into the number of the angels, and is the person generally known by the name of Michael.

ENOCH, THE PROPHECY or, an apocryphal book, ascribed to Enoch. The apostle Jude (ver. 14, 15,) cites a passage from the book of Enoch, which has much exercised interpreters. The question is, whether the apostle took this passage out of any particular book written by Enoch, which might be extant in the first ages of the church? whether he received it by tradition? or lastly, by some particular revelation? It is thought probable, that he read it in the book ascribed to Enoch, which, though apocryphal, might contain several truths that St. Jude, who was favoured with a supernatural degree of understanding, might make use of to the edification of the faithful. The ancients greatly esteemed this work. Tertullian expresses his concern, that it was not generally received. That father, on the authority of this book, deduces the original

original of idolatry, astrology, and unlawful arts, from the revolted angels, who married with the daughters of men. St. Augustine allows, indeed, that Enoch wrote something divine, because he is cited by St. Jude; but he says, it was not without reason that this book was not inserted in the canon, which was preserved in the temple at Jerusalem. This father sufficiently insinuates, that the authority of this book is doubtful, and that it cannot be proved that it was really written by Enoch. Indeed the account it gives of giants engendered by angels, and not by men, has manifestly the air of a fable, and the most judicious critics believe it ought not to be ascribed to Enoch. This book laid a long time buried in darkness; till the learned Joseph Scaliger recovered a part of it. Scaliger, Vossius, and other learned men, attribute this work to one of those Jews who lived between the time of the Babylonish captivity and that of Jesus Christ. Others are of opinion, that it was written after the rise and establishment of Christianity, by one of those fanatics with whom the primitive church was filled, who made a ridiculous mixture of the Platonic philosophy and the Christian divinity.

ENOS, the son of Seth and father of Cainan, was born, A. M. 235. Moses tell us (Gen. iv. 26,) that then "men began to call upon the name of the Lord;" or, as others translate it, that "Enos began to call upon the name of the Lord;" or was the inventor of religious rites and ceremonies in the external worship. This worship was kept up and preserved in Enos's family, while Cain's family was plunged in all kinds of immorality and impiety. Several Jews are of opinion, that idolatry was first introduced into the world at the time of Enos. They translate the Hebrew thus, "Then men began to profane the name of the Lord." Good men, to distinguish themselves from the wicked, began to take upon them the quality of sons or servants of God; for which reason, Moses, (Gen. vi. 1, 2,) says, that the sons of God; (that is to say the descendants of Enos, who had hitherto preserved the true religion), seeing the daughters of men, that they were fair, took them wives of all which they choose. Enos died at the age of 905; A. M. 1140.

ENOTARUSK, a town of Russia in the government of Caucasus, 72 miles N. N. E. of Astracan.

ENS, [Lat.] any being or existence.

ENS POSITIVUM, & **ENS REALE**, terms used in the schools by metaphysicians, synonymously with ens, for entity, as above defined, by way of distinction from

ENS RATIONIS, an imaginary being, or a thing that exists only in the imagination.

ENS, among chemists, imports the power, virtue, and efficacy, which certain substances exert upon our bodies.

ENS, in geography, a river of Germany, which rises in Saltsburgh, and runs into the Danube.

ENS, or **ENNS**, a city of Austria, seated on an eminence, at the conflux of the Ens and the Danube; and strongly defended by an arsenal and two castles. It lies 90 miles W. by S. of Vienna.

ENS, a town of Batavia in the department of the Yssel, and island of Schokland, in the Zuyder Zee: 10 miles N. W. of Campen.

ENSATÆ, in botany, [from *ensis*, a sword;] the 6th order in Linnaeus's natural method.

ENSAY, a small inhabited island of Scotland, in the county and on the coast of Inverness; four miles E. of Berneray.

ENSEELED, in falconry, a term applied to a hawk that has a thread drawn through her upper eye-lid, and made fast under her beak, to take away the light.

ENSEMBLE, [from *in* and *simul*, Lat.] a French term, sometimes used in English; literally signifying together, or one with another. In architecture, the ensemble, or tout ensemble, of a building, means the whole work, or composition, considered together, and not in parts; and sometimes also, the relative proportion of the parts to the whole.—"All those pieces of building make a fine ensemble."—"This picture is good, taking the parts separately; but the tout ensemble is bad."

ENSENE, a town of Egypt, on the E. side of the Nile; 120 miles S. of Cairo. Lon. 30. 54. E. Lat. 28. 5. N.

ENSIGN, [*enseigne*, Fr.] in the military art, a banner under which the soldiers are ranged according to the different companies or parties they belong to. See **COLOURS**, **FLAG**, **STANDARD**, &c. The European ensigns are pieces of taffety with various fi-

gures, arms, and devices, painted on them, in different colours; the Turkish ensigns are horses-tails.

ENSIGN is also the officer that carries the colours, being the lowest commissioned officer in a company of foot, subordinate to the captain and lieutenant. It is a very honourable and proper post for a young gentleman at his first coming into the army: he is to carry the colours both in assault, day of battle, &c. and should not quit them but with his life: he must always carry them himself on his left shoulder: only on a march he may have them carried by a soldier. If the ensign be killed, the captain must carry the colours in his stead.

ENSIGN, NAVAL, a large standard or banner hoisted on a long pole erected over the poop, and called the ensign staff. The ensign is used to distinguish the ships of different nations from each other; and to characterise the different squadrons of the navy. The British ensign in ships of war is known by a double cross, viz. that of St George and St Andrew, formed upon a field which is either red, white, or blue.

ENSIGNS, ANCIENT. The ensign of the ancient Persians, according to Xenophon, was a golden eagle on a white flag; the Corinthians bore a Pegasus, or winged horse, on theirs; the Athenians an owl; the Messenians, the Greek letter M; the Lacedæmonians, the Δ . The Romans had a great diversity of ensigns; the wolf, minotaur, horse, boar, and at length the eagle, where they stopped: this was first assumed in the 2d year of the consulate of Marius. A military ensign on a medal of a Roman colony, denotes it a colony peopled with old soldiers.

ENSISHEIM, a town of France, in the department of the Upper Rhine, and late province of Alsace, 10 miles S. W. of Brisac.

ENSKIRKEN, a town of Germany, in the late duchy of Juliers, 15 miles S. W. of Cologne.

ENTABLATURE, or **ENTABLEMENT**, the architrave, frieze, and cornice, of a pillar; being in effect the extremity of the flooring, which is either supported by pillars, or by a wall, if there be no columns. Harris.

ENTABLER, in the manege, the fault of a horse, whose croupe goes before his shoulders in working upon volts; which may be prevented by taking hold of the right rein, keeping your right leg near, and removing your left leg as far from the horse's shoulders as possible.

ENTAIL, in law, signifies fee tail, or fee entailed; that is, abridged, curtailed, or limited, to certain conditions. See **FEU**, and **TAIL**.

ENTE, in heraldry, a method of marshalling, used more frequent abroad than with us, and signifying grafted. We have, indeed, one instance of enté, in the grand quarter of his majesty's royal ensign, whose blazon is Brunswick and Lünenburg impaled with ancient Saxony, enté en pointe, "grafted in point."

ENTEROCÉLE, [*εντεροκηλη*], a rupture from the bowels pressing through or dilating the peritonæum, so as to fall down into the groin. The remedy in such cases, is chiefly by trusses and bolsters. Quincy.

ENTEROLOGY, [*εντερον* and *λογος*], the anatomical account of the bowels and internal parts. See **ANATOMY**.

ENTEROMPHALOS, [*εντερον* and *ομφαλος*], an umbilical or navel rupture.

ENTHUSIASM, [*ενθουσιασμος*], an ecstasy of the mind, whereby it is led to think and imagine things in a sublime, surprising, yet probable manner. This is the enthusiasm felt in poetry, oratory, music, painting, sculpture, &c.

ENTHUSIASM, in a religious sense, implies a transport of the mind, whereby it fancies itself inspired with some revelation, impulse, &c. from heaven. Mr. Locke gives the following description of religious enthusiasm. "In all ages, men in whom melancholy has mixed with devotion, or whose conceit of themselves has raised them into an opinion of a great familiarity with God, and a nearer admittance to his favour than is afforded to others, have often flattered themselves with a persuasion of an immediate intercourse with the Deity, and frequent communications from the Divine Spirit. Their minds being thus prepared, whatever groundless opinion comes to settle itself strongly upon their fancies, is an illumination from the Spirit of God. And whatsoever odd action they find in themselves a strong inclination to do, that impulse is concluded to be a call or direction from heaven, and must be obeyed."

obeyed. It is a commission from above, and they cannot err in executing it. This I take to be properly enthusiasm, which, though arising from the conceit of a warm and overweening brain, works, when it once gets footing, more powerfully on the persuasions and actions of men, than either reason or revelation, or both together; men being most forwardly obedient to the impulses they receive from themselves."

ENTHYMEME, in logic and rhetoric, [from *ενθυμησθαι*, to think, or conceive, a compound of *εν* and *θυμος*, mind,] is the most simple and elegant of all argumentations; being what a man, in arguing closely, commonly makes, without attending to the form. Thus, that verse remaining of Ovid's tragedy, intitled *Medea*, contains an enthymeme; *Servare potui, perdere an possum rogas*: "I was able to save you; consequently to have destroyed you." All the beauty would have been lost, had all the propositions been expressed; the mind is displeased with a rehearsal of what is no ways necessary. This kind of syllogism is perfect in the mind,

but imperfect in the expression, because one of the propositions is suppressed, as being easily supplied by the understanding of those with whom we discourse, e. g. Every man is mortal; therefore every king is mortal: where the minor proposition, every king is a man, is omitted as being sufficiently known. There is a particular elegance in the enthymeme form of arguing, as leaving somewhat to the exercise and invention of the mind; for which reason it is very frequent, as well in common conversation, as in the most polite writers. It not only shortens discourse, and adds a certain force and liveliness to our reasoning, but gives the reader a pleasure not unlike that the author himself feels in composing. Hence we are put upon exerting ourselves, and seem to share in the discovery of what is proposed to us.

ENTIERTIE denotes the whole, in contradistinction to moiety, which denotes the half; and a bond, damages, &c. are said to be entire when they cannot be apportioned.

ENTIRE TENANCY, signifies a sole possession in one man.

ENTOMOLOGY.

ENTOMOLOGY, [from *εντομη*, an insect, and *λογος*, a discourse,] the science of insects, a branch of zoology, which treats exclusively of this class of animals. The name of this science appears to be modern, but the study of the science is undoubtedly very ancient. Solomon, who is perhaps the most ancient zoologist, as well as botanist on record, is expressly said (1 Kings iv. 33,) to have "spoken also" (or written) "of creeping things," and may therefore be ranked as the earliest entomologist we know of. It is to be regretted that his works on this, as well as on many other subjects, are lost. But without attempting to enumerate the various ancient authors, who, since Aristotle and Pliny, have written upon this branch of natural history, we shall only mention here, that the great Linnæus may be justly considered as the father of Entomology as a distinct branch of science. Several modern authors, however, contributed to pave the way for Linnæus's improvement of entomology. Among these none has greater merit than the illustrious Dr. Swammerdam, that great inquirer into nature, who, by his ingenious and nice contrivances for dissecting the minutest insects, opened a field of investigation, and a fund of science, formerly quite unoccupied, and unknown. Insects being endowed with the various powers of creeping, flying, and swimming, there is scarce any place, however remote and obscure, in which they are not to be found. The great confusion which appeared to the ancients to arise from their number, made them never attempt to reduce them to any system. Swammerdam observed, that their metamorphoses were divided by nature into several states or orders. Their external appearance also carried with it some mark of distinction: so that entomologists called all those of the coleoptera order, Scarabæi, or beetles; those of the lepidoptera, Papiliones, butterflies; those of the gymnoptera order that had only two wings, Muscæ, flies; and those of the same order that had four wings, Apes, bees. No farther progress was made in the systematic part of this science till the time of Linnæus. He was the first who undertook to determine the genera, and assign them their proper characters, in the "*Systema Naturæ*;" and thus reduced this science to a systematic form. This system, in subsequent editions, was considerably enriched and amended by him, inasmuch that the science of entomology now shines forth in its full lustre. He first instituted natural orders, and reduced them into genera by expressive names; determined an infinite number of species in the "*Fauna Succica*" and "*Museum Regina*;" collected with incredible pains the synonymous names given by the various authors who had written on them; and, lastly added their descriptions, and the places in which they were to be found. So that the system of this illustrious author will lead any person, without the assistance of a master, for the most part, easily to ascertain the name of any insect he may meet with. Before his time, scarce more than 200 insects were known; whereas, in the last edition of his system, he has determined the names of nearly 3000 distinct species; though this is not the sixth

part of the number that is now known. Notwithstanding the great degree of perfection to which Linnæus had brought entomology, several authors have since made considerable alterations in his system. Among these, the most distinguished are Geoffroy, Scopoli, and Schæffer. The first of these entomologists, in his "*Histoire Abrégée des Insectes*," published at Paris in 1764, has, besides changing the orders, or first grand divisions of the Linnæan system, formed from different families of Linnæan genera many new genera; "some of them" (says Mr. Thomas Pattenison Yeats, in the Preface to his "*Institutions of Entomology*," p. vi.) "very judiciously; others perhaps without sufficient grounds."—"Scopoli, (he adds,) in his *Entomologia Carniolicæ*, published at Vienna in 1763, has made few alterations in the Linnæan system, but those seem every one to be well founded, and his specific characters equal those of Linnæus. Schæffer, in his *Elementa Entomologia*, printed at Ratisbon in 1766, has followed Geoffroy with very few and inconsiderable variations; but his figures convey a pretty good idea of his genera." Mr. Yeats also mentions the system of Poda, a Jesuit, as "a work much praised by Scopoli, which alone is sufficient to convey an advantageous idea of it," but adds, that he "had not been able to procure it, nor learn how or in what he differs from Linnæus." On the whole, as the Linnæan system of Entomology is still esteemed to be at least as perfect as those of any of his successors, it will be sufficient here to give the young entomologist a view of it, with a few of the synonyma of other authors, whom he may afterwards consult if he inclines. Those who are desirous of attaining a systematic knowledge of insects, ought first to acquire the terms made use of in the science, that they may be able rightly to denominate every part of an insect. The student should first know what an insect is, lest he mistake Hippocampi, and other amphibious animals, for them, as was formerly done; or confound them with Vermes, which Linnæus first distinguished from insects, and which differ as essentially from them as the class Mammalia do from birds. Every insect is furnished with a head, antennæ, and feet, of all which the vermes are destitute. All insects have six or more feet; they respire through pores on the sides of their bodies, which are termed spiracula: their skin is extremely hard, and serves them instead of bones, of which they have internally none. From this definition, the *acus marina* is evidently no insect. But the antennæ placed on the fore-part of the head constitute the principal distinction. These are jointed and moveable in every part, in which they differ from the horns of other animals: they are organs conveying some kind of sense; but we have no more idea of what this kind of sense is, than a man has, who, without eyes, attempts to determine the particular action of the rays of light on the retina of the eye, or to explain the changes which from thence take place in the human mind. That they are the organs of some kind of sense, is apparent from their perpetually moving them forward; yet the hard crust with which they are invested

vested, and their shortness in flies and other insects, would induce one to believe them not to be in the organs of touch: Mr. Barbut supposes them to constitute or to contain the organs of hearing. That they are tubular, and filled with air and some kind of humour, appears from the antennæ of butterflies immersed in water.

OF THE EXTERNAL PARTS OF INSECTS.

The external parts of the bodies of insects, agreeably to the usual anatomical division of those in larger animals, may be divided into the head, trunk, abdomen, and extremities.

I. CAPUT, the HEAD. It is asserted in the "Fundamenta Entomologiae," that this part in insects is without brain. The difference between the brain and spinal marrow consists in the former being a medullary part organized. We do not deny the existence of a medullary thread in the heads of insects, but we never could discover it to be organized: hence the hippobosca equina, or horse-fly, will live, run, nay even copulate, after being deprived of its head; to say nothing of many others which are capable of living long under the same circumstances. Insects not being apparently furnished with ears, they have been supposed to be incapable of hearing; as we can no more conceive that sense to exist without ears than vision without eyes. That they are nevertheless susceptible of any shrill or loud noise, as well as fishes, is indisputable; but it has been supposed to be in a manner different from that of hearing. Mr. Barbut, however, thinks they possess this sense in a very distinct manner. Many insects, he observes, are well known to be endowed with the power of uttering sounds, such as large beetles, the bee, wasp, common fly, gnat, &c. The sphinx atropos squeaks, when hurt, nearly as loud as a mouse. Now, if insects are endowed with the power of uttering sounds, it certainly must be for some purpose. As they vary their cry occasionally, it must certainly be designed either to give notice of pleasure or pain, or some affection in the creature who possesses it. "The knowledge of their sounds (he justly argues) is undoubtedly confined to their tribe, and is a language intelligible to them only; saving when violence obliges the animal to exert the voice of nature in distress, craving compassion; then all animals understand the doleful cry. For instance, attack a bee or wasp near the hive or nest, or a few of them: the consequence of that assault will be, the animal or animals, by a different tone of voice, will express his or their disapprobation or pain; that sound is known to the hive to be plaintive, and that their brother or brethren require their assistance; and the offending party seldom escapes with impunity. Now, if they had not the sense of hearing, they could not have known the danger their brother or brethren were in by the alteration of their tone." The organ of hearing, in our author's opinion, is situated in the antennæ; both from their situation in the part of the head most favourable to such organs, their inward structure being moveable, the ears of most inferior animals being so. He has never considered the antennæ as either offensive or defensive, but has observed them to be endowed with an exquisite sense of feeling; that the animal appeared to be in agony when its antennæ were pinched; and that it takes care to avoid the touching of any hard substance with them roughly. "This tenderness in the organ of hearing (says he) is common to all animals; and insects seem to be particularly tender in these parts by quickly withdrawing them from the touch." Mr. Barbut further observes, that the antennæ of all insects are composed of joints varying in size, form, and number. Those who are chiefly confined to live under water have their antennæ in general shorter than those who live on land. Some who roam at large in the air, have them long and slender. They are all hollow, and are rendered flexible by the joints, which are very visible in the horns of the crab and lobster. This hollowness, in our author's opinion, is to receive the sound communicated to the extremities of the antennæ by the repercussion of the air affected by any noise; and convey it, by means of the joints, from one to another, till it arrives in that lessened degree of tone best suited to the timid nature of the animal. In this circumstance there may be many variations in point of perfection in those organs; the strength, utility, and degree of power in receiving sound, being proportioned to the necessities of the animals, different in their nature and requisites. In most animals, the entrance to the auricular organ is palatous; but in this case the animal would suffer great inconveni-

ence from such an organization, as the organ would often be clogged with dirt, &c. Several entomologists have doubted, whether insects have the sense of smell, no organ being found in them adapted to that purpose: and although it was evident they had a perception of agreeable and fetid effluvia, it was thought to be in a manner altogether unknown to us. Mr. Barbut is of opinion, that the organs of smell reside in the palpi or feelers. Many insects have four and some six, two of which are in general cheliform, in order to assist the insect in conveying its food to its mouth. The palpi are in continual motion, the animal thrusting them into every kind of matter, as a hog would do his nose, smelling and searching after food. Insects which apparently do not possess palpi or spiral tongues, have undoubtedly some organ concealed within the mouth analogous to them in function and utility; the fleshy proboscis of the fly is thrust into every substance in which the animal expects to find food; and when it is extended, nearly in the middle are situated, in our author's opinion, two upright palpi, which, no doubt, perform in their turn some office, perhaps that of smell.

TONGUE. Many insects have no tongue, nor make any sound with their mouth; but for this purpose some use their feet, others their wings, and others some elastic instrument with which they are naturally furnished.

EYES. Most insects have two; but the gyrynus has four, the scorpion six, the spider eight, and the scolopendra three. They have no eye-brows, but the external tunic of their eyes is hard and transparent like a watch-glass; their eyes have no external motion, unless it be in the crab. They consist for the most part of one lens only; but in those of the butterfly, dipteræ, and many of the beetles, they are more numerous. Pugett says, he discovered 17,325 lenses in the cornea of a butterfly, and Lieuwenhoek 800 in a fly.

ANTENNÆ. Of these there are in general two (unless four be allowed to some species of crabs,) and placed on the fore-part of the head. They are peculiar to insects, and are plainly distinguishable from the tentaculæ of the vermes, in being crustaceous; and from the palpi of insects, which are more numerous, placed near the mouth, and are sometimes wanting. As the antennæ are of great moment in distinguishing the various kinds of insects, we shall enumerate and explain the several different forms of them. 1. *Setaceæ*, are those which grow gradually taper towards the extremity. 2. *Filiformes*, such as are of the same thickness throughout. 3. *Moniliformes*, are filiform, like the preceding, but consists of a series of round knobs, like a necklace of beads. 4. *Clavate*, such as gradually increase in size toward the extremity. 5. *Capitate*, are clavate, but have the extremity somewhat round. 6. *Fissiles*, are capitate; but have the capitulum, or knob, divided longitudinally into three or four parts, or laminae, as in the scarabæi. 7. *Perfoliata*, are also capitate; but have the capitulum horizontally divided, as in the dermestes. 8. *Pectinata*, so called from their similitude to a comb, though they more properly resemble a feather, as in the moths and elateres. This is most obvious in the male. 9. *Aristatæ*, such as have a lateral hair, which is either naked or furnished with less hairs, as in the fly; *Breviores*, those which are shorter than the body; *longiores*, those which are longer than the body; *mediocres*, those which are of the same length with the body; all three of which varieties are distinguishable in the cerambyces.

PALPI, or FEELERS, resemble filiform, articulated, moveable antennæ. They are most commonly four in number, sometimes six; they are sufficiently distinguished from antennæ, in being naked, short, and always placed at the mouth.

Os, the MOUTH, is generally placed in the anterior part of the head, extending somewhat downwards. In some insects it is placed under the breast, as in the chermes, coccus, cancer (crab,) and curculio.

ROSTRUM, or PROBOSCIS, is the mouth drawn out to a rigid point: in many of the hemiptera class it is bent downward toward the breast and belly, as in the cicada, nepa, notonecta, cimex (bug,) aphid, and remarkably so in some curculiones.

MAXILLÆ, the JAWS, are two in number, sometimes four, and at other times more; they are placed horizontally; the inner edge of them in some insects is serrated or furnished with little teeth.

LINGUA, the TONGUE, in some insects is taper and spiral, as in the

the butterfly; in others it is fleshy, resembling a proboscis, and tubular, as in the fly.

LABIUM SUPERIUS, the UPPER LIP, is situated above the jaws; as in the scarabæus and gryllus.

STEMMATA, or CROWNS, are three smooth hemispheric dots, placed generally on the top of the head; as in most of the hymenoptera, and others.

II. TRUNCUS, the TRUNK, is that part which comprehends the breast or thorax: it is situated between the head and abdomen; and has the legs inserted into it, that its parts may be distinctly determined. It is divided into thorax, scutellum, and sternum.

The **THORAX** is the back part of the breast, and is very various in its shape. It is called *dentatus*, when its sides are armed with points; *spinosis*, when its back is furnished with them, as in the cerambyx; and *marginatus*, when its margin is laterally dilated, as in the silpha and cassida.

SCUTELLUM, or ESCUTCHEON, is the posterior part of the thorax: it is frequently triangular; and appears to be divided from the thorax by an intervening suture, as in most of the coleoptera.

The **STERNUM** is situated on the inferior part of the thorax; it is pointed behind in the elateres, and blind in some of the dytisci.

III. The ABDOMEN is in most insects distinct from the thorax; it is the posterior part of the body of the insect; and is composed of a number of annular segments, which serve occasionally to lengthen or shorten it, and to contain the organs of chylyfication, &c.

SPIRACULA are little holes or pores, placed singly on each side of every segment of the abdomen: through these the insect breathes; and if oil be applied so as to stop them up, it proves fatal to most of them.

TERGUM, the BACK, is the superior part of the abdomen.

VENTER, the BELLY, is the inferior part.

ANUS, is the posterior part of the abdomen, perforated for the evacuation of the excrement. This part also frequently contains the organs of generation.

IV. ARTUS, the LIMBS, or EXTREMITIES, are the various instruments of motion.

PEDES, the LEGS, consist of several parts. The first joints of the leg, which is generally thickest, is called femur; the second, which is generally of the same size throughout, tibia; the third, which is jointed, tarsus; and the last, which in most insects is double, is named unguis. The legs of insects, in general, are named from the various motions they produce: *Cursorii*, from that of running, which are the most numerous; *saltatorii*, from that of leaping; *natatorii*, from that of swimming, &c.—In the *saltatorii*, the thighs are remarkably large, by which means they are able to leap to a considerable distance, as in the gryllus, grasshopper, &c. In those of the *natatorii*, the feet are flat, and edged with hairs, which answer the purpose of oars in assisting them to swim, as in the dytiscus.—*Mutici*, are such feet as have no claws.—*Chelæ*, or claws, are the fore-feet enlarged towards their extremities, each of which is furnished with two less claws, which act like a thumb and finger; as in the crab.

ALÆ, WINGS, the instruments which enable the insect to fly. These are membranous and undivided, except in the instance of the phalænæ alucitæ, in which they are in part divided. Most insects have four; the diptera class, and the coccus, however, have only two. The wing is divided into its superior and inferior surfaces: its anterior part in a butterfly, is that towards the anterior margin, or next to the head; its posterior part, that towards the anus; its exterior part, that towards the outer edge; and the interior, that next the abdomen.

The **ALÆ** are called **PLICATILES**, when they are folded at the time the insect is at rest, as in the wasp; opposite to these are the **Planæ**, which are incapable of being folded. *Erectæ*, such as have their superior surfaces brought in contact when the insect is at rest; as in the ephemera, libellula puella, and virgo, and papilionæ, (butterflies,) *Patentes*, such as remain horizontally extended when the insect is at rest, as in the phalænæ geometræ, and most of the libellulæ. *Incumbentes*, such as cover horizontally the superior part of the abdomen when the insect is at rest. *Deflexæ*, are incumbentes, but not horizontally, the outer edges declining toward the sides. *Reversæ*, are deflexæ, with this addi-

tion, that the edge of the inferior wings projects from under the anterior part of the superior ones. *Dentatæ*, are those in which the edge is serrated, or scolloped; *Caudatæ*, those in which one or more projections in the hinder wings are extended into processes. *Reticulatæ*, when the vessels of the wings put on the appearance of network, as in the hemerobius perla: the two anterior wings generally become superior, and the posterior ones inferior, in moths, when their wings are closed; but the anterior wings are called primary, and the inferior ones secondary, in butterflies, as none can properly be called inferior, when the wings are all erect.

Colores, the colours, are self-apparent and various; but according to their several shapes, they take the different names of puncta, dots; maculæ, spots; fasciæ, bands, which frequently run across and sometimes surround the edge of the wings; strigæ, streaks, which are very slender fasciæ; and lineæ, lines, which are longitudinally extended.

Ocellus, is a round spot, containing a less spot of a different colour in its centre. **Stigma**, another term introduced by Linnaeus, signifies the spot, or anastomosis, in the middle of the wing near the anterior margin; it is conspicuous in most of the hymenoptera and neuroptera, and even in the coleoptera. The single or double kidney-shaped spot, situated in the same part of the anterior wings, and frequently occurring in the phalænæ, is distinguished likewise by the name of stigma.

Elytra, the plural of elytron. The upper wings, which are of a hard substance, in some degree resembling leather, and which in most insects are of a very hard texture, but in others flexible, are called elytra; their superior surface is generally convex, their inferior one concave. When the insect flies, they are extended; and shut when it rests, closing together, and forming a longitudinal suture down the middle of the back, as in the coleoptera. They are of various shapes. *Abbreviatæ*, when shorter than the abdomen. *Truncatæ*, when shorter than the abdomen, and terminating in a transverse line. *Fastigiata*, when of equal or greater length than the abdomen, and terminating in a transverse line. *Serratæ*, when the exterior margin towards the apex is notched or serrated, as in some of the buprestes. *Spinosa*, when their surface is covered with sharp points or prickles. *Scabra*, when their surface is so uneven as to grate against the fingers. *Striata*, when marked with slender longitudinal furrows. *Porcata*, when with elevated longitudinal sulci or ridges. *Sulcatæ*, when these ridges are concave. *Hemelytra*, when the superior wings are of a middle substance betwixt leather and membrane; either totally so, as in the grylli; or partially so, as in the cimices, nepæ, and notonectæ: these are commonly named hemiptera.

Halteres, poisers, (a term also introduced by Linnaeus,) are little heads placed on a stalk or peduncle, most frequently under a little arched scale. They are found only in the class diptera, and appear to be nothing more than the rudiments of the hinder wings.

CAUDA, the Tail, in most insects is, *Simplex*, simple, capable of being extended, and again drawn back at pleasure. In the crab and scorpion, however, it is *Elongata*, elongated, or lengthened out. *Setacea*, bristle-shaped, or taper; as in the raphidea. *Trisetæ*, consisting of three bristles; as in the ephemera. *Furcata*, forked, as in the podura. *Forcipata*, resembling a pair of forceps; as in the forficula. *Foliola*, resembling a leaf; as in the blattæ, grylli, and some species of cancri. *Teliferæ*, armed with a dart or sting; as in the scorpion and panopa. *Aculeus*, the sting, an instrument with which they wound, and at the same time instil a poison; with such the bee, wasp, scorpion, &c. are furnished.

For further illustration of this subject see the following figures of plate XXXVII.

- Fig. 1. **ANTENNÆ PECTINATÆ**, or feathered antennæ; as in the phalænæ, moths.
2. **ANTENNÆ PERFORIATÆ**, or perforiated; as in the dermestor and dytiscus.
3. **ANTENNÆ FISSILES**, or fissile, divided into laminæ at the extremity, as in the scarabæi, beetles.
4. **ANTENNÆ CLAVATÆ**, or club-shaped, as in the papilio, butterfly.
5. **ANTENNÆ MONILIFORMES**, like a necklace of beads; as in the chrysomela.
6. **ANTENNÆ SETACEÆ**, setaceous, or bristle-shaped; as in many of the phalænæ.
7. **ANTENNÆ ARISTATÆ**,

7. **ANTENNA ARISTATÆ**, furnished with a lateral hair, as in the fly.
 8, 9. *a* Caput, the head. *b* Palpi, the feelers. *c* Antennæ, or horns. *d* Oculi, the eyes. *e* Thorax. *f* Scutellum, or escutcheon. *g* Pectus, the breast. *h* Sternum, the breast-bone. *i* Abdomen, and its segments. *k* Anus. *l* Elytra, or shells. *m* Membranous wings. *n* Pêdes, the feet, which are natatorii.
 10. *o* Femur, the thigh. *p* Tibia, or leg. *q* Tarsus, or foot. *r* Unguis, or claw.
 11. *a* The anterior part of the wing. *b* The posterior part. *c* The exterior part. *d* The interior part. *e* The margin. *f* The disk, or middle. *g* Oculi, the eye.
 12, 13, 14, 15, Represent the insect in its egg, caterpillar, pupa, and perfect state.

OF THE METAMORPHOSES OF INSECTS.

All insects, except those of the aptera order, are continually undergoing some transformation. Insects change first from the (ovum) egg, into the (larva) caterpillar or maggot; then into the (pupa) chrysalis; and lastly into the (imago) fly, or perfect state. During each of these changes, their appearance differs as much as night and day. The insect, as soon as it came out of the egg, was by former entomologists called *eruca*; but as this is synonymous with the botanic name *sisymbrium*, it was changed by Linnæus for the term.

LARVA; a name expressive of the insect's being, in this state, as it were, masked, having its true appearance concealed. Under this mask of skin the entire insect, such as it afterwards appears when perfect, lies concealed, enveloped only in its tender wings, and putting on a soft and pulpy appearance; insomuch that Swammerdam was able to demonstrate the butterfly with its wings to exist in a caterpillar, though it bore but a faint resemblance to its future perfection. The insect, therefore, in this state, undergoes little other alteration but the change of its skin. The larvæ are, for the most part, larger than the insect when perfect, and are very voracious. The caterpillar of the cabbage butterfly eats double what it would seem to require from its size; but its growth is not adequate to its voracity.

PUPA. The insect in this state was formerly called chrysalis or aurelia: but as the appearance of gilding is confined to a few butterflies only, the term of pupa has been adopted in its stead; because the lepidoptera, especially, resemble an infant in swaddling clothes; and in this state all, except those of the hemiptera class, take no nourishment.

IMAGO is the third state. This name is given by Linnæus to this third change, in which the insect appears in its proper shape and colours: and as it undergoes no more transformations, it is called perfect. In this state it flies, is capable of propagating its species, and receives true antennæ; which before, in most insects, were scarce apparent. As the shape of the pupa is different in different insects, it assumes different names; thus it is called,

COARCTATA, when it is round, and as it were turned, without the least resemblance of the structure of the insect; as in the diptera.

ORTECTA, when it consists as it were of two parts, one of which surrounds the head and thorax, and the other the abdomen.

INCOMPLETA, when they have wings and feet, but are not capable of moving them; as in most of the hymenoptera.

SEMICOMPLETA, in which they walk or run, but have only the rudiments of wings.

COMPLETA, in which they immediately obtain the perfect form of the insect, without undergoing any more change: as in those of the aptera class, except only the flea. The bed bug also belongs to this class. The spider undergoes frequent transformations, though only in the colour of its skin. The crustaceous insects, as

crabs, lobsters, &c. yearly cast their shells, as their growth would otherwise be impeded. The scolopendri, when young, have fewer feet than when they are full grown. All insects, as soon as they undergo the third change, are arrived at their full growth; nor do we find any difference in the size of the same species of insect in the same countries, unless, during its caterpillar state, it has not had a sufficiency of proper food.

OF THE ORDERS OF INSECTS.

The class of insects is divided by Linnæus into seven orders:

1. The **COLEOPTERA** [from *καλος*, a sheath, and *πτερον*, a wing,] are such insects as have crustaceous elytra or shells, which shut together, and form a longitudinal suture down the back of the insect; as the beetle, *buprestis ignita*, Plate XXXVII. fig. 16.

2. **HEMIPTERA** [from *ημισυ*, half, and *πτερον*,] have their upper wings usually half crustaceous and half membranaceous, not divided by a longitudinal suture, but incumbent upon each other; as the cimex, fig. 17.

3. **LEPIDOPTERA** [from *λεπιδ*, a scale, and *πτερον*,] are insects having four wings, covered with fine scales in the form of powder or meal; as in the butterfly, *papilio antiopa*, fig. 18.

4. **NEUROPTERA** [from *νευρον*, a nerve, and *πτερον*,] have four membranous transparent naked wings, generally like net-work; as in the *panorpa coa*, fig. 19.

5. **HYMENOPTERA** [from *υμενη*, a membrane, and *πτερον*,] are insects with four membranous wings, tail furnished with a sting; as in the *tenthredo*, fig. 20.

6. **DIPTERA** [from *δύω*, two, and *πτερον*,] are such as have only two wings, and poisers; as in the fly, *musca*, fig. 21.

7. **APTERA** [from *α*, without, and *πτερον*,] insects having no wings. This last division contains scorpions, spiders, crabs, lobsters, &c. See **ARANEA**, **CANCER**, &c. To insert here the characters of all the different genera is not necessary, as they will be found in their order in the course of the work.

OF THE TRIVIAL NAMES OF THE VARIOUS SPECIES OF INSECTS.

The trivial names of the various species of insects, subjoined to those of their respective genera occasion little or no controversy. They are current like money, and of the same utility as the proper names of men. Insects living on vegetables should receive their names from the particular plants on which they mostly feed, as that method is preferable to all others. Thus the names of the *coccus cacti*, *phalana mori*, &c. are excellent; and when we are able to give such to insects, the old ones ought to be discarded. But we must be cautious of not being too hasty in our judgement in this respect; as insects, when they cannot get their favourite food, will often eat other plants. Thus the silk-worm, for want of mulberry leaves, will eat those of lettuce, though it will not be so well nourished by them. Various other instances of the invention of trivial names may be met with in the *Systema Naturæ*, particularly among the butterflies and moths. To prevent confusion from the great number of species which constitute the genus of *phalana*, they are distributed into sections, and distinguished by the terms of *bombyces*, *noctuæ*, *geometra*, *tortrices*, *pyralides*, *tineæ*, and *alucitæ*. The *bombyces*, and *noctuæ*, which are so much alike, that the females of the *bombyces* are with great difficulty distinguished from the *noctuæ*, are named promiscuously. All the *geometra* have their names terminating in *aria* and *ata*, according as their antennæ are setaceous or pectinated: The *tortrices*, in *aria*; the *pyralides*, in *alis*; the *tineæ*, in *ella*; and the *alucitæ*, in *dactyla*: so that it is evident from the termination, to what section the insect is to be referred. It were to be wished that similar institutions could be formed throughout the whole science, as here the name itself serves to distinguish the insect.

ENTOYER, in heraldry, denotes a bordure charged wholly with things without life: it seems to be a corruption of the French *entour*, round about.

ENTRE DOURO E MINHO, or **ENTRE-DUERO-E-MINHO**, a province of Portugal, so named from its situation between the rivers Douro and Minho; 60 miles long from N. to S. and 35 broad. The soil is fertile and the air pure.

ENTREPAS, in the manege, a broken pace or going, that is neither walk nor trot, but has somewhat of an amble. This is a pace or gait of such horses as have no reins or back, and go upon their shoulders; or, of such as are spoiled in their limbs.

ENTRE-TAJO-E-GUADIANA, the province of Alentejo. See **ALENTEJO**.

ENTRING LADDERS, in a ship, are of two sorts; one used by the vessel's sides, in a harbour, or in fair weather, for persons to go in and out of the ship: the other is made of ropes, with small staves for steps; and is hung out of the gallery to enter into the boat, or to come aboard the ship, when the sea runs so high that they dare not bring the boat to the ship's side for fear of staving it.

ENTRY, WRIT OF, is a writ directed to the sheriff, requiring him to command the tenant of the land, that he render to the demandant the premises in question, or appear in court on such a day, and shew why he has not done it. Of this writ there are four kinds.

1. A writ of entry *sur disseisin*, that lies for the disseisee against the disseisor, upon a disseisin done by himself; and this is called a writ of entry in the nature of an assise. 2. A writ of entry *sur disseisin in the per*, for the heir by descent, who is said to be in the per, as he comes in by his ancestor. 3. A writ of entry *sur disseisin in the per and cui*, where the feoffee of a disseisor makes a feoffment over to another; and then the form of a writ is, that the tenant had no title to enter but by a prior alienee, to whom the intruder demised it. A writ of entry *sur disseisin in the post*, which lies after a disseisin: the land is removed from hand to hand, in case of a more remote seisin, whereunto the other three degrees do not extend, 1 Inst. 238. But all these writs are now disused, as the title of lands is now usually tried upon actions of ejectment or trespass.

ENTRY AD COMMUNEM LEGEM. The writ of entry *ad communem legem* lies where tenant in dower, or tenant by the courtesy, or for life, aliens in fee, or for the life of another, or in tail, the lands which they hold, &c. after their death, he in the reversion who has it in fee, or for life, shall have this writ against whomsoever is in possession of the land.

ENTRY AD TERMINUM QUI PRATERIIT: a writ of entry *ad terminum qui prateriit*, lies where a man leases lands or tenements for term of life, or years, and afterwards the term expires, and he to whom the lease was made, or a stranger, enters upon the land, and occupies the same, and deforces the lessor; the lessor or his heirs shall have the writ. And this writ lies in the per, cui, and post; for if the lessee holds over his term, and afterwards makes a feoffment, the lessor or heirs may have this writ against the feoffee in the per; and if the feoffee makes a feoffment over, he may have it against the second feoffee in the per and cui, and against the third feoffee in the post.

ENTRY IN CASU CONSIMILI. A writ of entry *in casu consimili* lies where tenant by the courtesy, or for life, or for another's life, aliens in fee, or in tail, or for life; now he in the reversion, who has an estate there for life, or in fee simple, or in tail, shall have that writ during the life of the tenant for life who aliened.

ENTRY IN CASU PROVISIO. The writ of entry *in casu proviso* lies where tenant in dower aliens in fee, for life, or in tail, the land which he holds in dower; he who has the reversion in fee, or in tail, or for life shall maintain that writ against the alienee, and against him who is the tenant of the freehold of land during the life of the tenant in dower, &c. and the writ may be made in the per, cui, and post.

ENTRY CAUSA MATRIMONII PRELOCUTI, lies where lands or tenements are given to a man, on condition that he shall take the donor to his wife within a certain time: and if he do not espouse her within the limited time, or espouse another, or otherwise disable himself, that he cannot take her according to the said condition, then the donor and her heirs shall have the said writ against him, or against whoever else is in the said land.

ENTRY, BILL OF, in commerce, See **BILL**. In making entries inwards, it is usual for merchants to include all the goods they have on board the same ship in one bill, though sometimes they may

happen to be upwards of twenty several kinds; and in case the goods are short-entered, additional or post-entries are now allowed, though formerly the goods so entered were forfeited. As to bills of entry outwards, or including goods to be exported, upon delivering them, and paying the customs, you shall receive a small piece of parchment called a *cocket*, which testifies your payment thereof, and all duties for such goods. If several sorts of goods are exported at once, of which some are free, and others pay customs, the exporter must have two cockets, and therefore must make two entries; one for the goods that pay, and the other for the goods that do not pay custom. Entries of goods on which a drawback is allowed, must likewise contain the name of the ship in which the goods were imported, the importer's name, and time of entry inwards. The entry being thus made, and an oath taken that the customs for those goods were paid as the law directs, you must carry it to the collector and comptroller, or their deputies; who, after examining their books, will grant a warrant, which must be given to the surveyor, searcher, or land-waiter, for them to certify the quantity of goods; after which the certificate must be brought back to the collector and comptroller, or their deputies, and oath made that the said goods are really shipped, and not landed again in any part of Great Britain.

ENVELOPE, in fortification, a work of earth, sometimes in form of a simple parapet, and at others like a small rampart with a parapet: it is raised sometimes on the ditch, and sometimes beyond it.

ENVIRONNE, in heraldry, signifies surrounded with other things: thus, they say, a lion *enveroné* with so many bezants.

ENUMERATION, in rhetoric, a part of peroration; in which the orator, collecting the scattered heads of what had been delivered throughout the whole, makes a brief recapitulation thereof.

ENVOY, a person deputed to negotiate some affair with a foreign prince or state. Those sent from the courts of Britain, France, Spain, &c. to any petty prince or state, such as the princes of Germany, the late republics of Venice, Genoa, &c. go in quality inferior to that of ambassadors; and such a character only do those persons bear, who go from any of the principal courts of Europe to another, when the affair they go upon is not very solemn or important. There are envoys ordinary and extraordinary, as well as ambassadors; they are equally under the protection of the law of nations, and enjoy all the privileges of ambassadors; only differing in this, that the same ceremonies are not performed to them.

EOLIPILE. See **EOLIPILA**.

EON, or **ÆON**. See **ÆON**.

EONIANS, in church history, the followers of Eon, a wild fanatic of the province of Bretagne, in the 12th century, whose brain was disordered. He concluded from the resemblance between eum, in the form for exorcising malignant spirits, viz. *Per eum, qui venturus est judicare vivos et mortuos*, and his own name Eon, that he was the Son of God, and ordained to judge the quick and the dead. He was solemnly condemned by the council at Rheims, in 1148, at which Pope Eugenius III. presided, and ended his days in a miserable prison.

EORIA, in mythology, a feast celebrated by the Athenians in honour of Erigonus, who, by way of punishment, for their not avenging the death of his father Icarus, engaged the gods to inflict this curse on their daughters, that they should love men who never returned their passion.

EOSTRE, in mythology, a goddess of the Saxons, to whom they sacrificed in April, called the month of Eostra; and thence the name of Easter, which the Saxons retained after their conversion to Christianity, applying it to the festival celebrated in commemoration of our Saviour's resurrection.

EPACRIS, a genus of the monogynia order, and pentandria class of plants. Calyx five-parted; corolla monopetalous, tubular, roundish, depressed, quinquelocular, quinquevalvular; capsule, gaping; seeds numerous, small. It has four species, natives of New Zealand.

EPACT, [*ἐπικτη*, from *ἐπαυω*, to intercalate,] a number, whereby we note the excess of the common solar year above the lunar, and thereby may find out the age of the moon every year. For the solar year consisting of 365 days, the lunar but of 354, the lunations every year get 11 days before the solar year; and thereby,

in 19 years, the moon completes 20 times 12 lunations, or gets up one whole solar year; and having finished that circuit, begins again with the sun, and so from 19 to 19 years. For the first year afterwards the moon will go before the sun but 11 days; the second year 22 days; the third 33 days: but 30 being an entire lunation, cast that away, and the remainder three shall be that year's epact; and so on, adding yearly 11 days. Thus to adjust the lunar year to the solar through the whole of 19 years, 12 of them must consist of 12 synodical months each, and 7 of 13, by adding a month of 30 days to every year when the epact would exceed 30, and a month of 29 days to the last year of the cycle, which makes in all 209 days, *i. e.* 19×11 ; so that the intercalary or embolimaean years in this cycle are 4, 7, 10, 12, 15, 18, 19. If the new moons returned exactly at the same time after the expiration of nineteen years, as the council of Nice supposed they would do (when they fixed the rule for the observation of Easter, and marked the new moons in the calendar for each year of the lunar cycle) then the golden number multiplied by 11, would always give the epact. But in a Julian century, the new moons anticipate, or happen earlier than that council imagined they would by $\frac{2}{5}$ of a day. In a Gregorian common century, which is one day shorter than a Julian century, they happen $\frac{17}{25}$ of a day later, ($1 \text{ day} - \frac{2}{5} = \frac{3}{5}$). Now $\frac{17}{25} \times 3 = \frac{51}{25}$ for the three common centuries, but $\frac{2}{5}$ being subtracted, on account of the Gregorian bissextile century, there will remain $\frac{43}{25}$. Therefore in four Gregorian centuries, the new moons will happen later by $\frac{43}{25}$ of a day, and the epacts must be decreased accordingly. At present the Gregorian epact is 11 days short of the Julian epact; but the quotient of the number of the centuries divided by 4, which at this time is 4, multiplied by $\frac{43}{25}$, with the addition of the remainder 1 multiplied by $\frac{17}{25}$, makes in all but $\frac{182}{25}$, or 7 days $+\frac{1}{5}$, therefore $\frac{36}{5}$, *i. e.* 3 days $+\frac{3}{5}$ must be added to complete the 11 days. Whence we have the following general rule for finding the Gregorian Epact for ever. Divide the centuries of any year of the Christian era by 4, (rejecting the subsequent figures.) Let the quotient increased by 2 be multiplied by 43, and the remainder multiplied by 17; divide the sum of these two products by 25, and subtract the quotient from 11 times the golden number, and the remainder, the thirties being rejected, will be the epact.

Example for 1809.

$$\begin{array}{r} 18 \\ - 4, \text{ rem. } 2 \\ 4 \\ 6, (4 + 2) \times 43 = 258 \\ 2 \times 17 = 34 \\ (258 + 34) \div 25 = 11 \\ 11 \times 5 \text{ (Gold. No.)} = 55 \\ 55 - 11 \\ \hline 44 = 1, \text{ rem. } 14 = \text{Epact} \end{array}$$

Examp. 2. To find the epact for the ensuing year of Christ 1811, the golden number for the year being 7.

$$\begin{array}{r} 18 \\ - 4, \text{ and } 2 \text{ over.} \\ 4 \\ 6, (4 + 2) \times 43 = 258 \\ 2 \times 17 = 34 \\ 258 + 34 \\ \hline 292 \\ 25 \\ \hline 267 \\ 11 \times 7, \text{ (golden number,)} = 77 \\ 267 - 77 \\ \hline 190 = 2, \text{ and six over, which remainder will be the epact for the given year.} \end{array}$$

Examp. 3. To find the epact for the year of Christ 2000, the golden number for that year being 6.

$$\begin{array}{r} 20 \\ - 5 \text{ and nothing over.} \\ 4 \\ 7, (5 + 2) \times 43 = 301 \\ 0 \times 17 = 0 \\ 301 \\ \hline 301 \\ 25 \\ \hline 276 \\ 11 \times 6 = 66 \end{array}$$

66 - 12

30 = 1, and 24 over, which will be the epact for the year required.

A shorter rule for finding the epact until the year 1900. Subtract 1 from the golden number; and multiplying the remainder by 11, reject the thirties, and you have the epact.

Example for 1809.

$$\begin{array}{r} 5 \text{ (Gold.No.)} - 1 = 4 \\ (4 \times 11) - 30 = 15 = \text{epact.} \end{array}$$

Example for 1811.

$$\begin{array}{r} 7 \text{ (Gold. Number)} - 1 = 6 \\ (6 \times 11) - 30 = 6; \text{ the epact.} \end{array}$$

Example for 1820.

$$\begin{array}{r} 16 \text{ (Golden Number)} - 1 = 15 \\ (15 \times 11) - 150 = 15, \text{ the epact.} \end{array}$$

EPAMINONDAS, a celebrated Theban, the son of Polymnus, and one of the greatest heroes of antiquity. He studied philosophy under Lysis, a Pythagorean philosopher; was taught music by Dionysius and Olympiodorus: and was from his infancy, inured to all the exercises of body and mind. He was learned, generous, well skilled in war, brave, modest, and prudent; and had such a regard for truth, that he would not tell a falsehood even in jest. He saved the life of Pelopidas, who received in battle seven or eight wounds; and contracted a strict friendship with that general, which lasted till his death. At his persuasion, Pelopidas delivered Thebes from the yoke of the Spartans, who had rendered themselves masters of Cadmea, which occasioned a bloody war between the two nations. Epaminondas being made general of the Thebans, gained the celebrated battle of Leuctra, in which Cleombrotus II. the valiant king of Sparta, was killed. He then ravaged the enemy's country, and caused the city of Messina to be rebuilt and peopled. At length the command of the army was given to another, because Epaminondas had kept his troops in the field four months longer than he had been ordered by the people; but, instead of retiring in disgust, he now served as a common soldier, and distinguished himself by so many brave actions, that the Thebans, ashamed of having deprived him of the command, restored him to his post, in order to carry the war into Thessaly, where his arms were always victorious. A war breaking out between the Elians and the inhabitants of Mantinea, the Thebans took the part of the former. Epaminondas then resolved to endeavour to surprise Sparta and Mantinea; but not succeeding, he gave the enemy battle, in which he received a mortal wound with a javelin, the bearded iron remaining in the wound. Knowing that it could not be drawn out without occasioning immediate death, he would not suffer it to be touched, but continued to give his orders; and on his being told that the enemy were entirely defeated, "I have lived long enough (he cried) since I die without being conquered;" and at the same time he plucked the javelin from his wound, and expired, B. C. 363.

EPANORTHOSIS, in rhetoric, a figure by which a person corrects, or ingeniously revokes, what he just before alledged, as being too weakly expressed, in order to add something stronger, and more conformable to the passion with which he is agitated.

EPARER, in the manege, the flinging of a horse, or his jerking and striking with his hind legs.

EPAULETTES, a kind of shoulder-knots. Those for the soldiers are of the colour of the facing, with a narrow yellow or white tape round it, and worsted fringe; those for the officers are made of gold or silver lace, with a rich fringe; they are badges of distinction worn on one or both shoulders. Those of the dragoon guards, horse, and dragoons, are worn on the left shoulder: the light dragoons, and officers of grenadiers, have one on each shoulder; those of the battalion wear one on the right shoulder only, made of embroidery or lace with a gold or silver fringe. Those of the royal regiment of artillery are of gold and embroidery, with gold fringe on scarlet cloth, and worn on the right shoulder.

EPAULEMENT, [French, from *epaule*, a shoulder,] in fortification, a sidework made either of earth thrown up, of bags of earth, gabions, or of fascines and earth. It sometimes denotes a semibastion, and a square orillon, or mass of earth faced and lined with a wall, designed to cover the cannon of a cazemate.

EPENTHESIS, [επειθεσις,] in grammar, the addition of a vowel or consonant in the middle of a word.

EPERIES,

EPERIES, a town of Hungary, in the county of Saros, famous for salt mines, 20 miles N. of Cassovia.

EPERNAY, an ancient and handsome town of France, in the department of Marne, and late province of Champagne; famous for its wines and cloth manufacture. It is 17 miles N.W. of Châlons sur Marne.

EPEUS, a descendant of Endymion, the inventor of the battering ram, an engine of great service in sieges to make a breach. He is said to have built the Trojan horse, and founded the city Metapontum.

EPHA, or **EPHAH**, [עֲפָה, Heb.] a dry measure among the Jews, equal to three pecks, three pints, twelve and four-tenths inches. Also a liquid measure equal to four gallons, two pints, and fifteen inches.

EPHEBÆUM, in antiquity, the place where the ephebi or youth exercised.

EPHEBI, among the ancient Athenians, a designation given to their young men when they are arrived at eighteen years of age, at which time they had their names entered in a public register.

EPHEDRA, a genus of the monodelphia order, and diccia class of plants; natural order Coniferae. Male calyx bifid; no corolla; stamina seven; antheræ four, inferior, three superior; female, calyx four, bipartite, five-fold, one upon another; no corolla; pistils two; seeds two, covered by the calyx, resembling a berry. It has two species, natives of Russia.

EPHEMERA, [ἐφήμερη.] 1. A fever that terminates in one day. 2. An insect that lives only one day.

EPHEMERA, the **DAY FLY**, in entomology, a genus of the order neuroptera. Mouth without mandibles; feelers four, very short, filiform; antennæ short, filiform; above the eye are two or three large stemmata; wings erect, the lower ones much shorter; tail terminating in long bristles or hairs. These short-lived animals, of which there are about twenty species, in two divisions, according as they have two or three hairs in the tail, are found every where about waters in the summer. They take their name from the shortness of their life, and are distinguished into several species. Some live several days, others do not take flight till the setting of the sun, and live not to see the rising luminary. Some exist but one hour, others but half that time; in which short period they comply with the call of nature. With respect to those which live several days, there is a peculiarity observed, incident to them alone. They have to cast off one slough more, an operation which sometimes takes twenty-four hours to complete. To bring this about, they cling fast to a tree. The ephemera, before they flutter in air, have in some respect been fishes. They remain in the states of larva and chrysalis for one, two, or three years. The chrysalis only differs from the larva by having cases for wings on its back. Both have on their sides small fringes of hair, which, when put into motion, serve them as fins. Nothing can be more curious than the plying of those little oars in the water. Their abdomen is terminated, as well as in their state of flies, by three threads. These larvæ scoop out dwellings in the banks of rivers; small tubes made like siphons, the one serving for an entrance, the other affording them an outlet. The banks of some rivers are often perforated with them. When the waters decrease, they dig fresh holes lower down, to enjoy their element the water. The season and hour, when the chrysalids of the different species of the ephemera turn into flies, maintain a kind of regularity. The heat, the rise or fall of the waters, accelerate, however, or postpone their final display. The ephemera of the Rhine appear in the air two hours before sunset. These flies are hatched almost all at the same instant in such numbers as to darken the air. The most early of those on the Marne and Seine in France, do not begin to fly till two hours after sunset, in the middle of August. They are seen fluttering and sporting on the brink of their tomb. The glare of light attracts them, round which they perform a thousand circles with amazing regularity. See Plate XXXVII.

EPHEMERIS, [ἐφημερίς.] 1. A journal; an account of daily transactions. 2. An account of the daily motions and situations of the planets.

EPHEMERIS, [ἐπί, and ἡμέρα, a day,] in astronomy, a table calculated to shew the state of the heavens for every day at noon; or the places wherein all the planets are found at that time. From these tables the eclipses, conjunctions, and aspects, of the planets, are determined; horoscopes or celestial schemes constructed, &c.

Origan, Kepler, Argoli, Heckerus, Mezzaracchis, Wing, Dela Hire, Parker, &c. have published ephemerides. S. Cassini has calculated ephemerides of the sidera medicæ, or satellites of Jupiter, which are of good use in determining the longitude. In England, the Nautical Almanac, or Astronomical Ephemeris, published annually by anticipation, under the direction of the commissioners of longitude, is the most considerable. In France, celestial ephemerides were published by M. Desplaces every ten years, from 1715, to 1745: they were afterwards continued by the Abbé Caille, with many additions; of which an account may be seen in the History of the Academy of Sciences, for 1743. That academy have likewise published annually, from the beginning of the present century, a kind of ephemeris, under the title of Connoissance des Temps. White's ephemeris is also a very useful work for the practical astronomer.

EPHESIA, a festival held at Ephesus in honour of Diana.

EPHESTIA, in antiquity, a festival in honour of Vulcan, wherein three young men ran for a prize.

EPHESTRIA, feasts celebrated at Thebes in honour of Tiresias.

EPHESUS, an ancient city of Ionia, much celebrated on account of its temple of Diana, and for being the most famous mart of Asia Minor, as well as the metropolis of all Asia. Stephanus gives it the title of Epiphanestate, or most illustrious; and Pliny styles it the ornament of Asia. The ancient city stood about 50 miles south of Smyrna, near the mouth of the river Cayster, and the shore of the Icarian sea, which is a bay of the Ægean; but it has been so often destroyed and rebuilt, it is no easy matter to determine the precise place. Most of our modern travellers are of opinion, that the ancient city stood more to the south than the present; which they argue from the ruins that still remain. Ephesus was anciently known by the different names of Alopes, Ortygia, Mörge, Smyrna, Trachæa, Samornion, and Ptelea. It was called Ephesus, according to Heraclides, from Ἐφεσος, permission; because Hercules (says he) permitted the Amazons to live and build a city in that place. Others tell us, that Ephesus was the name of the Amazon that founded the city; for Pliny, Justin, and Orosius, unanimously affirm that it was built by an Amazon; while others bestow this honour upon Androclus, the son of Codrus, king of Athens, who was the chief of the Ionians that settled in Asia. But in matters of so early a date, it is impossible to come at the truth. What we know for certain is, that the city, which in the Roman times was the metropolis of all Asia, acknowledged Lysimachus for its founder; for that prince having caused the ancient city to be entirely demolished, rebuilt, at a vast expence, a new one, in a place more convenient, and nearer the temple. Ephesus is now called Ajasaloue, and still exhibits many relics of its ancient grandeur. It is seated near a gulph of the same name, and, according to some modern travellers, has still a good harbour, 40 miles S. of Smyrna. Lon. 27. 33. E. Lat. 37. 48. N.

EPHETÆ, [from ἐφίημι, I send forth,] in antiquity, magistrates among the Athenians, instituted by king Demophoon, to take cognizance of murder, man-slaughter, and chance-medley.

EPHIELIS, in botany, a genus of the octandria monogynia class and order. Calyx five-parted; petals five, with claws; necessary ten scales, two to each petal; capsule oblong, one-celled, two-valved, two-seeded. One species, viz. *E. guianensis*, a lofty tree, growing in the forests of Guiana.

EPHOD, [עֶפֶד,] a sort of ornament worn by the Hebrew priests. That worn by the high priest was richly composed of gold, blue, purple, crimson; and twisted cotton; and upon the part which came over his two shoulders, were two large precious stones, upon which were engraven the names of the twelve tribes of Israel, upon each stone six names. Where the ephod crossed the high priest's breast was a square ornament, called the breast-plate; in which twelve precious stones were set, with the names of the twelve tribes of Israel engraved on them, one on each stone. The ephods worn by the other priests were of plain linen. *Calmet.*

EPHORI, in Grecian antiquity, magistrates established by Lycurgus in ancient Sparta to balance the regal power. The authority of the ephori was very great. They sometimes expelled, and even put to death, the kings, and abolished or suspended the power of the other magistrates, calling them to an account at pleasure. There were five of them, or, as others say, nine. They presided in the

the public shews and festivals. They were entrusted with the public treasure; and made war and peace; and were so absolute, that Aristotle makes their government equal to the prerogative of a monarchy.

EPHORUS, an orator and historian of Cumæ in Æolia, about B. C. 352. He was disciple to Isocrates, by whose advice he wrote an history of all the battles between the Greeks and Barbarians, for 750 years. It was greatly esteemed by the ancients; but is now lost.

EPHRAIM, [אפרים, Heb. *i. e.* fruitful,] the second son of the patriarch Joseph, and the progenitor of one of the tribes of Israel, was born about A. M. 2293.

EPHRAIM, in ancient geography, one of the divisions of Palestine by tribes. Ephraim and the half-tribe of Manasseh are blended together by the sacred writer; and it only appears that Ephraim occupied the more southern, and the half-tribe of Manasseh the more northern parts, but both seem to have extended from the Jordan to the sea.

EPHREM, St. an ancient Christian writer, in the fourth century, deacon of Edessa, was born at Nisibe, in Syria, hence styled Syrus. He was greatly esteemed by St. Basil, and St. Gregory of Nice, and other great men. He wrote against the opinions of Sabellius, Arius, Apollinarius, the Manichees, &c. and acquired such reputation by his virtue and his works, that he was called the doctor and the prophet of the Syrians. He died in 378. The best editions of his works are, that of Oxford, in 1708 in folio, and that of Rome, from 1732 to 1736, in Syriac, Greek, and Latin, 6 vols. folio.

EPHYDOR, in antiquity, an officer in the Athenian courts of justice, who provided the plaintiff and defendant with equal water hour-glasses. When the glass was run out, they were not permitted to speak any further; and, therefore, we find them very careful not to lose or mispend one drop of their water. Whilst the laws quoted by them were reciting, or if any other business intervened, the glasses were stopped.

EPIBATÆ, [ἐπιβαταί,] among the Greeks, marines, or soldiers, who served on board the ships of war. They were armed in the same manner as the land-forces, only that many of them wore heavy armour.

EPIBATERION, [from ἐπιβαίνω, to go abroad,] a poetical composition, in use among the Greeks, rehearsed at a person's return from a voyage, thanking the immortal gods for his preservation.

EPIBATERIUM, a genus of the hexandria order, and monœcia class of plants. Calyx double, outward one six-leaved, very small; inner one three-leaved, large; corolla six-petaled; drupes three, roundish, monospermous; seed a kidney-shaped compressed nut, somewhat furrowed. One species.

EPIC, [ἐπικός, Latin; *επος*,] narrative; comprising narrations, not acted, but rehearsed. It is usually supposed to be heroic, or to contain one great action achieved by a hero.

EPIC, or **HEROIC POEM**, a poem expressed in narration, formed upon a story partly real and partly feigned; representing in a sublime style, some signal and fortunate action, distinguished by a variety of great events, to form the morals, and affect the mind with the love of heroic virtue. We may distinguish three parts of the definition, namely, the matter, the form, and the end. The matter includes the action of the fable, under which are ranged the incidents, episodes, characters, morals, and machinery. The form comprehends the way or manner of the narration, whether by the poet himself, or by any persons introduced, whose discourses are related: to this branch likewise belong the moving of the passions, the descriptions, discourses, sentiments, thoughts, style, and versification; and besides these, the similes, tropes, figures, and, in short, all the ornaments and decorations of the poem. The end is to improve our morals and increase our virtue. See **POETRY**.

EPICEDION, [from ἐπι, upon, and κηδος, funeral,] in Greek and Latin poetry, a poetical composition, on the death of a person. At the obsequies of any man of figure, there were three kinds of discourses usually made; that rehearsed at his bustum or funeral pile, was called *nenia*; that engraven on his tomb, epitaph; and that spoken in the ceremony of his funeral, *epicedion*.

EPICHIREMA, [ἐπιχειρημα,] in logic, a mode of reasoning, which comprehends the proof of one or both the premises of a syllogism, before the conclusion is drawn.

EPICHIROTONIA, among the Athenians. It was ordained by Solon, that once every year the laws should be carefully revised and examined; and if any of them were found unsuitable to the present state of affairs, they should be repealed. This was called *ἐπιχειροτονια των νομων*, from the manner of giving their suffrages by holding up their hands. See Potter's *Archæol. Græc.* lib. 1. cap. 26. tom. i. p. 142.

EPICHRYSUM, in botany, a genus of the cryptogamia fungi class and order. Fungus rounded, concave; seeds globular; tailless, attached to a branched thread creeping within. It has one species, viz. *E. argenteum*.

EPICENE, in grammar, a term applied to nouns, which, under the same gender and termination, mark indifferently the male and female species. Such in Latin is *aquila, vespertilio*, &c. which signify equally a male or female eagle or bat. Grammarians distinguished between *epicene* and common. A noun is said to be common of two kinds, when it may be joined either with a masculine or a feminine article; and *epicene*, when it is always joined to one of the two articles, and yet signifies both genders.

EPICETETUS, a celebrated Stoic philosopher, born at Hierapolis in Phrygia, in the first century, was the slave of Epaphroditus, a freed man and one of Nero's guard. Domitian banishing all philosophers from Rome, about A. D. 94, Epictetus retired to Nicopolis in Epirus, where he died in very advanced age; and after his death, the earthen lamp he used had sold for 3000 drachmas. He was a man of great modesty; which was eminent in his practice, as well as in his recommendation to others; hence he used to say, "That there was no need of adorning a man's house with rich hangings or paintings, since the most graceful furniture is temperance and modesty, which are lasting ornaments, and will never be the worse for wearing." Of all the ancient philosophers, he seems to have made the nearest approaches to the Christian morality, and to have had the most just ideas of God and providence. He always possessed a cool and serene mind, unruffled by passion; and was used to say, that the whole of moral philosophy was included in these words, support and abstain. One day his master Epaphroditus strove in a frolic to wrench his leg; when Epictetus said, with a smile, and free from emotion, "If you go on, you will certainly break my leg." but the former redoubling his effort, and striking it with all his strength, he at last broke the bone; when all the return Epictetus made was, "Did not I tell you, Sir, that you would break my leg?" No man was more expert at reducing the rigour of the maxims of Stoics into practice. He conformed himself strictly, both in his discourse and behaviour, to the manners of Socrates and Zeno. He waged continual war with fancy and fortune; and it is an excellence peculiar to him, that he admitted all the severity of the Stoics without their sourness, and reformed Stoicism as well as professed it. Besides vindicating the immortality of the soul as strenuously as Socrates, he declared openly against suicide, the lawfulness of which was maintained by the rest of the sect. Arrian, his disciple, wrote a large account of his life and death, which is lost; and preserved four books of his discourses and his *Enchiridion*, of which there have been several editions in Greek and Latin; and, in 1758, a translation of them into English was published by the learned and ingenious Miss Carter.

EPICUREAN, one who holds the physiological principles of Epicurus.

EPICUREAN PHILOSOPHY, the doctrine or system of philosophy maintained by Epicurus and his followers. It consisted of three parts; canonical, physical, and ethereal. The first was about the canons or rules of judging. The censure which Tully passes upon him for his despising logic, will hold true only with regard to the logic of the Stoics, which he could not approve of, as being too full of nicety and quirk. Epicurus was not acquainted with the analytical method of division and argumentation, nor was he so curious in modes and formation as the Stoics. Soundness and simplicity of sense, assisted with some natural reflections, was all his art. His search after truth proceeded only by the senses; to the evidence of which he gave so great a certainty, that he considered them as an infallible rule of truth, and termed them the first natural light of mankind. In the second part of his philosophy, he laid down atoms, space, and gravity, as the first principles of all things; he did not deny the existence of God, but which is equally absurd and wicked, thought it beneath his majesty to concern himself with human affairs; he held him a blessed immortal Being, having

having no affairs of his own to take care of, and above meddling with those of others. As to his ethics, he made the supreme good of man to consist in pleasure, and consequently supreme evil in pain. Nature itself, says he, teaches us this truth; and prompts us from our birth to procure whatever gives us pleasure, and to avoid what gives pain. To this end he proposes a remedy against the sharpness of pain: this was to divert the mind from it, by turning our whole attention upon the pleasures we have formerly enjoyed. He held that the wise man must be happy, as long as he is wise: the pain, not depriving him of his wisdom, cannot deprive him of his happiness. Gassendus pretends, that the pleasure, in which this philosopher has fixed the sovereign good, was nothing else but the highest tranquillity of mind, in conjunction with the most perfect health of body: but Tully, Horace, and Plutarch, as well as almost all the fathers of the church, give us a very different representation: indeed the nature of this pleasure, in which the chief happiness is supposed to be seated, is a grand problem in the morals of Epicurus. Hence there were two kinds of Epicureans, the rigid and the remiss: the first were those who understood Epicurus's notion of pleasure in the best sense, and placed all their happiness in the pure pleasures of the mind, resulting from the practice of virtue: the loose or remiss Epicureans, taking the words of that philosopher in a gross sense, placed all their happiness in bodily pleasures, or debauchery.

EPICURUS, the greatest philosopher of his age, was born at Gargettium in Attica, about B. C. 340, in the 109th Olympiad. He settled at Athens in a fine garden he had bought; where he lived with his friends in great tranquillity, and educated a great number of disciples. They all lived in common with their master. The respect which his followers paid to his memory is admirable: his school was never divided, but his doctrine was followed as an oracle. His birth-day was still kept in Pliny's time; the month he was born in was observed as a continual festival; and they placed his picture every where. He wrote many books, and valued himself upon making no quotations. He raised the atomical system to a great reputation, though he was not the inventor of it, but had only made some change in that of Democritus. As to his doctrine concerning the supreme good or happiness, it was very liable to be misrepresented, and some ill effects proceeded from thence, which discredited his sect. He was charged with perverting the worship of the gods, and inciting men to debauchery; but he did not forget himself on this occasion: he published his opinions to the world: he wrote some books of devotion; recommended the veneration of the gods, sobriety, and chastity; and it is certain that he lived in an exemplary manner, and conformably to the rules of philosophical wisdom and frugality. Timocrates, a deserter of his sect, spoke very scandalously of him. Gassendus has given us all he could collect from the ancients concerning the person and doctrine of this philosopher. He died of a suppression of urine, aged 72.

EPICYCLE, [*ἐπικύκλιος* and *ἐπικύκλιος*], in the ancient astronomy, a little circle whose centre is in the circumference of a greater circle; or it is a small orb, or sphere, which being fixed in the deferent of a planet, is carried along with it; and yet, by its own peculiar motion, carries the planet fastened to it round its proper centre. It was by means of epicycles that Ptolemy and his followers solved the various phenomena of the planets, but more especially their stations and retrogradations. The great circle they called the eccentric or deferent, and along its circumference the centre of the epicycle was conceived to move; carrying with it the planet fixed in its circumference, which in its motion downwards proceeded according to the order of the signs, but, in moving upwards, contrary to that order. The highest point of a planet's epicycle they called apogee, and the lowest perigee. See **APOGEE** and **PERIGEE**.

EPICYCLOID, [*ἐπικυκλίδης*], in geometry, a curve generated by the revolution of the periphery of a circle, **ACE**, Plate LIV. fig. 17, along the convex or concave side of the periphery of another circle, **DGB**. The length of any part of the curve, that any given point in the revolving circle has described, from the time it touched the circle it revolved upon, shall be to double the versed sine of half the arch, which all that time touched the circle at rest, as the sum of the diameters of the circles, to the semi-diameter of the resting circle, if the revolving circle moves upon the convex side of the resting circle; but if upon the concave side, as the difference of the diameters to the semi-diameter of the resting

circle. In the Philosophical Transactions, No. 218, we have a general proposition for measuring the areas of all cycloids and epicycloids, viz. The area of any cycloid or epicycloid is to the area of the generating circle, as the sum of double the velocity of the centre and velocity of the circular motion, to the velocity of the circular motion: and, in the same proportion, are the areas of segments of those curves to those of analogous segments of the generating circle.

EPIDAUROM, **EPIDAUROS**, or **EPITAUROM**, in ancient geography, a town of Dalmatia, on the Adriatic.

EPIDAUROS, in ancient geography, a town of Argolis, in Peloponnesus, on the Saronic bay, S. of the promontory **Spiræum**; called sacred, because of the religious veneration paid to **Æsculapius**, whose temple stood five miles from the town.

EPIDEMIA, in Grecian antiquity, festivals kept in honour of Apollo and Diana, at the stated seasons, when those deities, who could not be present every where, were supposed to visit different places, in order to receive the vows of their adorers.

EPIDEMICAL, or **EPIDEMIC**, [*ἐπιδημικός*], in general, denotes a spreading disorder, which, as is supposed, arises from some corruption or malignity in the air, and attacks great numbers of people at certain seasons. Mankind have always been more inclined to search for the most distant causes, in order to explain physical events, rather than to avail themselves of those which are within their reach. Thus the yellow-fever, which in 1793 ravaged the city of Philadelphia, was doubtless generated by the immense quantities of damaged coffee, and other putrescible substances, exposed in the heat of summer on the muddy banks of the river. In like manner the plague, which formerly destroyed great numbers in London, was not always imported, but probably originated at home, where, in those ages, cleanliness was not so generally attended to as it is at present. Hence this domestic virtue has guarded us against many epidemics, to which other less cleanly nations have been subject. But there is still great occasion for improvements, especially in the houses of the narrow courts and alleys of the metropolis.

EPIDENDRUM, a genus of the diandria order, and gynandria class of plants; natural order, Orchideæ. Nectary turbinate, oblique, reflex; corolla spreading; spur none. There are 124 species. This numerous genus is obscure in its character, differences, and synonyms; for the flowers in dried specimens can hardly be unfolded. These plants are natives of America, and the East Indies.

EPIDERMIS, [*ἐπιδερμῖς*], the same with cuticle. See **ANATOMY** and **CUTIS**.

EPIDICASIA, among the Athenians. Daughters inheriting their parents estate, were obliged to marry their nearest relation; which gave occasion to persons of the same family to go to law with one another, each pretending to be more nearly allied to the heiress than the rest. The suit was called *ἐπιδικασίας δίκη*, and the virgin, about whom the relations contested, *ἐπιδίκασ*.

EPIDOTÆ, deities who presided over the growth of children; worshipped by the Lacedæmonians, and invoked by those who supposed themselves persecuted by ghosts, &c.

EPIGÆA, in botany, a genus of the monogynia order, and decandria class; natural order, Bicornes. Calyx, outer three-leaved; inner five-parted; corolla salver-form; capsule five-celled. Two species, viz. *E. repens*, creeping epigæa, or trailing arbutus, and *E. cordifolia*, heart-leaved epigæa; the former is a native of Virginia and Canada, and the latter of Guadaloupe.

EPIGLOTTIS, one of the cartilages of the larynx or wind-pipe. See **ANATOMY**.

EPIGRAM, [*ἐπιγραμμα*], originally signifies inscription. Epigrams derive their origin from those inscriptions placed by the ancients on their tombs, statues, temples, triumphal arches, &c. These, at first, were only simple monograms: afterwards increasing their length, they made them in verse, to be the more easily retained. Herodotus, and others, have transmitted to us several of them. Such little poems retained the name of epigrams, even after the design of their first institution was varied, and the people began to use them for the relation of little facts and accidents, the characterizing of persons, &c. The point is a quality much insisted on by the critics, who require the epigram constantly to close with something poignant and unexpected, to which all the rest of the composition is only preparatory; while others, on the contrary exclude the point, and require the thought to be equally diffused

diffused throughout the poem, without laying the whole stress on the close; the former is usually Martial's practice, and the latter that of Catullus. The Greek epigrams have scarce any thing of the point or briskness of the Latin ones: those collected in the Anthology, have most of them a remarkable air of ease and simplicity, attended with something just and witty: such as we find in a sensible peasant, or a child that has wit. They have nothing that bites, but something that tickles. Though they want the salt of Martial, yet to a good taste they are not insipid; except a few of them, which are quite flat and spiritless. However the general faintness and delicacy of the pleasantries in them, has given occasion for a Greek epigram, or epigram à la Grecque, to denote, among the French, an epigram void of sharpness. The epigram admits of a great variety of subjects: some are made to praise, and others to satirize; which last are much the easiest, ill-nature serving instead of point and wit. Boileau's epigrams are all satires on one or another; those of Des Reaux are all in honour of his friends; those of Buchanan are partly satirical, partly panegyrical; and those of Mad. Scudery are so many eulogies. The epigram being only a single thought, it would be ridiculous to express it in a great number of verses.

EPILEPSY, [*επιληψία*], a convulsion, or convulsive motion of the whole body, or of some of its parts, with a loss of sense. A convulsive motion happens when the blood, or nervous fluid, runs into any part with so great violence, that the mind cannot restrain them. Quincy.

EPILEPSY, or **FALLING-SICKNESS**, as it is also called, though hitherto considered an incurable disease, has often been relieved by the conjoint power of medicines and an appropriate diet. Hence, a pure and fresh air, light but nutritive food; cheerful company, and moderate exercise, will be here of greater service than the most celebrated nostrums, which are daily imposed upon the credulous. On the other hand, epileptic patients should carefully avoid all strong and heating, as well as hot liquors, which equally relax the stomach: abstain from swine's flesh, very fat meat, game, water-fowl, salted or pickled provisions, and likewise from oily and watery vegetables: hence they ought not to eat nuts, nor cabbages, greens, &c. See **MEDICINE**.

EPILOBIUM, the **WILLOW-HERB**: in botany, a genus of the monogynia order, and octandria class of plants: natural order, Calycanthemæ. Calyx four-cleft; petals four; capsule oblong, inferior; seeds downy. There are fourteen species. These plants are hardy perennials, commonly considered as weeds.

EPILOGUE, in oratory, the conclusion of a discourse, ordinarily containing a recapitulation of the principal matter delivered.

EPILOGUE, **THE**, in dramatic poetry, is addressed to the audience, after the play is over, by one of the principal actors; and usually contains some reflections on certain incidents in the play, especially those in the part of the person that speaks it. Having somewhat of pleasantry, it is intended to compose the passions excited by the representation; a practice which is ridiculed by the Spectator; and compared to a merry tune upon the organ after a good sermon, to wipe away any impressions that might have been made thereby.

EPIMEDIUM, **BARREN-WORT**: a genus of the monogynia order, and tetrandria class of plants; natural order, Corydæles. Nectary four, cupform, leaning on the petals; corolla four-petaled; calyx very caducous; fruit a silique. One species, viz. *E. alpinum*, alpine barrenwort.

EPIMENIDES, an ancient poet and philosopher, by some stiled a Phœstian; by others said to have been born at Gnossus in Crete. Contrary to the custom of his country, he always wore his hair long; which, according to some, was because he was ashamed of being thought a Cretan: and indeed he does not seem to have had a high opinion of his countrymen, if that verse cited by St. Paul be, as is generally believed to be, his; "The Cretans are always liars, evil beasts, slow bellies." His reputation was so great over all Greece, that he was esteemed a favourite of the gods. The Athenians being afflicted with the plague, and commanded by the oracle to make a solemn lustration of the city, sent Nicias the son of Niceratus, with a ship to Crete, to desire Epimenides to come to them. He accepted their invitation, accompanied the messengers to Athens, performed the lustration of the city, and the plague ceased. Here he contracted an acquaintance with Solon, whom he privately instructed in the proper method

for the regulation of the Athenian commonwealth. Having finished his business at Athens, the citizens offered him many valuable presents and high honours, and appointed a ship to carry him back to Crete; but he would accept of nothing except a little branch of the sacred olive preserved in the citadel; and desired the Athenians to enter into an alliance with the Gnosians. Having obtained this he returned to Crete; where he died soon after, aged 157 years; or as the Cretans, consistently with their character, pretended, 299. He was a great poet, and wrote 5000 verses on the Genealogy of the gods, 6500 on the building of the ship Argo, and Jason's expedition to Colchis, and 4000 concerning Minos and Rhadamanthus. He wrote also in prose, Concerning Sacrifices and the Commonwealth of Crete. St. Jerom likewise mentions his Book of Oracles and Responses. The Lacedæmonians procured his body, and preserved it among them by the advice of an oracle; and Plutarch tells us, that he was reckoned the 7th wise man by those who refused to admit Periander into the number.

EPIMETHEUS, in fabulous history, a son of Japetus and Clymene, one of the Oceanides, who married Pandora, by whom he had Pyrrha, the wife of Deucalion. He had the curiosity to open the box which Pandora had brought with her, and from thence issued a train of evils, which from that moment have never ceased to afflict the human race. Hope only remained at the bottom of the box, not having a sufficient time to escape, and it is she alone which comforts men under misfortunes. Epimetheus was changed into a monkey by the gods, and sent into the island Pithecusa.

EPINAL, a town of France, in the department of Vosges, and late province of Lorraine; 35 miles S. E. of Nancy.

EPIPHANIUS, Sr. an ancient father of the church, born at Besanducan, a village in Palestine, about A. D. 332. He founded a monastery near the place of his birth, and presided over it. He was afterwards elected bishop of Salamis; when he took part with Paulinus in opposition to Meletius, and ordained in Palestine, Paulinian the brother of St. Jerom; on which a contest arose between him and John bishop of Jerusalem. He afterwards called a council in the island of Cyprus, in which he procured a prohibition of the reading of Origen's writings; and made use of all his endeavours to prevail on Theophilus bishop of Alexandria to engage St. Chrysostom to declare in favour of that decree: but not meeting with success, he went himself to Constantinople, where he would not have any conversation with St. Chrysostom; and formed the design of entering the church of the apostles, to publish his condemnation of Origen; but being informed of the danger to which he would be exposed, he resolved to return to Cyprus: but died at sea, in 403. His works were printed in Greek, at Basil, 1544, in folio; and were afterwards translated into Latin, in which language they have been often reprinted. Petavius revised and corrected the Greek text by two manuscripts, and published it together with a new translation at Paris in 1622. This edition was reprinted at Cologne in 1682.

EPIPHANY, [*επιφάνεια*], a Christian festival, otherwise called the manifestation of Christ to the Gentiles, observed on the sixth of January, in honour of the appearance of our Saviour to the three magi, or wise men, who came to adore him, and bring him presents. The feast of epiphany was not originally a distinct festival, but made a part of that of the nativity of Christ, which being celebrated twelve days, the first and last of which were high or chief days of solemnity, either of these might properly be called epiphany, as that word signifies the appearance of Christ in the world. The kings of England and Spain offer gold, frankincense, and myrrh, on epiphany, or twelfth day, in memory of the offerings of the wise men to the infant Jesus. The festival of epiphany is called by the Greeks the feast of lights, because our Saviour is said to have been baptized on this day; and baptism is by them called illumination.

EPIPHONOMENA. See **ACCLAMATION** and **ORATORY**.

EPIPHORA, [*επιφορα*], an inflammation of any part, but more especially a refluxion of humours on the eyes.

EPIPHYLLOSPERMOUS, [from *επι*, πολλοι and *σπερμα*], is applied to plants that bear their seed on the back part of their leaves.

EPIPHYSIS, [*επιφύσις*], accretion; the part added by accretion; one bone growing to another by simple contiguity, without any proper articulation. See **ANATOMY**.

EPILOCE.

EPIPOLOCE, [*ἐπιπόλοσις*], a figure of rhetoric, by which one aggravation, or striking circumstance, is added in due gradation to another; as, he not only spared his enemies, but continued them in employment; not only continued, but advanced them.

EPIPOLOCELE, in medicine, a kind of hernia or rupture, in which the omentum subsides into the scrotum.

EPIPOLOMPHALON, an hernia umbilicalis, proceeding from the omentum falling into the region of the navel.

EPIRUS, a district of ancient Greece, bounded on the E. by Etolia, on the W. by the Adriatic, on the N. by Thessaly and Macedonia, and on the S. by the Ionian sea. It was anciently governed by its own princes, in which state it made a considerable figure. According to Josephus, it was first peopled by Dodanim the son of Javan, and grandson of Japhet.

EPISCOPACY is that form of church government, in which diocesan bishops are established as distinct from and superior to priests or presbyters. The ministers of religion have long been distinguished into different orders; but it has been much controverted whether the distinction be of divine or human right. This controversy commenced soon after the Reformation; and has been agitated with great warmth between the Episcopalians on the one side, and the Presbyterians and Independents on the other.

EPISCOPALIANS, in church history, an appellation given to those who prefer the episcopal government and discipline to all others. By the test act, none but Episcopalians, or members of the church of England, are qualified to enjoy any office civil or military: an act which every liberal-minded person must allow to be a disgrace to the laws of England, as long as it remains unrepealed. The inconvenience arising from it, even to the conscientious part of the English clergy themselves, has been unanswerably set forth by Mr. Beaufort in the House of Commons, in 1787.

EPISCOPIUS, SIMON, one of the most learned men of the 17th century, and the chief supporter of the Arminian sect, was born at Amsterdam in 1583. In 1612, he was chosen professor of divinity at Leyden, in the room of Gomarus, who resigned; and the functions of his office, with his private studies, were light burdens to him, compared with the difficulties he sustained on account of the Arminian controversy: which, though it began in the universities, soon flew to the pulpits, from whence it spread and inflamed the people. The states of Holland having invited Episcopius to take his place at the synod of Dort, he went thither accompanied by some remonstrant ministers; but the synod would not allow them to sit as judges, nor to appear in any other capacity than as persons summoned before them: they submitted, were deposed, and banished. They then retired to Antwerp, but the times growing more favourable, Episcopius returned to Holland in 1626, and was made minister of the church of Remonstrants at Rotterdam. In 1634, he was chosen rector of the college founded by his sect at Amsterdam, where he spent the remainder of his days. He died in 1643, of a retention of urine. His works make two volumes in folio, of which the 2d consists of posthumous publications.

EPISCOPUS. See BISHOP.

EPISODE, [*ἐπισῳδή*], an incidental narrative, or digression in a poem, separable from the main subject, yet rising naturally from it. All the particular incidents whereof the action or narration is compounded, are called episodes. See POETRY.

EPISPASTICS, [*ἐπι and σπασω*], in medicine, are topical remedies, which being applied to the external parts of the body, attract the humours to them.

EPISTATE, in the Athenian republic, the president of the Proedri.

EPISTEMONARCH, in the ancient Greek church, an officer of great dignity, who had the care of every thing relating to faith, in the quality of censor.

EPISTLE, [*ἐπιστολή*], a letter. This word is now chiefly used in speaking of ancient writings, as the epistles of St. Paul, epistles of Cicero, epistles of Pliny, &c.

EPISTLES AND GOSPELS, in the liturgy of the church of England, are select portions of scripture, taken out of the writings of the evangelists and apostles, and appointed to be read, in the communion service, on Sundays and holidays. They are thought to have been selected by St. Jerom, and by him put in the lectionary. It is certain, they were very anciently appropriated to the days whereon they are now read, as they are commented upon

in the homilies of several ancient fathers, preached upon those days, to which these portions of scripture are now affixed.

EPISTROPHE, in rhetoric, a figure, wherein that which is supposed of one thing, is strongly affirmed of another: thus, Are they Hebrews? so am I. Are they Israelites? so am I. Are they of the seed of Abraham? so am I, &c.

EPISTYLE, [from *ἐπί*, over, and *στυλος*, a column,] in the ancient architecture, is a mass of stone, or a piece of timber laid upon the capital of a column. It is now called architrave. See ARCHITECTURE.

EPITAPH, [*ἐπί*, upon, and *τάφος*, a sepulchre,] an inscription upon a tomb. It has been disputed whether the ancient Jews inscribed epitaphs on the monuments of the dead; but it is certain, some of very ancient date are found amongst them. The Athenians put only the name of the dead, with the epithet *χρηστος*, good, or *ηστος*, hero, and the word *χαίρει*, signifying their good wishes. The name of the deceased's father and his tribe were frequently added. The Lacedemonians allowed epitaphs to none but those who had died in battle. The Romans inscribed their epitaphs to the manes, dies manibus; and frequently introduced the dead, by way of prosopopœia, speaking to the living; of which we have a fine instance, worthy the Augustan age, wherein the dead wife thus bespeaks her surviving husband:

Immutata perii; sed tu, felicior, annos

Vive tuos, conjux optime, vive meos.

The epitaphs of the present age are too often filled with fulsome compliments which were never merited, characters which human nature in its best state could scarce lay claim to, and expressions of respect which were never paid in the life-time of the deceased. Hence the proverb, "He lies like an epitaph."

EPITAPH is also applied to certain elegies, either in prose or verse, composed without any intent to be engraven on tombs; as, That of Alexander,

Sufficit huic tumulus, cui non sufficeret orbis;

and that of Newton,

Isaacum Newton

Quem immortalem

Testantur Tempus, Natura, Cœlum,

Mortalem hoc marmor

Fatetur.

EPITASIS, in ancient poetry, the second part of a dramatic poem, wherein the plot, entered upon in the protasis, or first part, was carried on, heightened, and worked up, till it arrived at its state or height, called catastasis.

EPITASIS, in medicine, the increase of a disease or beginning of a paroxysm, particularly in a fever.

EPITHALAMIUM, [*ἐπι θάλαμῳ*], a nuptial song; a compliment upon marriage.

The **EPITHALAMIUM** among the Jews, was sung at the door of the bride, by her friends and companions, the evening before the marriage. The xlvth Psalm is an epithalamium. Among the Greeks it was sung as soon as the married couple were going to bed, and attended with shouts and stamping of the feet. They returned in the morning, and with the same song, a little altered, saluted them again. The evening songs were called *ἐπιθάλαμια χομίζοντα*; the morning salutes *ἐπιθάλαμια ἐγχετνα*. This was the practice amongst the Romans also, but their epithalamia were often obscene.

EPITHAURO. See EPIDAUROS.

EPITHEM, [*ἐπιθήμα*], in pharmacy, a remedy of a spirituous or aromatic kind, applied externally to the regions of the heart, liver, &c. to strengthen and comfort, or correct some intemperature of the part.

EPITHET, [*ἐπιθετον*], in poetry and rhetoric, an adjective expressing some quality of a substantive to which it is joined; or such an adjective as is annexed to substantives by way of ornament and illustration, not to make up an essential part of the description. Nothing, says Aristotle, tires the reader more than too great a redundancy of epithets, or epithets placed improperly; and yet nothing is so essential in poetry as a proper use of them. The writings of the best poets are full of them.

EPITOME, [*ἐπιτομή*], abridgment; abbreviature; compendious abstract; compendium. See ABRIDGMENT.

EPITRITUS,

EPITRITUS, in prosody, a foot consisting of three long and one short syllable. Of these, grammarians reckon four kinds: the first consisting of an iambus and spondaus, as *sālūtāntēs*; the second of a trochæus and spondaus, as *cōncitātī*; the third of a spondaus and an iambus, as *cōmmūnicāns*; and the fourth of a spondaus and trochæus, as *īncāntārē*.

EPITROPUS, a kind of arbitrator, whom the Greek Christians under the Turks elect to terminate their differences, and avoid carrying them before the Turkish magistrates. Anciently the Greeks used the term *ἐπίτροπος* in the same sense as the Latins did *procurator*, viz. for a commissioner or intendant.

EPIZEUXIS, in rhetoric, a figure which repeats the same word, without any other intervening; such is that of Virgil, "Nunc, nunc, insurgite remis."

EPOCHA, [*ἐποχή*, from *ἐπέχω*, to contain,] in chronology, a term or fixed point of time, whence the succeeding years are numbered or accounted. The most remarkable epochas are those that follow.

EPOCHA OF THE CREATION OF THE WORLD. According to the Vulgate, archbishop Ussher places this event 4004 years before the vulgar æra of the birth of Christ; Scaliger makes it 3950, Petavius 3984, and Ricciolus 4184 years before Christ. According to the Septuagint, Eusebius places the creation 5200 years before the nativity of our Lord; the Alphonsine tables, 6934; and Ricciolus 5634. The creation, therefore, as we follow the archbishop, happened in the year 710 of the Julian period. Sir Isaac Newton, again, makes the creation of the world later by 500 years than all other chronologists; and the proofs by which this illustrious philosopher supports his opinion are of two different kinds. The Egyptians counted 341 generations from Menes to Setho, allowing a hundred years for three generations; and the ancient Greeks computed one generation at about forty years. Now, says Sir Isaac, it is true, three ordinary generations may be computed at about 120 years; but generations are longer than the reign of kings, because it is evident that mankind in general live longer than kings reign. The duration of a reign, therefore, taking one with another, is according to him about twenty years: whence he concludes, that the ancients have erred in their calculation in allowing forty years for every generation. The second kind of proof is taken from the precession of the equinoxes. According to Clemens Alexandrinus, Chiron, who was in the expedition of the Argonauts, fixed the vernal equinox at the fifteenth degree of Aries, and consequently the summer-solstice at the fifteenth degree of Cancer. Meto fixed the summer-solstice at the eighth degree of Cancer, a year before the Peloponnesian war. Now since one degree answers to the retrograde motion of the equinoctial points in 72 years, there are seven times 72 years from the expedition of the Argonauts to the beginning of the Peloponnesian war: that is, 504 years, and not 507 years, as the Greeks affirm. By combining these two different proofs, Sir Isaac concludes, that the expedition of the Argonauts ought to be placed 909 years before Jesus Christ, and not 1400, as is generally believed: and therefore that the creation of the world ought to be placed about 500 years later than chronologists generally place it.

EPOCHA OF THE DELUGE. According to the Hebrew text, there are 1656 years from the creation to the deluge; 1307 according to the Samaritan; 2242, according to Eusebius and the Septuagint; 2256, according to Josephus and the Septuagint; and 2262, according to Julius Africanus, Petavius, and the Septuagint. In following the Hebrew text this epocha begins in the year 2366 of the Julian period.

EPOCHA OF THE OLYMPIADS, used principally by the Greeks, had its origin from the olympic games, which were celebrated at the beginning of every fourth year. This epocha begins 776 years before the incarnation, or in the year 3938 of the Julian period.

EPOCHA, VARRONIAN, OF THE BUILDING OF ROME, is fixed 753 years before our Saviour's birth, and in the year 3961 of the Julian period.

EPOCHA OF NABONASSAR, KING OF BABYLON, made use of by Ptolemy, Censorinus, and several other authors, began 747 years before the incarnation, and in the year 3967 of the Julian period.

EPOCHA, JULIAN. The first year of Julius Cæsar's correcting the calendar stands 45 years before our Saviour's birth, and coincides with the year 466 of the Julian period.

EPOCHA OF CHRIST. The Christian world generally reckon-

ed from the epocha of the creation, the building of Rome, the consuls' register, or the emperor's reign, till about 500 years after Christ, when the epocha of the nativity of our blessed Lord was introduced by Dionysius Exiguus. He began his account from the conception or incarnation, properly called Lady-day. Most countries in Europe, however, at present reckon from the first of January next following, except the court of Rome, where the epocha of the incarnation still obtains for the date of their bulls and briefs. But here we are to observe, that there are different opinions respecting the year of our Saviour's birth. Capellus and Kepler fix it at about the 758th year from the building of Rome. Decker and Petavius place the incarnation in the 749th of Rome. Scaliger and Vossius make it fall on the 751st of Rome. Dionysius Exiguus, Bede, &c. fix the birth of our Saviour to the year 751 of Rome; the diversity of these opinions proceeding from the difficulty of fixing Herod the Great's death, who, as is evident from the evangelists, was living at our Saviour's birth, the taxation of Cyrenius, and the time of our Saviour's beginning his ministry. But it is generally agreed, that as to computation and use, the common epocha is to be followed which places the birth of Christ in the 4713th of the Julian period, although the true birth rather corresponds with the 4711th of the same period.

EPOCHA, DIOCLESIAN, OR EPOCHA OF MARTYRS, called also the æra of the Cophti or Egyptians, because the emperor Dioclesian made a great many martyrs in Egypt, begins in the year 283 of our Lord, and the 4997th of the Julian period.

EPOCHA OF THE HEGIRA, OR FLIGHT OF MOHAMMED, is an æra used by the Mohammedans. In obedience to the command of their prophet they make use of the lunar year, which consists of 12 complete synodic revolutions of the moon; so that their year contains 354 and sometimes 355 days. The first year of this epoch happened in the 5335th year of the Julian period, and in the 622d year of the Christian æra. The following is a Table of the Epocha of the Hegira connected with the Christian æra from A. D. 1810 to A. D. 1923. *N.B.* An asterisk prefixed before any particular year of Christ denotes it to be bissextile, and a dagger before any particular year of the Hegira points it out to be one of those years which contains 355 days. The month and day of the month placed after the year of the Hegira is the day of the corresponding year of Christ upon which the said year of the Hegira commences.

Year of Christ.	Corresponding Year of the Hegira.	Year of Christ.	Corresponding Year of the Hegira.
1810	1225 February 5	1837	1253 April 5
1811	†1226 January 24	1838	†1254 March 25
*1812	1227 January 13	1839	1255 March 15
1813	†1228 January 2	*1840	†1256 March 3
1813	†1229 December 22	1841	1257 February 21
1814	1230 December 12	1842	1258 February 10
1815	1231 December 1	1843	†1259 January 30
*1816	†1232 November 19	*1844	1260 January 19
1817	1233 November 9	1845	1261 January 8
1818	1234 October 29	1845	†1262 December 28
1819	†1235 October 18	1846	1263 December 18
*1820	1236 October 7	1847	1264 December 7
1821	†1237 September 26	*1848	†1265 November 25
1822	1238 September 16	1849	1266 November 15
1823	1239 September 5	1850	†1267 November 4
*1824	†1240 August 24	1851	1268 October 25
1825	1241 August 14	*1852	1269 October 13
1826	1242 August 3	1853	†1270 October 2
1827	†1243 July 23	1854	1271 September 22
*1828	1244 July 12	1855	1272 September 11
1829	†1245 July 1	*1856	†1273 August 30
1830	1246 June 21	1857	1274 August 20
1831	1247 June 10	1858	†1275 August 9
*1832	†1248 May 29	1859	1276 July 30
1833	1249 May 19	*1860	1277 July 18
1834	1250 May 8	1861	†1278 July 7
1835	†1251 April 27	1862	1279 June 27
*1836	1252 April 16	1863	1280 June 16

Table of the Epocha of the Hegira connected with the Christian Era from A. D. 1810 to A. D. 1923, concluded.

Year of Christ.	Corresponding Year of the Hegira.	Year of Christ.	Corresponding Year of the Hegira.
*1864	†1281 June 4	1894	1312 July 3
1865	1282 May 25	1895	1313 June 22
1866	1283 May 14	*1896	†1314 June 10
1867	†1284 May 3	1897	1315 May 31
*1868	1285 April 22	1898	†1316 May 20
1869	†1286 April 11	1899	1317 May 10
1870	1287 April 1	1900	1318 April 29
1871	1288 March 21	1901	†1319 April 17
*1872	†1289 March 9	1902	1320 April 7
1873	1290 February 27	1903	1321 March 27
1874	1291 February 16	*1904	†1322 March 15
1875	†1292 February 5	1905	1323 March 5
*1876	1293 January 25	1906	1324 February 22
1877	1294 January 14	1907	†1325 February 11
1878	†1295 January 3	*1908	1326 February 1
1878	1296 December 24	1909	†1327 January 20
1879	†1297 December 13	1910	1328 January 10
*1880	1298 December 2	1910	1329 December 30
1881	1299 November 21	1911	†1330 December 19
1882	†1300 November 10	*1912	1331 December 8
1883	1301 October 31	1913	1332 November 27
*1884	1302 October 19	1914	†1333 November 16
1885	†1303 October 8	1915	1334 November 6
1886	1304 September 28	*1916	†1335 October 25
1887	†1305 September 17	1917	1336 October 15
*1888	1306 September 6	1918	1337 October 4
1889	1307 August 26	1919	†1338 September 23
1890	†1308 August 15	*1920	1339 September 12
1891	1309 August 5	1921	1340 September 1
*1892	1310 July 24	1922	†1341 August 21
1893	†1311 July 13	1923	1342 August 11

EPOCHA, PERSIAN, or YEZDEJERD, is the year of the Julian period 5345, answering to the year 632. To reduce the years of one epocha to those of another, observe the following rule; add the given year of an epocha to the year of the Julian period corresponding with its rise, and that will give the year of the period. For example, if to 1810, the present year of the Christian epocha, we add 4713, the year of the Julian period corresponding with its rise, the sum, 6523, will be the present year of the Julian period; now if we subtract from the year thus found, the year of the Julian period corresponding with the rise of any epocha, the remainder shews the true method of making a just connection betwixt that epocha and the known year of Christ. Again, if we want to find the year of the Julian period corresponding to a given year before Christ, we subtract the given year from 4714, and the remainder is the year required. See CHRONOLOGY and ERA.

EPODE, [*επὸδος*], in lyric poetry, the third or last part of the ode: the ancient ode being divided into strophe, antistrophe, and epode. The epode was sung by the priests, standing still before the altar, after all the turns and returns of the strophe and antistrophe, and was not confined to any precise number or kind of verses. The epode is now a general name for all kinds of little verses that follow one or more great ones, of what kind soever they be; and, in this sense, a pentameter is an epode after an hexameter. And as every little verse, which being put after another, closes the period, is called epode, hence the sixth book of Horace's odes is entitled "Liber Epodon, Book of Epodes;" because the verses are all alternately long and short, and the short ones generally, though not always, close the sense of the long one.

EPONA, in mythology, a goddess mentioned in some ancient inscriptions. Keyser supposes, that her name was derived from *επώνη*, a horse, and that she was worshipped as the protectress of these animals.

EPOPEE, or EPOPOEIA, in poetry, the history, action, or

fable, which makes the subject of an epic poem. The word is derived from the Greek *επος*, verse, and *ποιεω*, to make.

EPSOM, a town of Surrey, about 16 miles S. W. of London, long famous for its mineral waters. These were discovered in 1618; and are not yet impaired in virtue. The salt made from them is famous all over Europe, for gently cleansing and cooling the body. The hall, galleries, and other public apartments, are now run to decay; and there remains only one house on the spot, which is inhabited by a countryman and his wife, who carry the waters in bottles to the adjacent places, and supply the demands of dealers in London. On the neighbouring down are annually horse-races; but the inns, shops, and bowling-greens, are not so much frequented as formerly. The market is on Friday; the fair, July 25. Epsom has so many fields, meadows, orchards, gardens, &c. that a stranger would be at a loss to know whether it were a town built in a wood, or a wood surrounded by a town.

EPSOM SALT, was formerly obtained by boiling down the mineral water found in the vicinity of Epsom. It is at present prepared from sea-water, which after being boiled down, deposits an uncrystallized brine, that consists chiefly of muriated magnesia, and is sold in the shops, under the name of bitter purging salt.—It is of considerable service in colics, scurvy, rheumatism, and other chronical complaints.

EPSOM WATER is easily imitated by art; i. e. by only dissolving half an ounce of Epsom salt in a quart of pure water, made somewhat brisk by a few drops of spirit of vitriol and oil of tartar, so as to let the alkali prevail.

EPULARES, in antiquity, persons who were admitted to the sacred epulae or entertainments, it being unlawful for any to be present at them who were not pure and chaste.

EPULO, in antiquity, a minister of sacrifice among the Romans. The pontifices, not being able to attend all the sacrifices performed at Rome to so many gods as were adored by that people, appointed three ministers, whom they called epulones, because they conferred on them the care and management of the epula, feasts in the solemn games and festivals.

EPULUM, in antiquity, a holy feast prepared for the gods in times of public danger. The feast was sumptuous, and the gods were formally invited and attended; for the statues were brought on rich beds furnished with soft pillows, called pulvinaria: thus accommodated, their godships were placed on their couches at the most honourable part.

EPULUM also means any solemn feast, e. g.

EPULUM FEMALE, a funeral entertainment.

EPWORTH, a town of England, in the isle of Axholm, Lincolnshire, 11 miles N. of Gainsborough.

EQUABLE, an appellation given to such motions as always continue the same in degree of velocity, without being either accelerated or retarded. When two or more bodies are uniformly accelerated or retarded, with the same increase or diminution of velocity in each, they are said to be equably accelerated or retarded.

EQUAL, a term of relation between two or more things of the same magnitude, quantity, or quality.

EQUALITY, that agreement between two or more things, whereby they are denominated equal. The equality of two quantities, in algebra, is denoted by two parallel lines placed between them: thus, $4 + 2 = 6$, that is, 4 added to 2, is equal to 6.

EQUALITY, in a political sense, is a term much used, though not generally understood. All men are or ought to be upon an equality with regard to their rights. Their right to have their persons and their property (whether it be great or small) protected by the government under which they live, cannot be disputed. Neither can the right to do any thing that is not injurious to another, which is the only true definition of liberty, be called in question, let the party exercising it be ever so poor. But it is a dangerous error to suppose, that an equality of property is meant by the term; for that is to suppose, what is not true, that all men are equal in merit and in abilities. In fact, if the Almighty were by one act of his power, to make an equal and universal division of all the property and productions of this world among the whole human race, one week would not elapse before very considerable inequalities of property would arise from the indolence and extravagance of some, the avarice of others, and the virtuous industry and economy of others.

EQUANIMITY,

EQUANIMITY, in ethics, denotes that even and calm frame of mind and temper, under good or bad fortune; whereby a man appears to be neither puffed up, or overjoyed with prosperity; nor dispirited, soured, or rendered uneasy, by adversity. See **MORAL PHILOSOPHY** and **PASSIONS**.

EQUANT, in the old astronomy, a circle described on the centre of the deferent, for accounting for the eccentricity of the planets. See **EXCENTRIC** and **EXCENTRICITY**.

EQUATION, in algebra, the mutual comparing of two equal things of different denominations, or the expression denoting this equality; which is done by setting the one in opposition to the other, with the sign of equality (=) between them: thus $3s = 36d$, or 3 feet = 1 yard. Hence, if we put a for a foot, and b for a yard, we shall have the equation $3a = b$, in algebraical characters. See **ALGEBRA**.

EQUATION, ANNUAL, of the mean motion of the sun, and moon's apogee and nodes. The annual equation of the sun's mean motion depends upon the eccentricity of the earth's orbit round him, and is $16\frac{1}{2}$ such parts, of which the mean distance between the sun and the earth is 1000; whence some have called it the equation of the centre, which, when greatest, is $1^\circ 55' 35''$. The greatest equation of the moon's mean motion is $11' 40''$; of its apogee, $20'$; and of its node, $9' 30''$. These four annual equations are always mutually proportionable to each other; so that when any of them is at the greatest, the three others will also be greatest; and when one diminishes, the rest diminish in the same ratio. Wherefore the annual equation of the centre of the sun being given, the other three corresponding equations will be given; so that one table of the central equations may serve for all.

EQUATION OF CURVES, an equation expressing the nature of a curve, the relation between an absciss and a corresponding ordinate, or the relation of their fluxions. See **CURVE**. When the natures or properties of curves are expressed by algebraic equations any general absciss is commonly denoted by the letter x , and the corresponding ordinate by the letter y ; the other, or constant lines, being represented by other letters. Then the equations expressing the natures of different curves will admit of various forms, according to the situation of the point at which the absciss is supposed to commence, or to the relations of the co-ordinates. Thus, if the abscisses should be estimated from the vertex of the curve or from the end of the diameter then the equations are as follow: namely for the

Circle, $2dx - x^2 = y^2$, where $2d$ is the diameter AB, (fig. 33, Plate LVII.); x is the absciss AP or BP, and y is the ordinate PQ.

Parabola, $px = y^2$, where p is the parameter.

Ellipse, $\frac{t^2 y^2}{c^2} = 2tx - x^2$
Hyperbola, $\frac{t^2 y^2}{c^2} = \pm 2tx + x^2$

Where $2t$ is the transverse, and $2c$ the conjugate axis.

But if we take the abscisses from the centres, then in the

Circle, $d^2 - x^2 = y^2$, where $2d$ is the diameter.

Ellipse, $\frac{t^2 y^2}{c^2} = t^2 - x^2$
Hyperbola, $\frac{t^2 y^2}{c^2} = x^2 - t^2$

Where $2t$ and $2c$ are as before.

We may likewise make use of p the parameter in the equations to the ellipse and hyperbola: then in the

Ellipse, $\frac{2ty^2}{p} = 2t - xx$
Hyperbola, $\frac{2ty^2}{p} = x^2 \pm 2tx$

When the abscisses are taken from the vertex.

Ellipse, $\frac{2ty^2}{p} = t^2 - x^2$
Hyperbola, $\frac{2ty^2}{p} = x^2 - t^2$

When the abscisses are taken from the centre.

EQUATION, CONSTRUCTION OF, in algebra, the method of drawing a geometrical figure whose properties shall express the given equation, in order to demonstrate the truth of it geometrically.

EQUATION, A SIMPLE, is constructed by resolving the given simple equation into a proportion, or finding a third or fourth proportional, &c. Thus, 1. If the equation be $ax = bc$; then

$a : b :: c : x = \frac{bc}{a}$, the fourth proportional to a, b, c .

2. If $ax = b^2$; then $a : b :: b : x = \frac{b^2}{a}$, a third proportional to a and b .

3. If $ax = b^2 - c^2$; then, since $b^2 - c^2 = \overline{b+c} \times \overline{b-c}$, it will be $a : b + c :: b - c : x = \frac{(b+c) \times (b-c)}{a}$, a fourth proportional to $a, b + c$, and $b - c$.

If the equation be $x = \frac{ab+mn}{r-s}$, first find a mean proportional between a and b , which suppose to be p , also another mean proportional between m and n , which suppose to be q , then the equation will stand thus $x = \frac{p^2+q^2}{r-s}$. Which may be constructed

in the following manner. Let the base AB, (Plate LVII. fig. 26,) of the right-angled triangle APB be made equal to q , and the perpendicular AP equal to p ; then will PB^2 be equal $p^2 + q^2$, which according to the equation is to be divided by $r - s$. Therefore it will be as $r - s : PB (= \sqrt{p^2 + q^2}) :: PB$ to a third proportional, which will give x required.

EQUATIONS, QUADRATIC, require for their construction lines of the second order; hence it is necessary to shew the nature of these lines. See **CURVE**. The general equation expressing the nature of the lines of the second order, having all its terms and coefficients, will be in this form:

$$\left. \begin{array}{l} y^2 + axy + cx^2 \\ + by + dx \\ + e \end{array} \right\} = 0.$$

Where a, b, c, d, e represent any given quantities with their proper signs prefixed to them. If a quadratic equation is given, as $y^2 + py + q = 0$, and by comparing it with the preceding, if you take the quantities a, b, c, d, e , and x such, that $ax + b = p$, and $cx^2 + dx + e = q$, then will the values of y in the first equation be equal to the values of it in the second; and if the locus be described according to the first equation, the two values of the ordinate, when $ax + b = p$, and $cx^2 + dx + e = q$, will be the two roots of the equation $y^2 + py + q = 0$. See **LOCUS**. And as four of the given quantities a, b, c, d, e , may be taken at pleasure, and the fifth with the absciss x determined so, that $ax + b$ may be still equal to p , and $cx^2 + dx + e = q$; hence there are innumerable ways of constructing the same equation. But these loci are to be preferred which are described most easily; and therefore the circle of all conic sections is to be preferred for the resolution of quadratic equations. Let AB, fig. 27, be perpendicular to AE, and upon AB describe the semicircle BMMA. If AP be supposed equal to x , AB = a , and PM = y ; then making MRMR perpendicular to the diameter AB, since $AR \times RB = RM^2$, and $AR = y$, $RB = a - y$, $RM = x$, it follows that $a - y \times y = x^2$, and $y^2 - ay + x^2 = 0$. And if an equation $y^2 - py + q = 0$ be proposed to be resolved, its roots will be the ordinates to the circle, PM and PM, to its tangent AE, if $a = p$, and $x^2 = q$: because then the equation of the circle $y^2 - ay + x^2 = 0$ will be changed into the proposed equation $y^2 - py + q = 0$. We have therefore this construction for finding the roots of the quadratic equation $y^2 - py + q = 0$, take AB = p , and on AB describe a semicircle: then raise AE perpendicular to AB, and on it take AP = $\sqrt{q}$, that is, a mean proportional between 1 and q (by 13 el. 6.) then draw PM parallel to AB, meeting the semicircle in MM and the lines PM, PM, shall be the roots of the proposed

equations. It appears from the construction that if $q = \frac{p^2}{4}$, or

$\sqrt{q} = \frac{1}{2}p$, then $AP = \frac{1}{2}AB$, and the ordinate PN touches the curve in N, the two roots PM, PM, in that case becoming equal to one another, and to PN. If AP be taken greater than $\frac{1}{2}AB$, that is, when $\sqrt{q}$ is greater than $\frac{1}{2}p$, or q greater than $\frac{1}{4}p^2$, the ordinates do not meet the circle, and the roots of the equation become imaginary. The roots of the same equation may be otherwise thus determined. 1. If it be a simple quadratic, it may be reduced to this form $x^2 = ab$; and hence $a : x :: x : b$, or $x = \sqrt{ab}$, a mean proportional between a and b . Therefore upon a straight line (fig. 28,) take $AB = a$, and $BC = b$; then upon the diameter AC describe a semicircle, and raise the perpendicular BD to meet it in D; so shall BD be $= x$, the mean proportional sought between AB and BC, or between a and b .

2. If the quadratic be affected, let it first be $x^2 + 2ax = b^2$; then form the right-angled triangle whose base AB (fig. 29,) is a , and perpendicular BC is b ; and with the centre A and radius AC, describe the semicircle DCE; so shall DB and BE be the two roots of the given quadratic equation $x^2 + 2ax = b^2$.

3. If the quadratic be $x^2 - 2ax = b^2$, then the construction will be the very same as of the preceding one $x^2 + 2ax = b^2$.

4. But if the form be $2ax - x^2 = b^2$; form a right-angled triangle whose hypotenuse FG is a , (fig. 30,) and perpendicular GH is b ; then with the radius FG and centre F describe a semicircle IGK; so shall IH and HK be the two roots of the given equation $2ax - x^2 = b^2$, or $x^2 - 2ax = -b^2$.

EQUATIONS, CUBIC AND BIQUADRATIC, may be constructed by means of the conic sections. The roots of any equation may be determined by the intersections of a straight line with a curve of the same dimensions as the equation, or by the intersections of any two curves whose indices multiplied by each other, give a product equal to the index of the proposed equation. Thus the roots of a biquadratic equation may be determined by the intersections of two conic sections; for the equation by which the ordinates from the four points in which these conic sections may cut one another can be determined, will arise to four dimensions: and the conic sections may be assumed in such a manner, as to make this equation coincide with any proposed biquadratic: so that the ordinates from these four intersections, will be equal to the roots of the proposed biquadratic. If one of the intersections of the conic section falls upon the axis, then one of the ordinates vanishes, and the equation by which these ordinates are determined will then be of three dimensions only, or a cubic, to which any proposed cubic equation may be accommodated. So that the three remaining ordinates will be the three roots of that proposed cubic. Those conic sections ought to be preferred for this purpose that are most easily described. They must not, however, be both circles; for their intersections are only two, and can serve only for the resolution of quadratic equations. Yet the circle ought to be one, as being most easily described, and the parabola is commonly assumed for the other. Their intersections are determined in the following manner. Let APE be the common Apollonian parabola, (fig. 31.) Take on its axis the line AB = half of its parameter. Let C be any point in the plane of the parabola, and from it, as a centre, describe with any radius CP a circle meeting the parabola in P. Let PM, CD, be perpendiculars on the axis in M and D, and let CN parallel to the axis meet PM in N. Then will always $CP^2 = CN^2 + NP^2$ (47. 1. Euc.) Put $CP = a$, the parameter of the parabola $= b$, $AD = c$,

$DC = d$, $AM = x$, $PM = y$. Then $CN^2 = x^2 + c^2$, $NP^2 = y^2 + d^2$; and $x^2 + c^2 + y^2 + d^2 = a^2$. That is $x^2 \pm 2cx + c^2 + y^2 \pm 2dy + d^2 = a^2$. But from the nature of the parabola, $y^2 = bx$, and $x^2 = \frac{y^4}{b^2}$; substituting therefore these values for x^2

and x , it will be $\frac{y^4}{b^2} \pm \frac{2cy^2}{b} + y^2 \pm 2dy + c^2 + d^2 - a^2 = 0$.

Or multiplying by b^2 , $y^4 \pm 2bcy^2 + y^2 \pm 2db^2y + c^2 + d^2 - a^2 \times b^2 = 0$. Which may represent any biquadratic equation that wants the second term; since such values may be found for a , b , c , and d , by comparing this with any proposed biquadratic as to

make them coincide. And then the ordinates from the points P, P, P, on the axis, will be equal to the roots of that proposed biquadratic; and this may be done though the parameter of the parabola, viz. b , be given: that is, if you have a parabola already made or given, by it alone you may resolve all biquadratic equations, and you will only need to vary the centre of your circle and its radius. If the circle described from the centre (fig. 32,) pass through the vertex A, then $CP^2 = CA^2 = CD^2 + AD^2$, that is $a^2 = d^2 + c^2$; and the last term of the biquadratic ($c^2 + d^2 - a^2$) will vanish; therefore dividing the rest by y , there arises the cubic $y^3 \pm 2bc + b^2 \times y \pm 2db^2 = 0$. Let the cubic equation proposed to be resolved be $y^3 \pm py \pm r = 0$. Compare the terms of these two equations and you will have $\pm 2bc + b^2 = \pm p$, and

$$\pm 2db^2 = \pm r, \text{ or } \mp c = \frac{b}{2} \mp \frac{p}{2b}, \text{ and } d = \pm \frac{r}{2b^2}.$$

From which you have this construction of the cubic $y^3 \pm py \pm r = 0$, by means of any given parabola APE. From the point B, take in the axis (forward if the equation has $-p$, but backward if p be

positive) the line $BD = \frac{p}{2b}$; then raise the perpendicular $DC =$

$\frac{r}{2b^2}$, and from C describe a circle passing through the vertex A,

meeting the parabola in P; so shall the ordinate PM be one of the roots of the cubic $y^3 \pm py \pm r = 0$. The ordinates that stand on the same side of the axis with the centre C, are negative or affirmative, according as the last term r is negative or affirmative; and those ordinates have always contrary signs that stand on different sides of the axis. See Maclaurin's Algebra, part iii. cap. 2; and Simpson's Algebra, p. 267.

EQUATION OF TIME, in astronomy and chronology, the reduction of the apparent time or motion of the sun, to equable, mean, or true time. The difference between true and apparent time arises from two causes, the eccentricity of the earth's orbit, and the obliquity of the ecliptic. See ASTRONOMY.

EQUATOR. See ASTRONOMY and GEOGRAPHY.

EQUATORIAL SECTOR. See ASTRONOMY.

EQUERRY, or ECURY, popularly called Query, an officer of the king's stables, under the master of the horse. Of these there are seven, who, when his majesty goes abroad, ride in the leading coach, are in waiting one at a time monthly, and have a table with the gentlemen ushers during the time, and a salary of 300l. a-year each.

EQUERRY OF THE CROWN STABLE has that appellation, as being employed in managing and breaking the saddle horses, and preparing them for the king's riding.

EQUERY, or ECURY, [*Ecurie*, French, or *equile*, Lat. a stable, from *equus*, a horse,] a grand stable for horses, furnished with stalls, manger, rack, &c. Some think the word stable properly relates only to bullocks, cows, sheep, hogs, &c. and equery, to horses, mules, &c. A simple equery is that provided for one row of horses; a double equery that provided for two, with a passage in the middle, or two passages; the horses being placed head to head, as in the little equery at Versailles. Under equery are sometimes also comprehended the lodgings and apartments of the equerries, grooms, pages, &c.

EQUERY, [*esouyer*,] is also an officer who has the care of the horses of a king or prince.

EQUES, [from *equus*, a horse,] in antiquity, a knight, or horseman. See EQUITES.

EQUES, AURATUS, a knight bachelor; called *auratus*, i. e. gilt, because anciently none but knights might gild or beautify their armour with gold. In law this term is not used, but instead of it miles, and sometimes chevalier.

EQUESTRIA, in Roman antiquity, a place in the theatre where the equites or knights sat.

EQUESTRIAN GAMES, among the ancient Romans, horse-races, of which there were five kinds, the prodromus or plain horse-race, the chariot-race, the decursory race about funeral piles, the *ludi sevirales*, and the *ludi neptunales*.

EQUESTRIAN ORDER, among the Romans, signified their equites or knights; also their horsemen in the field; the first of which orders

orders stood in contradiction to the senators; as the last did to the foot, military, or infantry.

EQUIANGULAR, in geometry, an epithet applied to figures whose angles are all equal: such are a square, an equilateral triangle, &c.

EQUICRURAL, in geometry, the same with isosceles, a term applied to a triangle having two equal sides.

EQUIDIFFERENT NUMBERS, in arithmetic, numbers in arithmetical progression; they are of two kinds, 1. Continually equidifferent is when, in a series of three numbers, there is the same difference between the first and second, as there is between the second and third; as 3, 6, 9. And 2. Discretely equidifferent, is when, in a series of four numbers or quantities, there is the same difference between the first and second as there is between the third and fourth: such are 3, 6, 7, 10.

EQUIDISTANT, an appellation given to things placed at equal distance from some fixed point, or place, which they are referred.

EQUILATERAL, in general, something that hath equal sides, as an equilateral triangle.

EQUILATERAL HYPERBOLA, one whose transverse diameter is equal to its parameter; and so all the other diameters equal to their parameters; in such an hyperbola, the asymptotes always cut one another at right angles in the centre. Its most simple equation, with regard to the transverse axis, is $y^2 = x^2 - a^2$; and with regard to the conjugate, $y^2 = x^2 + a^2$, when a is the semitransverse, or semi-conjugate. The length of the curve cannot be found by means of the quadrature of any space, of which a conic section is any part of the perimeter.

EQUILIBRIUM, in mechanics, is when the two ends of a lever or balance hang so exactly even and level, that neither ascends, nor descends, but both keep in a position parallel to the horizon; being both charged with an equal weight. See **MECHANICS**.

EQUIMULTIPLES, in arithmetic and geometry, are numbers or quantities multiplied by one and the same number or quantity. Hence, equimultiples are always in the same ratio to each other as the simple quantities before multiplication; thus, if six and eight are multiplied by four, the equimultiples 24 and 32 will be to each other as six to eight.

EQUINOCTIAL, or **EQUINOCTIAL**, [*æquus* and *nox*, Lat.] in astronomy, a great and immoveable circle of the sphere, under which the equator moves in its diurnal motion. It is ordinarily confounded with the equator: but there is a difference; the equator being moveable, and the equinoctial immoveable; and the equator being drawn about the convex surface of the earth, but the equinoctial on the concave surface of the heavens. The shadows of those who live under this circle are cast to the southward of them for one half of the year, and to the northward during the other half; and twice in a year, viz. at the equinoxes, the sun at noon casts no shadow, being in their zenith. See **ASTRONOMY**.

EQUINOCTIAL DIAL, that whose plane lies parallel to the equinoctial. See **DIALING**.

EQUINOCTIAL POINTS are the two points wherein the equator and ecliptic intersect each other: the one, being in the first point of Aries, is called the vernal point or equinox; and the other, in the first point of Libra, the autumnal point or equinox. The equinoctial points, and all the other points of the ecliptic, are continually moving backward, or in antecedentia, i. e. westward. This retrograde motion is that famous and difficult phenomenon called the precession of the equinoxes. See **ASTRONOMY**.

EQUINOX, the time when the sun enters either of the equinoctial points, where the ecliptic intersects the equinoctial. See **ASTRONOMY**, and **EQUINOCTIAL**.

EQUIPAGE, in military art, denotes all sorts of utensils, artillery, &c. necessary for commencing and prosecuting with ease and success any military operations. Camp and field equipage consists of tents, kitchen furniture, saddle horses, baggage, waggons, bat horses, &c.

EQUIPOLLENCE, in logic, is when there is an equivalence, or agreement, either as to the nature of the thing, or as to the grammatical sense of any two, or more propositions: that is, when two propositions signify one and the same thing, though they express it after different manners.

EQUIRIA, in antiquity, a festival instituted by Romulus, and

celebrated on the 27th of February, in honour of Mars, at which there were horse-races.

EQUISETUM, **HORSE TAIL**: A genus of the order filices, and cryptogamia class of plants; natural order, Conifera. There is a spike of pettated or shielded fructifications opening at the base. There are seven species: natives of Europe in woods and shady places.

EQUITES, amongst the Romans, were persons of the second degree of nobility, next to the senators in point of rank. The equites or knights were required to be possessed of 400 sesteria before they could be admitted into that order; and when they were so reduced as to fall short of the prescribed revenue, they were expunged out of the equestrian list. This revenue amounted to about 10,000 crowns. Part of the ceremony whereby the honour of knighthood was conferred amongst the Romans was the giving of a horse; every eques received also the stipend of a horseman to serve in the wars, and wore a ring which was given him by the state.

EQUITY, in a general sense, the virtue of treating all other men according to reason and justice, or as we would be treated ourselves when we understand aright what is our due. See **JUSTICE**.

EQUITY, in jurisprudence, is defined a correction or qualification of the law, generally made in that part wherein it faileth or is too severe. It likewise signifies the extension of the words of the law to cases unexpressed, yet having the same reason; so that where one thing is enacted by statute, all other things are enacted that are of the like degree, e. g. the statute of Gloucester gives action of waste against him that holds lands for life or years; and by the equity thereof, a man shall have action of waste against a tenant that holds but for one year, or one half-year, which is without the words of the act, but within the meaning of it; and the words that enact the one, by equity enact the other. So that equity is of two kinds. The one abridges and takes from the letter of the law: the other enlarges and adds to it; and statutes may be construed according to equity, especially where they give remedy for wrong, or are for expedition of justice. Equity seems to be the interposing law of reason, exercised by the lord chancellor in extraordinary matters to do equal justice; and by supplying the defects of the law, gives remedy in all cases.

EQUITY, in mythology, sometimes confounded with Justice, a goddess among the Greeks and Romans, represented with a sword in one hand and a balance in the other.

EQUIVALENT PROPOSITIONS, those that signify the same thing differently expressed.

EQUIVALENT TERMS are where several words that differ in sound have yet one and the same signification; as every body was there, and nobody was absent; *nilhil non*, and *omne*.

EQUIVALENT THINGS, are either moral, physical, or statical. 1. Moral; e. g. the commanding or advising a murder is a guilt equivalent to that of the murderer. 2. Physical; a man who has the strength of two men is said to be equivalent to two men. 3. Statical; a less weight becomes equivalent in force with a greater, by having its distance from the centre increased.

EQUIVOCAL TERMS, or **WORDS**. Words of doubtful signification. Mr. Locke observes, that the doubtfulness and uncertainty of words has its cause more in the ideas themselves, than in any incapacity of the words to signify them; and might be avoided, would people always use the same term to denote the same idea or collection of ideas: but, adds he, it is hard to find a discourse on any subject where this is the case; a practice which can only be imputed to folly or great dishonesty; since a man, in making up his accounts, might with as much fairness use the numeral characters sometimes for one sometimes for another collection of units.

EQUIVOCATIONS are expedients to save telling the truth, and yet without telling a falsity. The fathers were too much addicted to equivocations.

EQUULEUS, or **ECCULEUS**, in antiquity, a kind of rack used for extorting a confession, at first chiefly practised on slaves, but afterwards made use of against the Christians.

EQUULEUS, **EQUICULUS**, or **EQUUS MINOR**, in astronomy, the horse's head; a constellation of the northern hemisphere. See **ASTRONOMY**.

EQUUS, in zoology, a genus of the class mammalia and order bellua.

belluæ. They have six erect and parallel fore-teeth in the upper jaw, and six somewhat prominent ones in the under jaw; one short tusk on each side of both jaws, at a considerable distance from the other teeth; and the feet consist of an undivided hoof. This genus is the only race of quadrupeds, in which the mammae are wanting on the males. Mr. Kerr enumerates six species, and many varieties.

I. *CABALLUS*, the COMMON HORSE, has a long flowing mane, and the tail covered on all parts with long hairs. The horse, in a domestic state, is a bold and fiery animal; equally intrepid as his master, he faces danger and death with ardour and magnanimity. He delights in the noise and tumult of arms, and seems to feel the glory of victory; he exults in the chase; his eyes sparkle with emulation in the course. But though bold and intrepid, he is docile and tractable; he knows how to govern and check the natural vivacity and fire of his temper. He not only yields to the hand, but seems to consult the inclination, of his rider. Constantly obedient to the impressions he receives, his motions are entirely regulated by the will of his master. He in some measure resigns his very existence to the pleasure of man. These excellencies, though in some degree natural to him are principally the effects of education of which the horse is remarkably susceptible. In most parts of the world the horse is found in a domesticated state, and it is said that in several parts of Asia and Africa they maintain their original independence, and range at pleasure in herds of several hundreds, having always one or more as an advanced guard, to alarm against approaching danger. These alarms are expressed by a sudden snorting, at which the main body gallop off with the most surprising swiftness. Wild horses are found, according to Dr. Pallas, in the deserts on each side the river Don, towards the Palus Mæotis; but these are supposed to be the offspring of the Russian horses, which were employed in the siege of Asoph, in the year 1697, when for want of forage they were turned loose, and their descendants have gradually relapsed into the appearance of natural wildness. Those which are found in some parts of South America, are well known to be the descendants of the horses introduced by the Spaniards on the first discovery of America, and which have so far relapsed into a state of nature as to exhibit the general characters of the wild animals. Of the several breeds of horses in common or general use in Europe, it is remarkable that none can come in competition with those of our own island, either for the strength required in laborious services, or for the swiftness and elegance of such as are bred for the course. The annals of Newmarket record instances of horses that have literally out-stripped the wind, as is proved from accurate calculations. The celebrated Childers is commemorated, in particular, as the swiftest horse ever known in the world; and the instances of his speed may be found in various publications. He was known to have run near a mile in a minute; and to have cleared the course at Newmarket, which is only 400 yards short of four miles, in six minutes and forty seconds; running at the rate of eighty-two feet and a half in the space of a second. This country has produced some others almost equally swift with Childers. See Plate LXVI. Draught-horses in Great Britain exceed in size and power those of other countries. Yorkshire and Lincolnshire are the most celebrated counties for this breed, whence several have been brought to London which have each, for a short distance drawn, without difficulty, the weight of three tons, half of which is considered as the regular draught. A horse of this class was exhibited as a curiosity in London in the year 1805, no less than twenty hands in height. For the cart-horse see Plate LXVI. Mr. Bruce informs us, that the horses of Nubia are of unparalleled beauty; far superior, in his opinion, even to those of Arabia. He observes, however, that from the manner in which they are fed they are apt to become too fat or corpulent. The colour of the horse is not of very great importance, the most beautiful general colour seems to be bright bay, which gives an air of peculiar neatness and elegance to the animal. Black horses are commonly of large size, and in this country are chiefly used for the cart and the plough. In some countries horses are not the less esteemed for being variegated or piebald, as it is commonly termed. This is said to be the case in China.

II. *EQUUS ASINUS*, the Ass. The ass, having been long condemned to a state of the lowest servitude, and considered as a species of less dignity than the horse, has acquired, in most parts of Europe, a character of contempt. Yet in its natural or wild state

it exhibits an appearance very far superior both in point of beauty and vivacity. It is a native of many parts of Asia, living, like the rest of this genus, in a gregarious manner. It chiefly occurs in the dry and mountainous deserts of Tartary, and in the southern parts of India and Persia. It is also said to be found in Africa, and to occur, though but very rarely, in some parts of Syria and Arabia; countries where it was in ancient times extremely common. In this its natural state its colour is said to be white, or of a very pale silvery grey, with a slight tinge of straw-colour on the sides of the neck and body: along the back runs a deep-brown stripe of thickish wavy hair, to the beginning of the tail: this stripe is crossed over the shoulders, as in the tame animal, by another of similar colour; but it is said that this is peculiar to the male. The neck is furnished with a brown mane three or four inches long, consisting of soft woolly hair: the tail is tufted at the end by dusky hairs of about six inches in length: the forehead is arched, and the ears erect and pointed. The generality of European asses have large slouching ears, a heavy appearance, and are of an ash-colour, more or less deep in different individuals, with a blackish dorsal stripe, crossed by another over the shoulders, and thus exhibiting the original mark of their species. In their manners they exhibit no superior marks of sagacity, but have the merit of being patient, quiet, and tractable, and are chiefly employed in the inferior offices of servitude. The ass is observed to be very temperate in his food, and by no means delicate in the choice of it; eating thistles, and a variety of coarse herbage which the horse refuses. He is said to be particularly fond of plantain, for which he will neglect every other herb of the pasture. In his choice of water he is remarkably nice, and will drink only of that which is clear. He has also an aversion to mud or water in his road, and will pass out of the way rather than wet his feet in a puddle. He is by no means void of docility, as vulgarly supposed; but may be made to practise several exercises not usual with his race. His voice, as is well known, is a most hideous bray; a discordant succession of flats and sharps. The ass has a very fine eye, an excellent scent, and a good ear. When overloaded, he hangs his head, and sinks his ears: when too much teased or tormented, he opens his mouth and retracts his lips in a disagreeable manner, which gives him an awkward air. If you cover his eyes, he will not move another step; if you lay him on his side, and place his head so that one eye rests on the ground, and cover the other with a cloth, he will remain in this situation without making any attempt to get up. He walks, trots, and gallops, in the same manner as the horse: but all his motions are slower. Whatever pace he is going at, if pushed he instantly stops. Mules are the offspring of the horse and ass, or the jack-ass and mare. Mr. Pennant mentions a mule produced between a jack-ass and a female zebra. The ass, like the horse, continues growing three or four years, and lives till he is 25 or 30: he sleeps less than the horse, and never lies down but when excessively fatigued. He is more robust, and less subject to disease, than the horse. In America there were originally no asses, but they were carried thither by the Spaniards, and afterwards by other nations, where they multiplied greatly; inasmuch, that, in some places, there are whole droves of them that run wild, and are not easily caught. Asses in general carry the heaviest burdens in proportion to their bulk; and, as their keeping costs little or nothing, it is surprising that they are not put to more uses than they generally are among us. The flesh of the common ass is never eaten in Europe; though some say, that of their colts is tender, and not disagreeable.

III. *EQUUS BISULCUS*, the CHINESE HORSE, in the size, number, and arrangement of teeth, as well as general appearance, resembles the horse; and is therefore ranked by Dr. Gmelin in this genus, though it differs from all the other species in having cloven hoofs. In its size, hair, colour, nose, eyes, neck, back, tail, legs, and internal structure, it resembles the ass, but wants the dusky cross on its shoulders. It resembles the horse in the figure of its ears, and the sound of its voice. Hence Mr. Kerr supposes, it may be only a wild horse, degenerated through the inclemency of the mountainous district it inhabits, in the Andes, in S. America; and that "the circumstance of its having cloven hoofs may be exaggerated, or only a mistake."

IV. *HEMIONUS* of Pallas, the *Ἡμιονος*, or half-ass, of Aristotle and Pliny, the *Czigithai* of Buffon, and the *Dshikketi*, of Fœculd or Wild Mule of Pennant, is of the size and appearance of the common

common mule; with a large head, flat forehead growing narrow toward the nose; eyes of a middle size, the irides of an obscure ash colour; 38 teeth in all, being two in number fewer than in a common horse; ears much longer than those of a horse, quite erect, lined with a thick whitish curling coat; neck slender, compressed; mane upright, short, soft, of a greyish colour; in place of the foretop, a short tuft of downy hair about an inch and three quarters long. This species inhabits the deserts between the rivers Onon and Argun in the most southern part of Siberia, and extends over the vast plains and deserts of western Tartary, and the celebrated sandy desert of Gobi, which reaches even to India. In Siberia they are seen only in small numbers, as if detached from the numerous herds to the south of the Russian dominions. These animals always carry their heads horizontally; but when they take to flight, hold them upright, and erect their tail. Their neighing is deeper and louder than that of a horse. They fight by biting and kicking, as usual with the horse: they are fierce and untameable; and even those which have been taken young, are so intractable as not to be broken by any art which the wandering Tartars could use. Its swiftness exceeds that of the antelope; it is even proverbial; and the inhabitants of Thibet, from the fame of its rapid speed, mount on it Chammo, their god of fire. The Mongolians despair of ever taking them by the chase; but lurk behind some tomb, or in some ditch, and shoot them when they come to drink or eat the salt of the desert. They are excessively fearful animals, and provident against danger. A male takes on him the care of the herd, and is always on the watch. If they see a hunter, who by creeping along the ground has got near them, the centinel takes a great circuit, and goes round and round him, as discovering somewhat to be apprehended. As soon as the animal is satisfied, it rejoins the herd, which sets off with great precipitation. Sometimes its curiosity costs its life; for it approaches so near as to give the hunter an opportunity of shooting it. But it is observed, that in rainy or in stormy weather, these animals seem very dull, and less sensible of the approach of mankind. The Mongolians and Tungusi, according to Du Halden, kill them for the sake of their flesh, which they prefer to that of horses, and even to that of the wild boar, esteeming it equally nourishing and wholesome.

V. E. QUAGGA, the **QUACNA**, is striped like the zebra on the head and body, but with fewer lines. The flanks are spotted; the rump is plain; the ground colour of the head, neck, body, and rump, a bright bay: the belly, thighs, and legs, are white, and free from all marks. This species, till of late, has been supposed to be the female of the zebra; but recent observations prove that the male and female zebra are marked alike. This differs likewise in being thicker and stronger made, and in being more tractable.

VI. E. ZEBRA has the figure and gracefulness of the horse, joined to the swiftness of the stag. He is about seven feet long, from the point of the muzzle to the origin of the tail, and about four feet high. The colour of his skin is beautiful and uniform, consisting of alternate parallel rings of black and white, disposed in the most regular manner, as represented in Plate LXVI. He is generally less than the horse, and larger than the ass. The zebra is found no where but in the E. and S. provinces of Africa, from Ethiopia to the Cape of Good Hope, and from the Cape of Good Hope to Congo. The Dutch have been at great pains to tame and use them for domestic purposes, but with little success. The zebra is hard-mouthed, and kicks when any person attempts to touch or come near him. He is restless and obstinate as a mule; but perhaps the wild horse is naturally as untractable as the zebra; for it is probable, if he were early accustomed to obedience and a domestic life, he would become as docile as the horse.

ERA. See **ÆRA**, **EPÔCHA**, and **CHRONOLOGY**.

ERANARCA, a public officer among the ancient Greeks, whose business was to preside over and direct the alms and provisions made for the poor.

ERANTHEMUM, a genus of the monogynia order, and dianthia class of plants. Corolla quinquefid, with the tube filiform; antheræ without the tube; stigma simple. It has five species, herbs or undershrubs, natives of the Cape of Good Hope.

ERASMUS, **DESIDERIUS**, born at Rotterdam in 1467. He lost his father and mother at 14 years of age; and was committed to the care of guardians, who forced him to be an ecclesiastic, which he refused for a long time. However he was obliged to as-

sume the religious habit among the canons regular in the monastery of Stein near Tergon; but afterwards obtained a dispensation from his vows. He was the most learned man of the age in which he lived; and contributed, by his example and his writings, to the restoration of learning in the several countries in which he occasionally resided, viz. Italy, Switzerland, Holland, France, and England. With the last he was most satisfied; and found the greatest encouragement from Henry VIII, Sir Thomas More, and all the learned Englishmen of those days. He published many books; and died at Basil in 1536. He was buried honourably, and his memory is still held in veneration. He had, however, many enemies; and as he did not embrace the reformation, and yet censured many things in popery, he has been treated injuriously both by Catholics and Protestants. The works of Erasmus in 10 vols. folio, were published at Leyden in 1706, in a very handsome manner, under the care of M. Le Clerc. Dr. Jortin published his life in one vol. 4to. 1758.

ERASED. See **COUPED**.

ERASTIANS, a religious sect which arose in England during the time of the civil wars in 1647, thus called from their leader Thomas Erastus, whose distinguishing doctrine it was, that the church had no right to discipline, that is, no regular power to excommunicate, exclude, censure, absolve, decree, or the like.

ERATO, [from *ἔρω* I love,] in mythology, the Muse who presided over love poetry. There was also a Nereid of this name.

ERATOSTHENES, a Cyrenean philosopher, historian, and poet; stiled for his learning Plato Minor. He was keeper of the famous library at Alexandria: and was greatly in favour with Ptolemy Evergetes, by whose order he wrote a history of the Theban kings of Egypt, which succession had been entirely omitted by Manetho. He thus fixed the Egyptian chronology, and his authority is by many preferred to that of Manetho. He wrote many other things, a catalogue of which is to be seen in Fabricius, Vossius, &c. but his only piece now remaining entire is a description and fabulous account of the stars. He starved himself in old age through grief for the dimness of his sight, about the 10th or 12th year of Ptolemy Epiphanes, B. C. 194.

ERBACH, a mountainous county of Germany, in the circle of Franconia, 21 miles long, and 18 broad; containing mines of silver, copper, lead, iron, and mercury; and producing wheat, oats, wood, &c.

ERBACH, the capital of the county, 16 miles N. N. E. of Heidelberg.

EREBUS, [*Ἔρεβος*, from *εἶναι*, night,] in mythology, a term denoting darkness. According to Hesiod, Erebus was the son of Chaos and Nox, or Night, and the father of Dies, or Day.

EREBUS was also part of the infernal regions among the ancients. They had a peculiar expiation for those who were detained in Erebus. It was properly the gloomy region, and distinguished both from Tartarus, the place of torment, and Elysium, the region of bliss.

ERFORT, or **ERFURT**, a town of Germany in the late circle of Upper Saxony, the capital of Thuringia, and subject to the elector of Mentz. Lon. 11. 23. E. Lat. 51. 0. N.

ERGASTULUM, in Roman antiquity, a prison, work-house, or house of correction, where slaves by the private authority of their masters were confined and kept for their offences to hard labour. The Greeks had a place of confinement of this sort, called *Εργαστήριον*.

ERICA, **HEATH**: in botany, a genus of the monogynia order, and octandria class of plants; natural order, Bicornes. Calyx tetraphyllous; corolla quadrifid; filaments inserted into the receptacle; antheræ bifid; capsule quadrilocular. It has eighty-four species.

ERIDANUS, in ancient geography, a river of Attica, falling into the Ilissus.

ERIDANUS, the ancient name of the Padus or Po, an appellation ascribed by Pliny to the Greeks; followed in this by Virgil.

ERIDANUS, in astronomy, a constellation of the southern hemisphere, in form of a river.

ERIE, an extensive lake of N. America, near 300 miles long, and 40 broad, at its broadest part. Its form is elliptical, but a point of land projects into it from the N. side for several miles towards the S. E. It receives its waters on the W. by the Detroit from Lakes Superior, Michigan, and Huron; and on the N. E. communicates

communicates with Lake Ontario by the Niagara. The line of division, between the United States and Upper Canada, runs through it. Its navigation is rendered dangerous by numerous projections of perpendicular craggy rocks into the water from its N. shore for many miles; and its banks and island on the W. are equally dangerous to land on, being much infested with rattlesnakes, and a peculiar species of poisonous reptile, called the Hissing Snake.

ERIE FORT, a strong fort of Upper Canada, on the N. coast of Lake Erie, and W. bank of the Niagara, 27 miles S. by E. of Fort Niagara. Lon. $78^{\circ} 20' 30''$ W. Lat. $42. 59. N.$

ERIGERON, **FLEA-BANE**, in botany, a genus of the polygamia superflua order, and syngenesia class of plants; natural order, Compositæ. Receptacle naked; pappus hairy; florets of the radius linear, and very narrow. There are thirty species.

ERIGONE, in fabulous history, the daughter of Icarus, died of grief for her father's death, was translated into heaven, and made the sign Virgo.

ERIN, an ancient name of Ireland.

ERINACEUS, the **HEDGEHOG**, in zoology, a genus of quadrupeds of the order, Feræ. Generic character: two fore-teeth, both above and below, those of the upper jaw distant, those of the lower approximated; five tusks on each side of the upper jaw, three on each side of the lower; four grinders on each side, both above and below; body covered on the upper part with spines. There are six species.

1. **E. EUROPEUS**, **COMMON** or **EUROPEAN HEDGEHOG**, is found in most of the temperate parts of Europe and Asia, and, according to Mr. Pennant, is also seen in Madagascar. It commonly measures about 11 inches in length. Its colour is generally grey-brown, but it sometimes is found totally white, or of a yellowish white. It feeds principally on the roots of vegetables; but it also eats worms, as well as beetles and other insects. It wanders about chiefly by night, and during the day conceals itself in its hole, under the roots of some tree, or mossy bank. It produces four or five young at a birth, which are soon covered with prickles like those of the parent animal, but shorter and weaker. The nest is large, and is composed of moss. The hedgehog, when disturbed rolls itself up into a globular form, and thus presents to its adversary an invulnerable ball of prickles. From this state of security, it is not easily forced; scarcely any thing but cold water obliging it to unfold itself. It swims perfectly well when thrown into water. The hedgehog is one of those animals which, during the winter, are supposed to continue in a state of torpidity. In that season it lies concealed in its hole, surrounded with a bed of moss, secure from the rigours of the most piercing frost, and at the return of spring recommences its wanderings. The hedgehog may be rendered in a considerable degree domestic; and has frequently been introduced into houses for the purpose of expelling those troublesome insects the blattæ, or cockroaches, which it pursues with avidity, and is fond of feeding on. It is itself an occasional article of food in some places, and is said to be best in the month of August. The hedgehog is generally considered as a harmless inoffensive animal, but has been frequently supposed (and to this day the absurd notion prevails in many places) to suck the teats of cows by night, and thus cause by its prickles those excruciations which are sometimes seen on cattle. From this accusation, however, it is completely absolved by Mr. Pennant, who observes, that its mouth is by far too small to admit of this practice. See Plate LXVI.

2. **E. AURITUS**, the **LONG-EARED URCHIN** of Pallas and Gmelin, or **SIBERIAN HEDGEHOG** of Pennant, has long oval ears, nostrils crested at the edges, and all the manners of the European. It inhabits Asiatic Russia, near the Volga and Ural, where it is smaller than the European, and beyond lake Baikal, where it is larger.

3. **E. ECAUDATUS**, the **TANREC** of Buffon, and **ASIATIC HEDGEHOG** of Pennant, is nearly as large as a rabbit, and has a very long slender muzzle, but no tail. It inhabits India and Madagascar.

4. **E. INAURIS**, the **WHITE AMERICAN URCHIN** of Seba, or **GUIANA HEDGEHOG** of Pennant, is 8 inches long, and has no external ears. It is a native of S. America.

5. **E. MALACCENSIS**, the **MALACCA URCHIN** of Brisson, or **SHORT-TAILED PORCUPINE** of Linnaeus, has pendulous ears, and

inhabits Asia. From this species is procured the Piedra del Porco, formerly much esteemed, supposed by Mr. Kerr, to be a kind of Bezoar. See Plate LXVI.

6. **SETOSUS**, the **TENDRAC**, has spines only on the head, neck, tail, and withers; is scarce six inches long, and inhabits India and Madagascar.

ERINNYIS, [*Erinnyis*, i. e. an avenger of crimes.] in mythology, a name common to the Furies. See **FURIES**.

ERINUS, in botany, a genus of the angiospermia order, and didynamia class of plants; natural order, Personatæ. Calyx pentaphyllous; corolla border quinquefid and equal; with its lobes emarginated, upper lip very short and reflexed; capsule bilocular. Thirteen species chiefly natives of Africa.

ERIOCAULON, in botany, a genus of the trigynia order, and triandria class of plants; natural order, Eusatæ. The common calyx is an imbricated capitulum or knob; there are three equal petals; and the stamina are on the germen. It has six species.

ERIOCEPHALUS, in botany, a genus of the polygamia necessary order, and syngenesia class of plants; natural order, Compositæ. Receptacle somewhat villous; no pappus; calyx deca-phyllous and equal; the radius has five florets. Two species, natives of the Cape of Good Hope.

ERIOPHORUM, a genus of the monogynia order, and triandria class of plants; natural order, Calamariæ. Glumes paleaceous, imbricated all around; no corolla; seed one, furnished with a very long down. There are six species.

ERIOSPERMUM, in botany, a genus of the hexandria monogynia class and order. Corolla six-petaled, campanulate, permanent; filaments dilated at the base; capsule three-celled; seeds invested with wool. There are three species.

ERIOSTEMUM, in botany, a genus of the decandria monogynia class and order. Calyx five-parted; petals five, sessile; stamina flat, ciliate; antheræ pedicelled terminal; style from the base of the germ; capsules five, united, seated on a nectary covered with protuberances; seeds coated. One species, viz. *E. australasia*.

ERIPHYLE, in fabulous history, the sister of Admetus king of Argos, wife of Amphiaræus, and daughter of Talæus and Lisi-mache.

ERIS, or **ATE**, the goddess of Discord among the Greeks, and the Discordia of the Latins. She was represented by Aristides, with fiery eyes, a pale countenance, livid lips, and wearing a dagger in her bosom.

ERISICHTHON, in fabulous history, a Thessalian, son of Triops, who derided Ceres, and cut down her groves. This impiety irritated the goddess, who afflicted him with continual hunger.

ERITHALIS, a genus of the monogynia order, and pentandria class of plants. Corolla quinquepartite; calyx bladder-like; berry decemlocular, inferior. It has two species.

ERIVAN, a city of Persia, in Asia, and capital of Persian Armenia. It is a large, dirty, ill-looking place, in which there are no handsome buildings, the houses being very mean, and raised with earth or mud; but it is full of gardens and vineyards. Lon. $44. 50. E.$ Lat. $40. 20. N.$

ERIVAN, **PERSIAN ARMENIA**, or **GREATER ARMENIA**, a province of Persia, 600 miles long, and 180 broad, of which the above city is the capital.

ERIVAN, an extensive lake in the above province, 60 miles in circumference.

ERKELENS, a town of Germany, 10 miles N. W. of Juliers.

ERLANG, a town of Germany, in the circle of Franconia, 12 miles N. W. of Nuremberg.

ERMELAND, a province of Prussia. The chief towns are Frauenbourg, Braunsberg, and Heilsburg.

ERMINE, in zoology. See **MUSTELA**.

ERMINE, or **ERMIN**, in heraldry, denotes a white field or fur, powdered or interspersed with black spots, called powdering. It represents the skin of an animal so named. There is, however, no animal whose skin naturally corresponds to the herald's ermin. The animal is milk white; and so far from having spots, that tradition reports, it will rather die or be taken, than sully its whiteness; hence its symbolical use. But white skins having for ages been used for the linings of the robes of magistrates and great men, the furriers, to add to their beauty, sewed bits of the black tails of those creatures upon the white skins; which alteration was introduced

duced into heraldry. The sable spots in ermine are not of any determinate number, but may be more or less at the pleasure of the painter or furrier.

ERMINE, an order of knights, instituted in 1450 by Francis I. duke of Bretagne, and formerly subsisting in France.

ERMINES, in heraldry, the reverse of ermine, *i. e.* white spots on a black field.

ERNODEA, in botany, a genus of the tetrandria monogynia class and order. Calyx four-parted; corolla one-petaled, salver-shaped; berry two-celled; seeds solitary. One species, viz. *E. littoralis*, a native of Jamaica.

ERODIUM, CRANES-BILL, in botany, a genus of the monadelphia pentandria class and order. Calyx five-leaved; corolla five-petaled; nectary five scales, alternate with the filaments and glands at the base of the stamens; fruit five-grained, with a spiral beak, bearded on the inside. There are twenty-eight species.

ERODIUS, a genus of insects of the order coleoptera. Antenna moniliform; feelers filiform; body roundish, gibbous, immarginate; thorax transverse; shells closely united, longer than the abdomen; jaw horny, bifid; lip horny, emarginate. There are four species.

EROS, [*ἔρως, i. e.* love,] in mythology, one of the two chiefs over all the other Cupids, being the cause of love.

EROTEUM, a genus of the class and order pentandria monogynia. Calyx five-leaved; corolla five-petaled; the style trifid; berry juiceless, three-celled, many-seeded. There are two species, natives of Jamaica.

EROTIA, a festival in honor of Eros, celebrated by the Thespians every fifth year with sports and games.

EROTIC, [*ἔρωτικός, from ἔρως, love*] of, or belonging to love.

EROTICUM DELIRIUM, in medicine, a kind of melancholy contracted through excess of love.

ERPACH, a county of Germany, in Suabia.

ERPACH, a town and castle in the above county, 8 miles S. E. of Ulm.

ERQUIKO, a sea-port of Africa, on the coast of Abex, on the Red Sea; 320 miles S. W. of Mecca. Lon. 39. 5. E. Lat. 17. 30. N.

ERRHINE, [*ἔρρινη, from ἔρρω, to promote*], in pharmacy, medicines which when snuffed up the nose promote a discharge of mucus. These are more friendly to the constitution and nerves than sternutatories, by their subtle, acrid, and volatile salt, gently stimulating the pituitary membrane, and drawing the mucid humour from it. They are also much safer. Those prepared of cephalic herbs are of singular service in oppressive pains of the head, hermicrania, lethargic disorders, weaknesses of memory, stuffings of the head, and coryza, mucous deluxions of the eyes, drowsiness, vertigoes, and in cases where the malignant humours generated by the lues venerea are lodged in the membranes of the nostrils.

ERRHINES, MILD, are marjoram, basilicon, thyme, hyssop, savory, marum syriacum, the tops of origanum, flowers of lilies of the valley, and gum benzoia, the resin of guaiacum, fine raspings of aloes wood, dry volatile salt of sal ammoniac, perfumed with oil of marjoram, and white vitriol.

ERRHINES, VIOLENT, are, euphorbium, the powder of white hellebore, several sorts of snuffs, precipitate mercury, turbit mineral, and pepper.

ERROUR, or ERROR, in philosophy, a mistake of our judgement, giving assent to that which is not true. Mr. Locke reduces the causes of error in philosophy, to these four; 1st, want of proofs; 2dly, want of ability to use them; 3dly, want of will to use them; and, 4thly, wrong measures of probability. He observes upon the first of these, that the greatest part of mankind want conveniences and opportunities of making experiments and observations themselves, or of collecting the testimonies of others, being prevented by the necessity of their condition. Upon the 2nd, he observes, that there are many, who, from the state of their condition, might bestow time in collecting proofs, but yet are not able to carry a train of consequences in their heads, nor weigh exactly the preponderancy of contrary proofs and testimonies, merely from the difference in men's understandings, apprehensions, and reasonings. He remarks, 3dly, that though some have opportunities and leisure enough, and want neither parts, learning, nor other helps, that they never come to the knowledge of several truths within their reach, either upon account of their attachment to pleasure or business; or otherwise because of their laziness or aversion to study. The 4th cause of error he imputes, 1. To the

practice of taking for principles propositions that are not in themselves certain and evident, but, on the contrary, doubtful and false. 2. To received hypotheses. 3. To predominant passions or inclinations. And, 4. To authority, or the giving up of our assent to the common received opinions either of our friends or party, neighbours or country. The causes of error in philosophy, or the reasons why all former philosophers have through so many ages erred, according to Lord Bacon, are these following: 1. Want of time suited to learning. 2. The little labour bestowed upon natural philosophy. 3. Few entirely addicted to natural philosophy. 4. The end of the sciences wrong fixed. 5. A wrong way chosen. 6. The neglect of experiments. 7. REGARD to antiquity and authority. 8. Admiration of the works in use. 9. The artifice of teachers and writers in the sciences. 10. Ostentatious promises of the moderns. 11. Want of proposing worthy tasks. 12. Superstition and zeal being opposite to natural philosophy, as thinking philosophy dangerous, on account of the school theology; from the opinion that deep natural inquiries should subvert religion. 13. Schools and academies proving unfavourable to philosophy. 14. Want of rewards. And, 15. Despair, and the supposition of impossibility.

ERROR LOCI, *i. e.* ERROR OF PLACE, a term introduced into medicine by Boerhaave, from the opinion that the vessels were of different sizes for the circulation of blood, serum, and lymph; and that when the larger sized globules were forced into the less vessels by an error of place, they were obstructed. But this opinion is now exploded.

ERROR, in law, signifies an error in pleading, or in the process; and the writ which is brought for remedy thereof, is called a writ of error. A writ of error is a commission to judges of a superior court, by which they are authorized to examine the record upon which a judgement was given in an inferior court, and on such examination, to affirm or reverse the same according to law. Jenk. Rep. 25. For particulars as to the practice of writs of error, see Impey's K. B. and C. P.

ERSE, or GAELIC LANGUAGE. See GAELIC.

ERUCA, the general name of caterpillars of all kinds. The caterpillar state is that through which every butterfly must pass before it arrives at its perfection and beauty: and, in the same manner, all the known winged animals, except only the puceron, pass through a reptile state; none else being produced in their winged form. The change from caterpillar to butterfly was long esteemed a metamorphosis, a real change of one animal into another; but this is not the case. The egg of a butterfly produces a butterfly, with all the lineaments of its parent; only these are not disclosed at first, but for the greater part of the animal's life are covered with a case or muscular coat, in which are legs for walking, which only suit it in this state; but its mouth takes in nourishment, which is conveyed to the included animal; and after a proper time this covering is thrown off, and the butterfly, which all the while might be discovered in it by an accurate observer with the help of a microscope, appears in its proper form. Before it passes into this state, however, there requires a state of rest for the wings to harden, and the other parts to acquire their proper firmness; this is transacted in a time of perfect rest, when the animal lies in what is called the nymph or chrysalis state, in appearance only a lump of inanimate matter. There is a determined time for each of these changes in every species; but, in the several different kinds, the periods are very different. There is no sign of sex in the animal while in the caterpillar state: the propagation of the species is the business of the creature in its ultimate perfection; and till that, these parts are never excluded; one female butterfly, when she has been impregnated by the male, will produce 300 or 400 eggs, or even more. There is no way of knowing the sexes of these little creatures by viewing the parts; but the whole figure and manner of the animal shews the difference. The females are always larger than the males; they are also more slow in their motions; and some of them have no wings, or, at the most, only very small ones. The males, however, have a sort of beards, more beautiful than the antennæ or horns of the females: the female is much stronger as well as bigger than the male; and often, in case of danger or disturbance, she flies away with him in time of copulation. On dissecting the female, her uterus affords an astonishing sight. The number of eggs in the tubes is amazing: but these have not all the same figure; and, in some species, as the silk-worm, &c. the eggs are of a beautiful blue;

blue; if any yellowish ones are seen among them, they are judged to be defective. The care of all the butterfly tribe to lodge their eggs in safety is surprising. Those whose eggs are to be hatched in a few weeks, and who are to live in the caterpillar state during part of the remaining summer, always lay them on the leaves of such plants as will afford a proper nourishment, but those, whose eggs are to remain unhatched till the following spring, always lay them on the branches of trees and shrubs, and usually select such places as are least exposed to the rigour of the ensuing season, and frequently cover them from it in an artful manner. Some make a general coat of a hairy matter over them, taking the hairs from their own bodies for that purpose; others hide themselves in hollow places in trees, and in other sheltered cells, and there live in a kind of torpid state during the whole winter, that they may deposit their eggs in the succeeding spring, at a time when there will be no severities of weather for them to combat. The day butterflies only do this, and of these but a very few species; but the phalænæ, or night ones, all without exception, lay their eggs as soon as they have been in copulation with the male, and die immediately afterwards.

ERUDITION, implies chiefly the knowledge of history and antiquity, of languages and of books. The Scaligers were men of deep erudition: the writings of M. Launoy, a priest of the Oratory, are full of erudition. Mr. Locke says, it is of more use to fill the head with reflections than with points of erudition. M. Balzac calls a heap of ill chosen erudition the luggage of antiquity.

ERUPTION, in medicine, a sudden and copious excretion of humours, as pus or blood: it signifies also the same with exanthema, any breaking out, as the pustules of the plague, small-pox, measles, &c.

ERVUM, the **LENTIL**; a genus of the decandria order, and diadelphia class of plants; natural order, Papilionaceæ. Calyx five-parted, the length of the corolla. There are six species; of which the *E. lens*, the common lentil, is cultivated in many parts of England, either as fodder for cattle, or for the seeds which are used in meagre soups.

ERYMANTHUS, in ancient geography, a mountain, river, and town of Arcadia, where Hercules is said to have killed a prodigious boar, which he carried on his shoulders to Eurytheus; who was so terrified at the sight, that he hid himself in a brazen vessel.

ERYNGIUM, **ERYNGO**, or **SEAHOLLY**, a genus of the dignity order, and pentandria class of plants; natural order, Umbellatæ. Flowers collected into a round head; receptacle paleaceous. There are eleven species; most of which are hardy herbaceous perennials, producing erect stalks from one to two or three feet high; with simple, entire, or divided prickly leaves; and the stalks terminated by roundish aggregate heads of quinquepetalous flowers, of white, blue, or purple colours. They all flower mostly in July, and the seeds ripen in September.

ERYSIMUM, **HEDGE MUSTARD**: a genus of the siliquosa order, and tetradynamia class of plants; natural order, Siliquosæ. Siliqua long, linear, and exactly tetragonal; calyx close. It has eight species.

ERYSIPELAS, [*erysipelas*], an erysipelas is generated by a hot serum in the blood, and affects the superficies of the skin with a shining pale red, and citron colour, without pulsation or circumscribed tumour, spreading from one place to another. See **MEDICINE**.

ERYTHRÆ, in ancient geography, three towns: 1. in Ætolia, on the Corinthian bay: 2. in Beotia, near Plataea and mount Cithæron: 3. in Ionia, on the peninsula, at its extremity; with 4. a cognominal port. It was famous for an ancient temple of Hercules.

ERYTHRÆA, a surname of the Sybil Herophile, from her birth-place, Erythræ in Ionia.

ERYTHRÆUM MARE, erroneously called **Rubrum**, or the **Red Sea**, by the Romans. Thus, the ocean that washes Arabia and Persia, and extends a great way farther, is denominated. Hence Herodotus says, that the Euphrates and Tigris fall into the **Mare Erythræum**. It is named from

ERYTHRAS, the son of Perseus and Andromeda, whose kingdom lay on the confines of that sea.

ERYTHRINA, **CORAL TREE**: a genus of the decandria order, and diadelphia class of plants; natural order, Papilionaceæ.

Calyx bilabiate, the one lip above, the other below; vexillum of the corolla very long and lanceolated. There are seven species, shrubby flowering exotics for the stove, adorned chiefly with trifoliate leaves, and scarlet spikes of papilionaceous flowers. They are natives of the warm parts of Africa and America; and must always be kept in pots, which remain constantly in stoves in this country.

ERYTHROIDES, in anatomy, the first of the proper coats which cover the testicles.

ERYTHRONIUM, **DOG'S-TOOTH VIOLET**: a genus of the monogynia order, and hexandria class of plants; natural order, Samentaceæ. Corolla hexapetalous, campanulated; with a nectarium, tubercles two, adhering to the inner base of every other petal. There is only one species, which, however, admits of several varieties in its flowers, as white, purple, pale red, dark red, crimson, and yellow.

ERYTHROXYLON, in botany, a genus of the trigynia order, and decandria class of plants. Calyx turbinate; corolla having each a nectariferous emarginated scale at the base; stamina connected at the base; fruit a bilocular plum. It has five species.

ERYX, in fabulous history, a son of Butes and Venus, who relying upon his strength, challenged all strangers to fight with him in the combat of the cestus. He was killed in the combat, by Hercules, who had accepted his challenge.

ERZERON, or **ERZERUM**, a city of Turkey in Asia, the capital of Turcomania; five days journey from the Black Sea, and 10 from the frontiers of Persia. Lon. 40. 41. E. Lat. 39. 57. N.

ERZGEBIRG, or **ERZGEBURG**, a territory of Germany, in Upper Saxony, surrounded by those of Leipsic, Meissen, Vogtlandt, Neustadt, Bohemia, and Altenburgh.

ESARHADDON, or **ASAR-ADDON**, the son of Sennacherib, and his successor in the kingdom of Assyria, about B. C. 712. He united the kingdoms of Nineveh and Babylon; conquered Ethiopia and Syria; sent a colony to Samaria; and his generals took king Manasseh, and carried him in chains to Babylon. He reigned 29 years at Nineveh, from A. M. 3294 to 3322; and 13 at Babylon; in all 42 years. He died A. M. 3336, and was succeeded by Sardanapalus. Esarhaddon, in the opinion of Sir Isaac Newton, is the Sardanapalus who died, as Clectarchus says, of old age, after the revolt of Syria; the name Sardanapalus being derived from Asserhadon Pul.

ESAU, [עֵשָׂו, Heb. i. e. doing.] See **EDOM**.

ESAU, a mountain of Arabia, in Yemen, 4 miles N. of Udden.

ESACENA, a town of Spain, in Seville, 20 miles W. of Seville.

ESCALLONIA, a genus of the monogynia order, and pentandria class of plants. Fruit bilocular, polyspermous; petals distant, tongue-shaped; stigma headed.

ESCALONA, two towns of Spain; 1. in New Castile, 32 miles S. W. of Madrid: 2. in Old Castile, 14 miles N. N. E. of Segovia.

ESCAPE, in law, a violent or privy evasion out of some lawful restraint, without being delivered by due course of law. There are two sorts of escapes, voluntary and negligent.

ESCAPE, **NEGLIGENT**, is where one is arrested, and afterwards escapes against the will of the person that arrested him, and is not pursued with fresh suit, and retaken before the person pursuing hath lost sight of him. By stat. 8 and 9 Will. III. c. 26. the keepers of prisons conniving at escapes shall forfeit 500*l.* and in civil cases, the sheriff is answerable for the debt.

ESCAPE, **VOLUNTARY**, when a man arrests another for felony, or other crime, and afterwards lets him go freely by consent; in which case, the party that permits such escape is held guilty, committed, and must answer for it.

ESCAUT, or the **SCHELD**T, a department of Belgium, containing part of the late Austrian Flanders. Ghent is the capital.

ESCHALOT. See **ALLIUM**.

ESCHAR, in surgery, the crust or scab occasioned by burnt or caustic medicines. See **SURGERY**.

ESCHAROTICS, in pharmacy, medicines which produce eschars. See **ESCHAR**.

ESCHEAT, in our law, denotes an obstruction of the course of descent, and a consequent determination of the tenure by some unforeseen contingency; in which case, the land naturally results back, by a kind of reversion, to the original grantor, or lord of the fee.

fee. 2 Black. 244. Escheat happens either for want of heirs of the person last seized, or by his attainder for a crime by him committed; in which latter case, the blood is tainted, stained, or corrupted, and the inheritable quality of it is thereby extinguished. For want of heirs, is where the tenant dies without any relations on the part of any of his ancestors, or where he dies without any relations of those ancestors, paternal or maternal, from whom his estate descended, or where he dies without any relations of the whole blood. Bastards are also incapable of inheritance; and therefore if there is no other claimant than such illegitimate children, the land shall escheat to the lord; and, as bastards cannot be heirs themselves, so neither can they have any heirs but those of their own bodies; and therefore if a bastard purchases land, and dies seized thereof without issue and intestate, the land shall escheat to the lord of the fee. Aliens also, that is, persons born out of the king's allegiance, are incapable of taking by descent; and unless naturalized, are also incapable of taking by purchase; and therefore, if there are no natural-born subjects to claim, such lands shall in like manner escheat. By attainder for treason or other felony, the blood of the person attainted is corrupted and stained, and the original donation of the feud is thereby determined, it being always granted to the vassal on the implied condition of his well demeaning himself. In consequence of which corruption and extinction of hereditary blood, the land of all felons would immediately revert to the lord, but that the superior law of forfeiture intervenes, and intercepts it in his passage; in case of treason, for ever; in case of other felony, for only a year and a day; after which time it goes to the lord, in a regular course of escheat. 2 Black. c. 15.

ESCHEATOR, was an ancient officer, so called because his office was properly to look to escheats, wardships, and other casualties belonging to the crown. This office had its chief dependence on the courts of wards, but is now out of date. Co. Lit. 13. b. 4. Inst. 225.

ESCHELLES, a town in France, in the department of Mont Blanc, late Savoy, 10 miles S. W. of Chambéry.

ESCHEVIN, or ECHEVIN, [*Scabinus*, Lat.] in the late French and Dutch polity, a magistrate elected by the inhabitants of a city, to take care of their common concerns.

ESCHRAKITES, or ESRAKITES, a sect of philosophers, among the Mohammedans, who adhere to the doctrines of Plato. The word is derived from the Arabic *شراق*, *schrava*, which in the fourth conjugation *شراق*, *aschraca*, signifies to shine, or glitter, like the sun; so that Eschrakite seems to import illumined.

ESCHWEGEN, a town of Germany, in Hesse, 27 miles E. S. E. of Cassel. Lon. 10. 6. E. Lat. 51. 9. N.

ESCHWEILER, a town of France, in the department of Roer, and late duchy of Juliers, 6 miles S. of Juliers.

ESCLATTE, in heraldry, signifies a thing forcibly broken, or rather a shield that has been broken and shattered with the stroke of a battle-ax.

ESCORT, in the art of war, the same with convoy. See CONVOY.

ESCOUADE, or SQUAD, is usually the third or fourth part of a company of foot; so divided for mounting guards, and for the more convenient relieving of one another. It is equivalent to a brigade or a troop of horse. See BRIGADE.

ESCROW, among the lawyers, a deed delivered to a third person, to be the deed of the party making it upon a future condition, that when a certain thing is performed, it shall be delivered to the party to whom it was made, to take effect as the deed of the person first delivering it.

ESCUAGE, in our old customs, a kind of knight service, called service of the shield, by which the tenant was bound to follow his lord to the wars at his own charge. It is also used for a sum of money paid to the lord in lieu of such service; or even for a reasonable aid, levied by the lord upon his tenants who held by the knight's service.

ESCUBIAL, a royal residence of Spain, 15 miles N. W. of Madrid. It is the largest and most superb structure in the kingdom, and one of the finest in Europe. The word is Arabic, meaning "a place full of rocks." It is built in a dry barren spot, surrounded with rugged mountains, inasmuch that every thing which grows there is owing to art. This place was chosen, it is said, for the sake of the stone wherewith the fabric is built, which is got from a mountain just by, and is very durable; and the de-

sign for erecting it was to commemorate a victory which Philip II. obtained over the French (but by the assistance of the English forces) at St. Quintin, on St. Laurence's day, in the year 1557. The Spanish description of this structure forms a sizeable quarto volume. Its founder expended upon it six millions of ducats. The apartments are decorated with an astonishing variety of paintings, sculpture, tapestry, ornaments of gold and silver, marble, jasper, gems, and other curious stones, surpassing all imagination. This building, besides its palace, contains a church, large and richly ornamented; a mausoleum; cloisters; a convent; a college; and a library, containing about thirty thousand volumes; besides large apartments for all kinds of artists and mechanics, noble walks, with extensive parks and gardens, beautified with fountains and costly ornaments.

ESCUTCHEON, in heraldry, is derived from the French *escussion*, and that from the Latin *scutum*, and signifies the shield whereon coats of arms are represented. Most nations, of the remotest antiquity, were wont to have their shields distinguished by certain marks painted on them; and to have such on their shields was a token of honour, none being permitted to have them till they had performed some honourable action. The escutcheon, as used at present, is square, only rounded off at the bottom. As to the bearings on shields, they might at first be arbitrary, according to the fancy of the bearer; but, in process of time, they came to be the gift of kings and generals, as the reward of honourable actions.

ESCUTCHEON OF PRETENCE, that on which a man carries his wife's coat of arms, being an heiress, and having issue by her. It is placed over the coat of the husband, who thereby shews forth his pretensions to her lands.

ESDRAS, or EZRA, a Jewish priest, and doctor of the law. Artaxerxes Longimanus, sent him with rich presents for the use and ornament of the temple at Jerusalem, rebuilt under Zerubbabel; he also ordered the neighbouring governors to provide him with what conduced to the pomp of the Jewish religion, and to exempt the priests from paying taxes. Ezra is supposed to have been the collector of the Canon of Scripture; and that, by divine inspiration, he added some things which happened after the deaths of the authors. It is supposed he wrote the Chronicles, besides those books which bear his name; the two last of which are exploded as apocryphal, even by the church of Rome.

ESENS, a town of Germany, in east Friesland, 24 miles N. N. E. of Emden. Lon. 7. 14. E. Lat. 53. 47. N.

ESFARIAN, a town of Persia, 90 miles E. of Astrabad. Lon. 41. 23. E. Lat. 36. 48. N.

ESIONGABER, ASIONGABER, or EZIONGEBER, an ancient town of Arabia Petrea, on the bay of Elath, a part of the Arabian Gulf; the dock or station for the ships of Solomon and Jehoshaphat. It was afterwards called Bernice.

ESK, a river of England, in Cumberland, which runs into the Irish Sea, near Ravinlass.

ESK, BLACK and WHITE, two rivers of Scotland, in Eskdale, Dumfriesshire. Also two rivers in Angushire.

ESKI SHEHR, a town of Asiatic Turkey, in Natolia, on the Sakaria, 116 miles S. E. of Constantinople.

ESLINGEN, a large imperial town of Germany, in the late duchy of Wirtemberg, 8 miles S. E. of Stutgard.

ESOX, in ichthyology, the PIKE, a genus of fishes of the order abdominales. Head flattish above, mouth and throat large; teeth sharp, in the jaws, palate, and tongue; nostrils double, near the eyes; gill-membrane with from seven to twelve rays; body elongated; dorsal fin near the tail. Gmelin enumerates fifteen species, and Shaw twenty-two: the following are the most important.

E. LUCIUS, or the COMMON PIKE. In Lapland this fish, is frequently found eight feet long. It is to be met with in most lakes and small rivers throughout Europe. Its common colour is a pale olive, but in Holland it has been seen of an orange colour with black spots. When in its perfect state its colours are uniformly found to be most vivid. The largest pike ever caught in Great Britain is supposed to have been one which weighed thirty-five pounds. It is a fish of particularly rapid growth, and also of great longevity, having been ascertained, according to one of the natural historians of Poland, to live to the age of ninety years. The stomach of the pike is particularly strong, muscular, and extended. Its teeth, without including those nearest the throat, are

no fewer than seven hundred, and those which are placed on the jaws are alternately moveable and fixed. It is one of the most voracious of fishes, and is often found to swallow water-rats and young ducks; it has even attacked the swan, and swallowed the head and great part of the neck of that bird; but being unable to separate these from the body, it became, in this instance, the victim of its voracity.

E. BELONE, the **GAR**, or **SEA NEEDLE**, sometimes grows to three feet or more. The jaws are very long, slender, and sharp-pointed; the under jaw extends much farther than the upper; and the edges of both are armed with numbers of short and slender teeth: the tongue is small: the eyes are large; the irides silvery; and the nostrils wide and round. The body is slender, the belly quite flat, bounded on both sides by a rough line.

E. STOMIAS, or the **PIPER-MOUTHED PIKE**, is a native of the Mediterranean sea, about eighteen inches in length, and of a greenish brown colour. Its lower jaw is considerably longer than the upper; it has two fore-teeth in the upper, and these with two of the under, project from the mouth when shut; a specimen of it is to be seen in the British Museum.

ESPALIERS, in gardening, are rows of trees planted about a whole garden or plantation, or in edges, so as to inclose quarters or separate parts of a garden; and are trained up regularly to a lattice of wood-work in a close hedge, for the defence of tender plants against the injuries of wind and weather. They are of admirable use and beauty in a kitchen-garden, serving not only to shelter the tender plants, but screen them from the sight of persons in the walks.

ESPALION, a town of France, in the department of Aveiron, 12 $\frac{1}{2}$ miles N. N. E. of Rhodéz.

ESPAMISCACK, a lake of Lower Canada, 222 miles N. E. of Quebec. Lon. 68. 0. W. Lat. 50. 0. N.

ESPLANADE, in fortification, the stopping of the parapet of the covered way towards the campaign. It is the same with glacis, but begins to be antiquated, and is more properly the empty space betwixt a citadel and the houses of a town, commonly called a place of arms. See **FORTIFICATION**.

ESPLEES, in law, the general products which lands yield, or the profit or commodity that is to be taken or made of a thing.

ESPOSENDA, a sea-port town of Portugal, in Entre-Duero-e-Minho, 22 miles N. of Oporto.

ESPOSENDA, a town of Spain, in Gallicia, 12 miles S. W. of Orense.

ESPOUSALS, in law, signify a contract or promise made between a man and a woman, to marry each other; and in cases where marriage may be consummated, espousals go before. Marriage is termed an espousal de presenti.

ESPOUSALS among the Jews, were either by writing, or by a piece of silver given and received, or by cohabitation. Among the Greeks, after the parents and friends of the young couple had finished their negotiation, the couple themselves pledged their faith to each other, the man swearing that he would be constant and true, the woman that she would marry him, and make him master of all she had. Then they ratified their agreement by a kiss and joining right hands. Among the Romans the espousals consisted in an engagement of friends on both sides, whether absent or present, in public or without witnesses. But the common way was by writings drawn up by common consent, and sealed by both parties; the man also sent a ring to the woman, consisting of iron and without a stone.

ESQUILÆ, **ESQUILINE**, or **ESQUILINUS MONS**, in ancient geography, one of the seven hills of Rome, which Varro will have to consist of two, viz. Cispius and Opus.

ESQUIMAUX, a people of North America inhabiting all that vast tract of land called Labrador, or New Britain. They differ very considerably, both in aspect and behaviour, from the other American nations; agreeing in most respects with the inhabitants of West Greenland.

ESQUIRE is derived from the French *escu*, and the Latin *scutum*, in Greek *ταυτο*, which signifies a hide, of which shields were anciently made, and afterwards covered: for, in the time of the Anglo-Saxons, the shields had a covering of leather. An esquire, or Squire was originally a person who, attending a knight in time of war, carried his shield; whence he was called *escuier* in

French, and *escutifer*, or *armiger*, i. e. armour-bearer, in Latin. This title has not, for a long time, had any relation to the office of the person, as to carry arms, &c. Those to whom the title of esquire is now of right due, are all noblemen's younger sons, and the eldest sons of such younger sons; the eldest sons of knights, and their eldest sons; the officers of the king's courts, and of his household: counsellors at law, justices of the peace, &c. though those latter are only esquires in reputation: besides, a justice of the peace holds this title no longer than he is in commission, in case he is not otherwise qualified to bear it: but a sheriff of a county, who is a superior officer, retains the title of esquire during life, in consequence of the trust once reposed in him: the heads of some ancient families are said to be esquires by prescription.

ESQUIRES OF THE KING are such as have that title by creation, wherein the form used is, to put about their necks a collar of SS, and bestow on them a pair of silver spurs, &c.

ESQUIRES OF THE KNIGHTS OF THE BATH are constituted by these knights, each knight of the Bath constituting three esquires, at his installation.

ESQUISSE, [Fr. a sketch,] in painting, the first slight sketch or draught of a picture.

ESSAY, in literature, a peculiar kind of composition, the character whereof is to be free, easy, and natural; not tied to strict order or method, not worked up and finished like a formal system.

ESSAY-BALANCE. See **BALANCE**.

ESSAY-HATCH is the miner's term for a little trench or hole, which they dig to search for shoad or ore.

ESSAYING, or **ASSAYING**, in chemistry and metallurgy. See **ASSAYING**.

ESSEDARI, a sort of gladiators, mentioned by Seneca, Suetonius, and Tully, who on some occasions engaged one another out of chariots called *essedæ*.

ESSEDUM, a sort of heavy chariot from which the Gauls and Britons engaged the Romans.

ESSEN, three towns of Germany in Westphalia.

ESSENCE, in chemistry, denotes the purest, most subtle, and balsamic part of a body; extracted either by simple expression, or by means of fire, from fruits, flowers, and the like. Of these there are a great variety, used on account of their agreeable smell and taste, by apothecaries, perfumers, and others. Those extracted by means of fire, with more propriety are to be counted among the essential oils.

ESSENCE OF BERGAMOT, is a fragrant essence, extracted from a fruit which is produced by grafting a branch of lemon-tree, upon the stock of a bergamot-pear. It is imported from Italy and Sicily, particularly from Reggio and Messina. This spirit is extracted, by paring off the rind of the fruit with a broad knife, pressing the peel between wooden pincers against a sponge, and as soon as the sponge is saturated, the volatile liquor is squeezed into a phial.

ESSENCE OF ORANGE, and **ESSENCE OF LEMON**, are prepared in a similar manner, and come from the same countries.

The **ESSENCES OF LAVENDER**, of **THYME**, of **ROSEMARY**, of **ANISE**, of **CLOVES**, of **CINNAMON**, &c. are obtained by means of fire.

ESSENCE, in metaphysics, that which constitutes the particular nature of each genus or kind, and distinguishes it from all others; being nothing but that abstract idea to which this name is affixed, so that every thing contained in it is essential to that particular kind. This Mr. Locke calls the nominal essence; in contradiction to the real essence, or constitution of substances, on which this nominal essence depends. Thus the nominal essence of gold is that complex idea the word gold stands for; as implying a body, yellow, weighty, malleable, fusible, and fixed; but its real essence is the constitution of its insensible parts, on which these qualities and all its other properties depend, which is wholly unknown to us.

ESSENDI QUIETUM DE THEOLONIO, a writ that lies for citizens and burgesses of any city or town, that have a charter on prescription to exempt them from toll through the whole realm, if it happened to be any where exacted of them.

ESSENEs, or **ESSENIANS**, in Jewish antiquity, one of the three ancient sects among that people. They allowed a future state, but denied a resurrection from the dead. Their way of

life was very singular: they did not marry; but adopted the children of others, whom they bred up in the institutions of their sect; they despised riches, and had all things in common; and never changed their cloaths till they were entirely worn out.

ESSENTIAL, something necessarily belonging to the essence or nature of a thing, from which it cannot be conceived distinct: thus the primary qualities of bodies, as extension, figure, number, &c. are essential or inseparable from them in all their changes and alterations. See **QUALITY**.

ESSENTIAL OILS are such as are really contained in a plant, and are drawn from it by distillation in an alembic with water; they are thus called, in contra-distinction to empyreumatic oils, which are raised by a naked fire without water.

ESSEX, a county of England, bounded on the N. by part of Cambridgeshire, and by the river Stour, which separates it from Suffolk; on the E. by the German Ocean; on the S. by the Thames, which divides it from Kent; and on the W. by Herts and Middlesex; being divided from the former, in one part by the Stort, and then by the Lea, which separates it likewise from Middlesex. It is 54 miles in length from E. to W.; 48 broad from N. to S.; and 200 in circumference. Several towns of Essex, have been long distinguished for the manufacture of baize, which, however, is far from being so flourishing as formerly. The rivers, besides the boundary ones, are the Chelmer, Blackwater, Coln, Crouch, and Roding. Chelmsford is the capital.

Essex, a county of Massachusetts, 38 miles long, and 25 broad, bounded on the S. and E. by the Atlantic.

Essex, a county of New Jersey, 25 miles long and 16 broad; bounded on the E. by the Passaic and Newark Bay.

Essex, a county of Virginia, 55 miles long and 12 broad; bounded on the E. and N. E. by the Rappahannock; S. E. by Middlesex; S. and S. W. by King and Queen County; and N. W. by Caroline.

ESSOIN, in law, an excuse for a person summoned to appear and answer to an action, on account of sickness or other just cause of his absence. It is a kind of imparlance, or craving of longer time, and obtains in real, personal, and mixed actions. There are three essoins, as *de ultra mare*, when the defendant is beyond sea, whereby he is allowed forty days; in an expedition to the holy land, a year and a day; infirmity, called common essoin, when he is sick in bed; and, lastly, in the king's service.

ESSOIN-DAY, is regularly the first day of every term, though the fourth day after is also allowed by way of indulgence.

ESSOIN DE MALO VILLE, is where the defendant appears in court, but before pleading, falls sick in a certain village: this is also allowed, if found true.

ESSORANT, in heraldry, denotes a bird standing on the ground with its wings expanded, as if it had been wet, and were drying itself.

ESTABLISHMENT OF DOWER, in law, an assurance of dower made to the wife by the husband, or some friend of his, on marriage. See **DOWER**.

ESTAIN, a town of France, in the department of the Meuse, and late duchy of Bar; 10½ miles E. N. E. of Verdun.

ESTAMPES, or **ETAMPES**, a town of France, in the department of Seine and Oise, and late province of the isle of France, on the Juine, 15 miles E. of Chartres.

ESTAPA, or **ESTAPE**, a town of Mexico, in the province, and on the river Tabasco.

ESTAPLES, a town of France in the department of the Straits of Calais, 12 miles S. of Boulogne.

ESTAPO, a strong town of New Spain, at the mouth of the Taluc.

ESTATE, in law, signifies the interest that a person has in lands, tenements, or other effects; comprehending the whole in which a person has any property. Estates are either real or personal; otherwise distinguished into Freeholds, which descend to heirs; or Chattels, that go to executors or administrators. A fee simple is the amplest estate our law admits of. See **FEU**. Estates are obtained several ways; as, by descent from a father to a son; by conveyance or grant from one person to another; by gift or purchase; or by deed or will. See **DESCENT**, **SUCCESSION**, **TENURE**, &c.

ESTATES, in a political sense, is used either to denote the dominions of a prince, or the general classes into which the people

are divided. In Britain, the estates are the king, lords, and commons.

ESTE, a fertile district of Maritime Austria, in the Paduano.

ESTRE, the capital of the above district, anciently called *Ateste*.

ESTHER, [אֶסְתֵּר, Heb. *i. e.* secret, or hid,] a canonical book of the Old Testament, containing the history of

ESTHER, a Jewish virgin, whose great beauty raised her to the throne of Persia; whereby she saved her countrymen from the fatal extermination planned by proud Haman, prime minister and favorite of king Ahasuerus. The learned are not agreed who this Ahasuerus was. Archbishop Ussher supposes him to be Darius Hystaspes, and Artystona to be Esther. Scaliger makes him the same with Xerxes, and his queen Hamestris to be Esther. Josephus, on the contrary, positively asserts, that the Ahasuerus of the scriptures, is the Artaxerxes Longimanus of profane story; and the Septuagint, throughout the whole book of Esther, translate Ahasuerus by Artaxerxes. Most authors agree in this last opinion; and indeed the extraordinary kindness shewed by Artaxerxes to the Jews, can scarce be accounted for otherwise than by supposing that they had so powerful an advocate as Esther to solicit for them.

ESTOILE'E, or **CROSS ESTOILLE'E**, in heraldry, a star with only four long rays in form of a cross; and, accordingly, broad in the centre, and terminating in sharp points.

ESTOPPEL, in law, an impediment or bar to an action, which arises from a person's own fact; or rather where he is forbid by law to speak against his deed, which he may not do, even to plead the truth. Thus where a person is bound in a bond by such a name, and being afterwards sued by that name on the obligation, he shall not be allowed to say he is misnamed, but shall answer according to the bond, though it be wrong. Hence the parties in all deeds are estopped from saying any thing against them. However, a plaintiff is not estopped from saying any thing against what he had said in his writ or declaration; and though parties be estopped, yet juries are not so, who may find things out of the record.

ESTOVERS, in law, is used by Bracton, for that sustenance which a man committed for felony is to have out of his lands or goods for himself and family during imprisonment. In stat. 6, Edw. I. it is used for an allowance in meat or clothes. In some manors the tenants have common estovers; that is, necessary botes or allowances out of the lord's wood: in which last sense, estovers comprehend *house-bote*, *hay-bote*, and *plow-bote*; so that if a man have in his grant these general words, *de rationabili estoverio in boscis*, &c. he may thereby claim all three.

ESTOVERS is also used for alimony, which, if the husband refuses to pay, there is, besides the ordinary process of excommunication, a writ at common law, *de estoveriis habendis*, in order to recover it.

ESTRAMADURA. See **ESTREMADURA**.

ESTRAPE, [Fr.] the defence of a horse that will not obey, who, to get rid of his rider, rises mightily before; and while his fore-hand is yet in the air, yerks furiously with his hind-legs.

ESTRAVAYER, a town, fort, and district, of the Helvetic republic, in the canton of Friburg, 13 miles W. of Friburg.

ESTRAYS AND WAIFS, in law. Estrays are where any horses, sheep, hogs, beasts, or swans, or any beast that is not wild, come into a lordship, and are not owned by any man. Kitch. 23. The reason of estray is, because when no person can make title to the thing, the law gives it to the king, if the owner does not claim it within a year and a day. Waifs are goods which are stolen, and waved or left by the felon, on his being pursued, for fear of being apprehended, and forfeited to the king or lord of the manor: and though waifs are generally spoken of things stolen, yet if a man is pursued with hue and cry as a felon, and he flies and leaves his own goods, these will be forfeited as goods stolen; but they are properly the fugitive's goods, and not forfeited till it is found before the coroner, or otherwise of record, that he fled for the felony. 2 Haw. 450. Waifs and strays were anciently the property of the finders by the law of nature, and afterwards the property of the king by the law of nations. Dalt. Sher. 79. Waifs and strays not claimed within the year and day are the lord's. For where the lord has a beast a year and a day, and it has been cried in the church and markets, the property is changed. Kitch.

80. But it must be a year and a day from the time of proclamation, and not from the time of seizure; for it does not become an estray till after the first proclamation. 11 Mod. 89.

ESTREAT, is a true copy or note of some original writing on record, and especially of fines and amercement imposed in the rolls of a court, and extracted or drawn out thence, and certified into the court of exchequer: whereupon process is awarded to the sheriff to levy the same.

ESTREMADURA, a province of Portugal, near the mouth of the Tajo, bounded on the N. by Beira, on the E. and S. by Alentejo, and on the W. by the Atlantic. It is about 88 miles long, and 45 broad. This province is divided into six districts, called comarcas, viz. Litria, Lisbon, Tomar, Santarem, Alanquar, and Setubal, so named from the principal towns. It abounds in corn, and feeds numerous flocks of sheep. The fruits and the wines are all excellent; and it was here that the sweet oranges brought from China were first planted, and of which there are large quantities transported to foreign parts, with the wines and other fruits.

ESTREMADURA, a province of Spain, bounded by New Castile on the E. Leon on the N. Andalusia on the S. and Portugal on the W. It is said to be 175 miles long and 100 broad. Its principal towns are Calatrava, Menda, Badajoz, Alcantara, Cona, and Placentia. It has a very pure and healthful air, and its mountains are full of wild and tame animals. It abounds with corn and fruits; and the vineyards produce excellent wines of all colours.

ESTREMOS, or **ESTREMOZ**, a town of Portugal, in Alentejo, defended by a strong citadel on the top of a hill, surrounded by a large ditch, and 10 bastions. It is 15 miles W. of Badajoz.

ESTREPEMENT, or **ESTREPAMENT**, the spoil made by a tenant for life, upon any lands or woods, to the prejudice of the reversioner. Estrepement also signifies a writ which lies in two cases; the one is when the person having an action depending; (as a formedon, or dum fuit infra statem, or writ of right, or any other,) wherein the demandant is not to recover damages, sues to inhibit the tenant from making waste during the suit. The other is for the demandant that is adjudged to recover seisin of the land in question, and before execution sued by the writ habere facias seisinam, for fear of waste to be made before he can get possession: he then sues out this writ.

ESTUARY, [*estuarium*, Latin,] an arm of the sea; the mouth of a lake or river in which the tide reciprocates; a frith.

ESUS, the supreme god of the ancient Britons.

ESWECEN, a town of Germany, in Hesse-Cassel, 25 miles S. E. of Cassel.

ESZEK, a town of Slavonia, with a strong fort, 80 miles W. by N. of Belgrade, and 17 S. by E. of Vienna.

ETAIN, or **ESTAIN**. See **ESTAIN**.

ETANGS, a town of France, in the department of the Moselle, $7\frac{1}{2}$ miles E. N. E. of Mentz.

ETAYA, or **ETAYAH**, a town of Hindostan, in the province of Agra, 62 miles S. E. of Agra.

ETC, a contraction of the two Latin words *et cætera*, which signifies, and so on; and the rest; and others of the like kind.

To **ETCH**, [*etzen*, German,] a way used in making prints, by drawing with a proper needle upon a copper-plate, covered over with a ground of wax, &c. and well blacked with the smoke of a link, in order to take off the figure of the drawing or print; which, having its back side tintured with white lead, will, by running over the stricken out lines with a stift, impress the exact figure on the black or red ground; which figure is afterwards with needles drawn deeper quite through the ground, and all the shadows and hatchings put in; and then a wax border being made all round the plate, there is poured on a sufficient quantity of well tempered aqua fortis, which insinuating into the strokes made by the needles, usually eats, in about half an hour, into the figure of the print or drawing on the copper-plate. Harris.

ETCHING, a method of engraving on copper, in which the lines or strokes, instead of being cut with a tool or graver, are eaten in with aqua fortis. See **ENGRAVING**. Etching, though not very modern, is a later invention than engraving with the tool; of which it was at first only an imitation, practised by painters and

other artists, who could much sooner form their hands to, and attain a faculty of, working in this way, than with the graver. But being then considered as a counterfeit kind of engraving, and therefore inferior to the other, it was cultivated in a very confined manner; the closeness of the resemblance of the work to that performed by the tool, being made the test of its merit, and consequently the principal object or aim in those who pursued it. This servile confinement of the art of etching to the imitation of the original kind of engraving, retarded its advancement towards perfection, as many of the most able masters cramped their talents with the observance of it: which may be seen in the works of Sadelers, Swaneberg, Villamena, and particularly Le Bosse; who, in his treatise on engraving, has laid it down as a principle, that the perfection of etching consists in the close similitude of the work with that done by the tool. This absurd prepossession has since worn out: and etching has been so far improved, that instead of being now deemed a spurious kind of engraving, it is allowed to impart an excellence to many modern works, that could never have been produced without it: for though the neatness and uniformity of the hatches, made by the tool, are more advantageous with respect to portraits; yet the liberty and facility of etching give a much greater opportunity to exercise the force of genius and fancy in history engraving; where the effect of the whole, and not the minute exactness in finishing all the parts, constitutes the principal value. There are two methods of engraving in this way; the one with a hard varnish or ground, the other with a soft. The first was formerly much used, being better accommodated to the intention of imitating the engraving with the tool; as the firmness of the body of the varnish gave more opportunity of retouching the lines, or enlarging them with the oval-pointed needles, called by the French *echopes*, as was practised by Le Bosse and others for that purpose. The latter has now almost wholly superseded the use of the other, by the free manner of working it admits of; which affords a power of expression incompatible with the greater inflexibility of the hard varnish, that confines the lines and hatches to such a regularity and sameness, as gives a stiffness of manner and coldness of effect to the work. The mixture of the use of the tool and aqua fortis, which are now both employed in many cases, has, however, given that perfection to engraving which it possesses at present. The truth and spirit of the outline, that the method of working with aqua fortis affords, and the variety of shades which the different kinds of black produce in this way, as well as other means of expressing the peculiar appearance and character of particular subjects, furnish what was defective in the sole use of the tool; while, on the other hand, the exactness and regularity of the lines, which are required for finishing many kinds of designs, are supplied by the graver; and by a judicious application of both, that complete finishing is obtained, which either of them alone must necessarily want. The manner by which this art is performed, is the covering of the surface of the plate with a proper varnish, or ground, as it is called which is capable of resisting aqua fortis; and then scoring or scratching away, by instruments resembling needles, the parts of this ground, in the places where the strokes or hatches of the engraving are intended to be: the plate being then covered with aqua fortis, the parts that are laid naked by removing the varnish, are eaten away by it; while the rest, being secured and defended, remain untouched. The difference between the two methods above-mentioned consists as much in the difference of the varnish, as in that of the aqua fortis, adapted to each kind; but the general methods of performing them are alike in both. These varnishes are distinguished by the names of hard and soft: for in their consistence, or the resistance they give to the needles, lies their essential difference. The hard varnish was not the first in use, but soon took place of the other; and was, for some time, the most received in practice, on account of its allowing the work to be made more like that of the graver: the soft has, however, since, in its turn, prevailed to the exclusion of the hard in some degree, except in particular subjects; but not so entirely as to take away the expedience of shewing how it is performed. The manner of etching with the soft varnish is now, however, one of the most important objects of the art of engraving; and it is at present in universal use, sometimes alone, but more frequently intermixed with the work of the tool, and in some cases with great advantage, even where the whole is intended to pass for being performed by the graver. The hard, or Florence varnish

varnish is thus prepared: Take four ounces of fat oil very clear, and made of very good linseed oil, like that used by painters: heat it in a clean pot of glazed earthenware, and afterwards put to it four ounces of mastich well powdered: and stir the mixture briskly till the whole be well melted: then pass the whole mass through a piece of fine linen into a glass bottle with a long neck, that can be stopped very securely: and keep it for use. To making the soft varnish, Mr. Lawrence, an eminent English engraver at Paris, gives the following directions: "Take of virgin wax and asphaltum, each two ounces: of black pitch and Burgundy pitch, each half an ounce. Melt the wax and pitch in a new earthenware glazed pot; and add to them, by degrees, the asphaltum finely powdered. Let the whole boil, till such times as that, taking a drop upon a plate, it will break when it is cold, on bending it double two or three times, betwixt the fingers. The varnish being then enough boiled, must be taken off the fire; and letting it cool a little, must be poured into warm water, that it may work the more easily with the hands; so as to be formed into balls; which must be rolled up, and put into a piece of taffety for use." Care must be taken, 1st: that the fire be not too violent, for fear of burning the ingredients; a slight simmering will be sufficient: 2dly, that while the asphaltum is putting in, and even after it is mixed with them, the ingredients should be stirred continually with the spatula: and, 3dly, that the water, into which this composition is thrown, should be nearly of the same degree of warmth with it, to prevent a kind of cracking that happens when the water is too cold. The varnish ought always to be harder in summer than in winter; and it will become so if boiled longer, or if a greater proportion of the asphaltum or brown resin be used.

ETCHING, METHOD OF. 1. To apply the soft varnish: The plate being well polished, burnished, and cleansed from all greasiness by chalk or Spanish white, fix a hand-vice on the edge of the plate where no work is intended to be, to serve as a handle for managing it when warm: then put it upon a chafing-dish, in which there is a moderate fire; observing to hold it so that it may not burn: keep the plate over the fire till it be so hot that the varnish being brought into contact with it may melt: then cover the whole plate equally with a thin coat of the varnish; and while the plate is warm, and the varnish upon it in a fluid state, beat every part of the varnish gently with a small ball or dauber made of cotton tied up in taffety; which smooths and distributes the varnish equally over the plate. When the plate is thus uniformly and thinly covered with the varnish, it must be blackened by a piece of flambeau, or of a large candle which affords a copious smoke; sometimes two, or even four candles are used together for the sake of dispatch, that the varnish may not grow cold: which if it does during the operation, the plate must be heated again, that it may be in a melted state when that operation is performed: but great care must be taken not to burn it; which, when it happens, may be easily perceived by the varnish appearing burnt and losing its gloss. The following expedient is used, for the commodiously blackening the varnish, particularly where the plates are large: a strong hook is fixed in the roof of the room, through which passes four pieces of cord of equal length, at the end of which are fixed four iron rings of about four inches diameter, for supporting the corners of the plate. The plate being thus suspended in the air, with the varnished side downwards, may be blackened with great convenience: but this is not, however, absolutely requisite, except in the case of large plates that could not, without difficulty, be held up, unless this or some other such contrivance were made use of. The flambeau or candle must be kept at a due distance from the plate, lest the wick touch the varnish, which would sully and mark it. If the smoke has not penetrated the varnish, the plate must be again placed for some little time over the chafing-dish; and as the plate grows hot, the varnish will melt and incorporate with the black which lay above it, so that the whole will be equally pervaded by it. The greatest caution should be used to keep all the time a moderate fire; and to move frequently the plate, and change the place of all the parts of it, that the varnish may be alike melted every where, and kept from burning. Care must also be taken, that during this time, and even till the varnish be entirely cold, no filth, sparks, or dust, fly on it; for they would then stick fast, and spoil the work. 2. The method of applying the hard varnish is precisely the same as for the soft; being spread

equally over the warm plate with the taffety ball; and smoked in the same manner: only after it is smoked, it must be baked, or dried, over a gentle fire of charcoal, till the smoke from the varnish begins to decrease; taking care not to overheat the plate, which would both soften and burn the varnish. The plate being prepared, and an exact drawing of the outlines of the design made upon thin paper, the other side of the paper must be well rubbed with chalk or Spanish whitening, or, rather with red chalk scraped to a powder. The loose chalk is cleaned off with a linen rag: then the stained side of the paper is laid upon the varnish, fixing the corners to the plate with wax or wafers, to prevent its shuffling; and with a blunted needle or pointer the drawing is slightly traced, and communicates to the varnish an exact outline of the design to be etched. A variety of pointers is necessary for the work. Those used for the broad large strokes ought to be very blunt, exceedingly round, and well polished at the point; the sole of a shoe answers very well for polishing the points. The finest ought to be as sharp as a needle. If any scratches or false strokes happen in the working, they must be stopped up with a hair pencil dipped in Venetian varnish, mixed with lamp black, by which these places will be defended from the action of the aqua fortis. The next operation is that of eating or corroding the plate with aqua fortis. A border of soft wax (being a composition of bees'-wax melted with a little Venice turpentine and tallow) must be fastened round the plate about an inch high, in the form of a little wall, to contain the aqua fortis. At a corner of this border a gutter is made to pour the aqua fortis off the plate. Take a due quantity of the refiner's aqua fortis; mix it with half its quantity of common water; and pour it gently on, till it rise about a finger's breadth above the surface of the plate; when the aqua fortis will soon exert its action in the hatches which have been strongly touched; but those more weakly engraved will appear at first clear, and of the colour of the copper. The menstruum must therefore be suffered to continue on the plate till its effects become visible on the more tender parts: then the aqua fortis should be poured off, the plate washed with clean water, and dried before the fire: then take a small pencil dipped in the Venetian varnish, and cover with it the lighter parts of the plate. The aqua fortis must then be again poured on, and continued a longer or shorter time, according to the strength of the menstruum, or the nature of the engraving; when it must be again poured off, and the plate immediately washed with water. When the aqua fortis is on the plate, a feather should be used to cleanse away the foulness of the verdigris that gathers in the hatches, when the aqua fortis operates on them, and to give it more room to exert its action; for by moving the aqua fortis to and fro, on the plate by the feather, and brushing away the black saline matter where it appears to be formed, the hatches will be cleansed, and the aqua fortis exert its whole force equally on every part. The plate being thus sufficiently corroded by the aqua fortis, and well washed with water, it must be warmed at the fire, and the border of wax removed; after which, it must be made hotter till the varnish melt; then it must be well wiped with a linen cloth, and afterwards rubbed heartily with oil of olives; when it will be ready to be retouched and finished by the graver. See ENGRAVING.

ETCHING ON GLASS. Glass resists the action of all the acids, except the fluoric acid. By this, however, it is corroded in the same manner as copper is by aqua fortis; and plates of glass may be engraved in the same manner as copper. There are several methods of performing this. We shall first describe the mode of etching by means of the fluoric acid in the state of gas. Having covered over the glass to be etched with a thin coat of virgin-wax (which is only common bees'-wax bleached white,) draw the design upon it in the same manner as in etching on copper. Then take some fluor spar, commonly called Derbyshire spar, pound it fine, and put it into a leaden vessel, pouring some sulphuric acid over it. Place the glass with the etched side lowermost over this vessel, two or three inches above it. Apply a gentle heat to the leaden vessel; this will cause the acid to act upon the fluor spar, and disengage the gas, which will corrode the glass. When it is sufficiently corroded, remove the wax by oil of turpentine. This etching may be also performed by raising a margin of bordering-wax all round the glass, in the same manner as on copper, and pouring on the liquid fluoric acid, which acts upon the glass. The method of making this acid is described under fluoric acid.

A third

A third method of etching on glass is as follows: Having put the wax on the glass, draw your design, and raise a margin all round it. Then put pounded fluor spar, with some sulphuric acid diluted with water, upon the glass. The sulphuric acid will disengage the fluoric, which will be absorbed by the water, and corrode the glass.

ETEOCLES, in fabulous history, the eldest son of *Œdipus* and *Jocasta*. See *CŒRON*. Having reigned one year in Thebes, he refused to give up the crown to his brother, *Polynices*, according to their mutual agreement. *Polynices*, resolving to punish such a violation of a solemn engagement, implored the assistance of *Adrastus* king of *Argos*. He received that king's daughter in marriage, and was soon after assisted with a strong army headed by seven famous generals. *Eteocles* chose seven brave chiefs to oppose these, and stationed them at the seven gates of the city. He placed himself against his brother *Polynices*, and he opposed *Menalippus* to *Tydeus*, *Polyphontes* to *Capaneus*, *Megareus* to *Eteocles*, *Hyperbius* to *Parthenopæus*, and *Lasthenes* to *Amphiraus*. After much blood had been shed, it was at last agreed between the two brothers that the war should be decided by a single combat. Inflamed with the most inveterate fury on each side, they both fell; and it is said that their ashes separated on the funeral pile, as if still sensible of resentment, and hostile to reconciliation.

ETERNITY, is one of the attributes of God. See *LOGIC* and *METAPHYSICS*.

ETERNITY, in mythology, a divinity among the Romans, who had neither temples nor altars. They represented it under the figure of a woman, who held the sun in one hand and the moon in the other: her symbols were a phoenix, a globe, and an elephant.

ETESLÆ, or **ETESIAN WINDS**, are such as blow at stated times of the year, from what part soever of the compass they come. They are so called from the Greek word *ἔτος*, year, being anniversary winds, such as our seamen call monsoons and trade winds, which in some parts of the world continue constantly blowing for certain stated seasons of the year.

ETHER, [*æther*, Latin; *αἴηρ*,] in chemistry. See *ETHER* and *PHARMACY*.

ETHER, in physiology. See *ETHER*.

ETHICS, [from *ἠθικός*, manners, because the object thereof is to form the manners,] the science of manners or duty, which it traces from man's nature and condition, and shews to terminate in his happiness; or, in other words, it is the knowledge of our duty and felicity, or the art of being virtuous and happy. See *MORAL PHILOSOPHY*.

ETHIOPIA, a celebrated empire of Africa, whose boundaries have never been exactly defined either by ancient or modern geographers. Mr. Cruttwell divides it into Upper and Lower. Some writers of antiquity gave the title of Ethiopians to all nations whose complexion was black: Hence we find the Arabians as well as many other Asiatics sometimes falling under this denomination; besides a number of Africans whose country lay at a distance from Ethiopia Proper. Thus the Africans in general were by these writers divided into the western or Hesperian Ethiopians, and those above Egypt situated to the E. of the former; the latter being much more generally known than the former, by the commerce they carried on with the Egyptians. From this account we may easily understand, why there is such a seeming disagreement among ancient authors concerning the situation of the empire of Ethiopia, and likewise why it should pass under such a variety of names. Sometimes it was named India, and the inhabitants Indians; an appellation likewise applied to many other distant nations. Sometimes it was denominated *Atlantia* and *Etheria*, and in the most remote periods of antiquity *Cephenia*; but more usually *Abasene*, a word resembling its modern names, *Habash*, *Abassia*, or *Abyssinia*. On the other hand, we find *Persia*, *Chaldaea*, *Assyria*, &c. styled Ethiopia by some writers; and all the countries extending along the coast of the Red Sea were promiscuously denominated India and Ethiopia. By the Jews the empire of Ethiopia was styled *Cush* and *Ludim*. Notwithstanding this diversity of appellations, and vast diffusion of territory ascribed to the Ethiopians, there was one country to which the title was thought more properly to belong than to any of the rest; and which was therefore called *Ethiopia Propria*. This was bounded

on the N. by Egypt, extending all the way to the lesser cataract of the Nile, and an island named *Elephantine*; on the W. it had *Libya interior*; on the E. the Red Sea, and on the S. unknown parts of Africa; though these boundaries cannot be fixed with any precision. In this country the ancients distinguished a great variety of different nations, to whom they gave names either from some personal property, or from their manner of living. The principal of these were, 1. The *Blemmyes*, seated near the borders of Egypt; and who, probably from the shortness of their necks, were said to have no heads, but eyes, mouths, &c. in their breasts. Their form, somehow or other, must have been very extraordinary, as we learn from *Vopiscus*, who gives an account of some of the captives of this nation brought to Rome. 2. The *Nobatae*, inhabiting the banks of the Nile near the island *Elephantine*, said to have been removed thither by *Oasis* to repress the incursions of the *Blemmyes*. 3. The *Troglodytes*, by some writers said to belong to Egypt, and described as little superior to brutes. 4. The *Nubians* inhabiting *Nubia*. 5. The *Pignies*, by some supposed to be a tribe of *Troglodytes*; but by the most approved writers placed on the African coast of the Red Sea. 6. The *Aualitæ* or *Abalitæ*, of whom we know nothing more than that they were situated near the *Abalitic* gulf. 7. The *Struthiophagi*, so called from their feeding upon ostriches, were situated to the S. of the *Memnonæ*. 8. The *Acridophagi*; 9. *Chelonophagi*; 10. *Ichthyophagi*; 11. *Cynamolgi*; 12. *Elephantophagi*; 13. *Rhizophagi*; 14. *Spermatophagi*; 15. *Hylophagi*; and, 16. *Ophiophagi*: all of whom had their names from the food they made use of, viz. locusts, tortoises, fish, bitches milk, elephants, roots, fruits or seeds, shrubs, and serpents. 17. The *Hylogones*, near to the *Elephantophagi*, and who were so savage that they had no houses, nor any other places to sleep in but the tops of trees. 18. The *Pamphugi*, who used almost every thing indiscriminately for food. 19. The *Agriophagi*, who lived on the flesh of wild beasts. 20. The *Anthropophagi*, or man-eaters, are now supposed to have been the *Caffres*, and not any inhabitants of Proper Ethiopia. 21. The *Hippophagi*, or horse-eaters, who lay on the N. of *Libya Incognita*. 22. The *Macrobi*, a powerful nation, remarkable for their longevity; many of them attaining the age of 120 years. 23. The *Sambri*, situated near the city of *Tenupsis* in *Nubia* upon the Nile; of whom it is reported that all the quadrupeds they had, not excepting even the elephants, were destitute of ears. 24. The *Asacha*, a people inhabiting the mountainous parts, and continually employed in hunting elephants. Besides these, there were a number of other nations or tribes, of whom we scarce know any thing but the names; as the *Gapachi*, *Ptoemphanes*, *Catadupi*, *Pechini*, *Catadræ*, &c. The most famous cities and towns of ancient Ethiopia were *Abalis*, *Axum*, *Caloe*, *Melis*, *Mondus*, *Mosylon*, *Napata*, *Opone*, and *Premis* or *Premnis*. The climate of Ethiopia varies, according to the situation and elevation of the ground. On the coast of the Red Sea, as well as the open flat parts of the country in general, the heat is so intense, that at *Suakem*, an island in the Red Sea, *Gregory*, the *Abyssine*, relates that it was so great, as to excoriate any part of the body exposed to the solar rays, melt hard sealing-wax, and sear a garment like red hot iron. In several districts, however, the heat is milder than in Portugal, and in *Samen* the air is rather cold than otherwise. In some other provinces the winter is very severe, though snow is seldom seen. Hail indeed sometimes falls, and Mr. Bruce mentions snow having once fallen which lasted three days, and was looked upon as a prodigy. There are frequent and violent thunders, with excessive deluges of rain during part of the year, and violent storms of wind. The missionaries mention a kind of wind named *Sendo*, which, according to *Gregory*, may be seen like a serpent of vast magnitude with its head on the ground, and the body twisted in vast curls up to the skies. This, in all probability, is that violent species of whirlwind, named *Typhon*, frequent in Egypt, America, and other warm countries: and its being visible is owing to the dust which it takes up in its passage. In a country inhabited by such a variety of nations, as we have above enumerated, all in a state of extreme barbarism, it is rather to be wondered that we have any history at all, than that it is not more distinct. It is generally agreed that *Cush* was the great progenitor of the inhabitants, and hence the country has been named from him. Many authors are of opinion, that Ethiopia received its first inhabitants from the country lying E. of the Red Sea; and that the descendants

of Cush, having settled in Arabia, gradually migrated to the S. E. extremity of that country; whence, by an easy passage across the straits of Babelmandel, they transported themselves to the African side, and entered the country properly called Ethiopia: a migration which, according to Eusebius, took place during the residence of the Israelites in Egypt; but, in the opinion of Syncellus, after they had taken possession of Canaan, and were governed by judges. Mr. Bruce mentions a tradition among the Abyssinians, which, they say, has existed among them from time immemorial, that very soon after the flood, Cush the grandson of Noah, with his family, passed through Atbara, then without inhabitants, till they came to the ridge of mountains, which separates that country from the high lands of Abyssinia. Here, still terrified with the thoughts of the deluge, and apprehensive of a return of the same calamity, they chose to dwell in caves made in the sides of these mountains rather than trust themselves in the plains of Atbara; and our author is of opinion, that the tropical rains, which they could not fail to meet with in their journey southward, and which would appear like the return of the deluge, might induce them to take up their habitations in these high places. Be this as it may, he says, it is an undoubted fact, "that here the Cushites, with unparalleled industry, and with instruments utterly unknown to us, formed to themselves commodious, yet wonderful, habitations in the heart of mountains of granite and marble, which remain entire in great numbers to this day, and promise to do so till the consummation of all things." The Cushites having once established themselves among these mountains, continued to form similar habitations in all the neighbouring ones: and thus following the different chains, spread the arts and sciences, which they cultivated, across the African continent from the eastern to the western ocean. According to the tradition abovementioned, they built the city of Axum, early in the days of Abraham. This city was anciently noted for its superb structures, of which some remains are still visible. The Cushites extended themselves along the mountains which run parallel to the Red Sea on the African side; which country, according to Mr. Bruce, has "in all times been called Saba, or Azabo, both of which signify South;" an epithet given it from its lying S. of the Arabian gulf, and which in ancient times was one of the richest and most important countries in the world. "By that acquisition (says Mr. Bruce,) they enjoyed all the perfumes and aromatics in the east; myrrh, and frankincense, and cassia; all which grow spontaneously in that stripe of ground from the Bay of Bilur W. of Azab to Cape Gardefan, and then southward up in the Indian ocean, to near the coast of Melinda, where there is cinnamon, but of an inferior kind." As the Cushites advanced still farther S. they met not only with mountains, in which they might excavate proper habitations, but likewise with great quantities of gold and silver furnished by the mines of Sofala, which, our author says, furnished "large quantities of both metals in their pure and unmixed state, lying in globules without alloy or any necessity of preparation or separation." In other parts of this work he proves Sofala to have been the Ophir of scripture. See OPHIR. Thus the Ethiopians, for some time after their settlement, according to Mr. Bruce, must have been a nation of the first importance in the world. The northern colonies from Meroe to Thebes built cities, and made improvements in architecture; cultivated commerce, agriculture, and the arts; not forgetting the science of astronomy, for which they had an excellent opportunity by the clearness of the sky in the Thebaid. According to some ancient authors, the Ethiopians were conquered by Moses; of which transaction they give the following account. Before the time of that legislator, the Ethiopians possessed the country of Thebais in Egypt: but, not content with this, they made an irruption into the Lower Egypt, and penetrated as far as Memphis; where, having defeated the Egyptians, they threatened the kingdom with total destruction. The Egyptians, by the advice of their oracles, put Moses at the head of their forces; who immediately prepared for invading the enemy's country. The Ethiopians imagined that he would march along the banks of the Nile; but Moses chose rather to pass through some of the interior countries, though greatly infested with serpents, and where consequently his march must have been attended with much danger. To preserve his men, he constructed a number of panniers of the Egyptian reed papyrus, which he filled with the birds named Ibis, celebrated for their antipathy to serpents. As soon as he approached the tract abounding with these reptiles, a sufficient num-

ber of the birds were let out, who presently cleared the way for the army by destroying the serpents. Thus the Ethiopians were surprised in their own country where they had dreaded no invasion; their forces, being defeated in the field, were at last shut up in the capital Meroe, a city almost impregnable, by being surrounded with three rivers, the Nile, Astapus, and Astaboras. The daughter of the Ethiopian monarch, however, having an opportunity of seeing Moses from the walls, fell in love with him, and offered to deliver up the city, provided he would swear to marry her. With this requisition the Jewish legislator complied; but treated the inhabitants with great severity; plundering the city, and putting many of the people to death. After this he ravaged the whole country, dismantling all the places of strength; and having thus rendered the Ethiopians incapable of attempting any kind of offensive operations against other nations for a considerable time, he returned in triumph to Egypt, after an absence of 10 years. From the time of Moses to that of Solomon there is a chasm in the Ethiopic history. After this, however, we are furnished with some kind of regular accounts. The history commences with the reign of the queen of Sheba, who came to visit the Jewish monarch, and whom the Abyssinians suppose to have been sovereign of Ethiopia Proper: but Mr. Bruce is of opinion that she was only sovereign of that territory on the E. coast of Africa named Saba, which he says ought to be her title, instead of Sheba. In favour of this opinion he likewise urges, that it was customary for the Sabaeans, who inhabited Saba, to be governed by women; whereas those who inhabited the opposite side of the Arabian gulf, and who were named Sabean Arabs, or Homerites, were not only governed by kings, but would not allow their sovereigns to go abroad any where, under pain of being stoned to death. The Abyssinians, however, claim her for their sovereign; and he informs us, that having received an account from Tamerin, an Ethiopian merchant, of the surprising wisdom and wealth of Solomon, she undertook the journey mentioned in Scripture, to ascertain the truth of the report. In this she was attended by many of her nobility, carrying along with her also magnificent presents for the monarch she intended to visit. According to the Abyssinian historians, she was a pagan at the time this journey was undertaken; but being struck with admiration at the sight of Solomon's grandeur, and the wisdom he displayed, she became a convert to the true religion.

ETHIOPIA, LOWER, according to the reverend Mr. Crutwell, in his New Universal Gazetteer, comprehends all the kingdoms south of the equinoctial line; as Congo, Lower Guinea, Caffraria, Monomotapa, &c.

ETHIOPIA, MODERN, or THE UPPER, or HIGHER ETHIOPIA, or, as it is now called, **ABYSSINIA**, is divided, according to Mr. Bruce, into two parts, named Tigre and Amhara; though this rather denotes a difference in the language than the territory of the people. It is subdivided into twelve provinces.

ETHIOPIA, MODERN, BOUNDARIES OF. From the map which Mr. Bruce has given of Abyssinia, in his fifth volume, it appears that this empire is bounded on the south by a vast chain of mountains, extending with very little interruption from 34° to 44° Lon. E. and between 8° and 9° Lat. N. In more prosperous times it extended beyond these S. into the kingdom of Adel; but the mountains are undoubtedly to be reckoned its natural boundaries on this side. On the E. and N.E. it has the Red Sea, and on the S.E. the kingdom of Adel. On the W. and N. its boundaries are less distinctly marked; having on both these quarters the barbarous kingdom of Sennaar, whose limits frequently vary according to the fortune of war betwixt the two monarchs. From Arkeeko, situated near the foot of the Basalt mountains, in about 15° 30' Lat. N. it extends near 7° Lat. N. where the mountains of Caffa, the most southerly province of Abyssinia terminate. Along the coast of the Red Sea lie the territories inhabited by the Hazorta Shiho, the district of Engana Shiho, and the kingdom of Dancali, including the territory of Azab and the salt-pits. To the west of these is the kingdom of Tigre, including the country of the Dobas, part of the kingdom of Bali, and that of Dawaro. Still farther west are those of Sire, Lasta, Amhara, the greatest part of Bali, and part of Fatigar, which last reaches beyond the mountains. Proceeding still in the same direction, we come to Tcherkin, Tchelga, Abargale, Salao, Begemder, Xoa, and Ifat; reckoning always from north to south; Tcherkin, for instance, being north of Tchelga, &c. Xoa extends

a considerable way to the west, so that, besides Ifat, it has to the south of it also the kingdoms of Hade and Cambut; the latter extending beyond the south ridge of mountains. To the west are Ras de Feel, Dembea, Gojam, and Damot; and beyond these are the kingdoms of Dembea, Bizamo, Gooderoo, and Guraque; those of Nare, or Enarea, and Caffa, occupying the south-west corner of the empire. Ancient authors agree, that Ethiopia was very mountainous; but they mentioned no mountains of any magnitude, except Garbato and Elephas, whose situation is not now easily ascertained, though it is thought they answer to the mountains of Tigre. The Jesuits were the first who gave any information to the Europeans concerning this country. The provinces of Begemder, Gojam, Walaka, Xoa, &c. are one continued chain of mountains. Many of them are said to be of such enormous height, that the Alps and Pyrenees are but mole-hills in comparison. Those called Aorni were said to be of this kind; but Mr. Bruce informs us, that these accounts are exaggerated. Amongst those mountains, and often in the plains, there are many steep and craggy rocks of various and whimsical shapes; some of them so smooth, that men and oxen are craned up to the top by engines: but what is most surprising, the tops of these rocks are covered with woods and meadows, full of springs and streams of water; of the truth of which we have an attestation by Mr. Bruce, in his description of Lamalmon. The names of the twelve provinces of Abyssinia are, Masuah, Tigre, Samen, Begemder, Amhara, Walake, Gojam, Damot, Maisha, Dembea, Kuara, and Narea. See these articles in their order. Abyssinia abounds with a vast variety of quadrupeds both wild and tame. Immense numbers of cattle every where appear, some of them the most beautiful in the world. Some have monstrous horns, said to be capable of holding ten quarts each; but this, says Mr. Bruce, is a disease which proves fatal to them. Buffalos are numerous, fierce, and untractable; but there are no carnivorous bulls, which have been said to exist in this and other parts of Africa. Antelopes are met with in great numbers in the uncultivated parts; feeding chiefly on the leaves of trees. Hyenas, lions, foxes, jackals, &c. are also found, as well as elephants, camelopards, and other more uncommon kinds. Great havoc is made in the cultivated fields by baboons, apes, rats, and mice. There is plenty of hares; but these being reckoned unclean, as well as wild boars, are not used as food. The rivers abound with crocodiles and hippopotami, at least the Nile, and those large streams which flow into it: but many others have water in them only during the rainy season, and thus have neither fish, nor any animal that feeds upon them. The number of birds in this country is immense. Great numbers of eagles, vultures, hawks, and other carnivorous birds, come punctually every year after the tropical rains. They feed at first upon the shell-fish, which are found in great quantities on the edges of the deserts, where they had lived in the salt springs; but, being forced from their natural habitations when these springs swell by the rains, are afterwards left to perish on dry land. When these fail, they feed on the carcasses of the large animals, such as the elephant and rhinoceros, which are killed in the flat countries by the hunters. Their next supply is the multitudes of rats and field mice which infest the country after harvest. The vast slaughter of cattle made by the Abyssinian armies, the multitude of persons killed, whose bodies are allowed to rot on the field of battle, &c. furnish them also with other resources. There are other birds which feed upon insects, and multitudes which live on grain and seeds of various kinds, which are amply supplied by the immense quantity of fruits and berries which grow in Abyssinia, and are ripe at all seasons of the year. Among the reptiles in Abyssinia, Mr. Bruce describes a kind of lizard, and the cerastes, or horned serpent; but denies that serpents are numerous in Abyssinia, as almost all authors have supposed. He describes very few fishes; though he says that an account of these, and other marine productions of the Red Sea, which he has painted and collected, would occupy many large volumes, and the engraving would cost a sum which he could not by any means afford. He mentions one named binny, which is good food, and grows to a pretty large size; that from which he took the drawing being about 32 pounds weight. Its whole body is covered with beautiful scales resembling silver spangles. Of the insect tribe the most extraordinary is the tsaltalya, or zimb, a kind of venomous fly, extremely destructive to cattle. Mr. Bruce also mentions a small species of ants, whose bite is more painful than the sting of a scorpion, and which issue

out of the ground in such numbers, as to cut in pieces carpets and every thing made of soft materials that they have access to. The three largest rivers in Ethiopia are the Nile, the Tacazze, and the Zebbee; but there are many others of inferior size, such as the Bachilo, Geshen, Gult, Mai-Lami, Samba, Temci, &c. The great variety of climates in Ethiopia, is very perceptible in its soil and productions. The mountains in many places are not only barren, but altogether inaccessible, except by those who make it their constant practice to climb amongst them; and even by them they cannot be ascended without great difficulty and danger. In the vallies, however, and flat parts of the country, the soil is excessively fruitful, though in the warmest places grain cannot be brought to perfection. Wine is also made in some places; but the greatest profusion of fruits of all kinds is to be met with every where, as well as many plants not to be found in other countries. There is a vast variety of flowers which adorn the banks of the rivers, in such a manner as to resemble fine gardens. Among these there is a species of roses, which grow upon trees, and are much superior in fragrance to those which grow on bushes. Sena, cardamon, ginger, and cotton, are likewise produced in great quantities. All the trees of Abyssinia are ever-greens; and their leaves are of a thick leathery consistence, and highly varnished, to enable them to resist the violent periodical rains. A very remarkable particular concerning the fruit-trees is, that those which bear fruit all the year round do not carry it always in the same place. The W. side is that which blossoms first, and where, of consequence, the fruit first comes to perfection; the south side succeeds, and goes through the same process; after which, the north blossoms in like manner; and last of all the east side, which produces flowers and fruit towards the beginning of the rainy season. A variety of rare plants are met with in Abyssinia, the chief of which Mr. Bruce particularly describes. The ancient Ethiopians, who inhabited the country above Meroë made remarkable distinctions among their gods. Some, they said, were of an eternal and incorruptible nature, as the sun, the moon, and the universe; others, having been born among men, had acquired divine honours by their virtue, and by the good which they had done to mankind. They worshipped Isis, Pan, and particularly Jupiter and Hercules, from whom they supposed they had received most benefits. But some Ethiopians believed that there were no gods; and when the sun rose, they fled into their marshes, execrating him as their most cruel enemy. Circumcision was a rite observed among the ancient Ethiopians, as well as the Egyptians, from very early antiquity; and some suppose that the former received it from the latter, and both from the Israelites; though others insist, that the Ethiopians first adopted it from the children of Abraham by Keturah. The religion of the modern Ethiopians is a mixture of Paganism, Judaism, Christianity, and Mohammedanism. Christianity, however, being the established religion, is the one most generally professed. The frontier countries of Nara, Rasel-Feel, Tchelga, &c. are wholly inhabited by Mohammedans.

ETHMOIDES OS. See **ANATOMY**. The name of this bone is derived from *εθμος*, a sieve, and *ειδος*, form, because it is porous like a sieve.

ETHNARCH, or ETHNARCHA, [*εθνος*, a nation, and *αρχος*, a ruler,] a governor of a nation. There are some medals of Herod the Great, on one side whereof is *Ἡρωδου*, and on the other *Εθναρχου*, i. e. Herod the Ethnarch. This title has been used synonymously with Tetrarch, though originally different.

ETHNOPHRONES, [from *εθνος*, a heathen, and *φρονειν*, to think,] in antiquity, a sect of heretics in the seventh century, who made a profession of Christianity, but joined thereto many of the ceremonies and follies of paganism; as judicial astrology, sortileges, and other divinations.

ETHOLOGY, [*εθος*, manner, and *λογος*, discourse,] a representation of the manners and customs of a people.

ETHOPOIA, [from *εθος*, manner, and *ποιειν*, to do,] a figure in rhetoric, in which the manners of a people are represented.

ETHULIA, in botany, a genus of the polygamia aequalis order, and syngenesia class of plants; natural order Compositæ. Receptacle naked; down none. It has six species.

ETIENNE, St. or ST. ESTIENNE, a town of France, in the department of Rhone and Loire, 22 miles S. E. of Fuers, and 260 S. by E. of Paris.

ETIQUETTE, [Fr. *i. e.* a ticket, or title, affixed to a bundle of papers, expressing its contents,] is used when applied to the Spanish

Spanish and some other courts, to signify a particular account of what is to be done daily in the king's household, and in the chief ceremonies relating to it. The word is now chiefly used to denote those forms that regulate the decorum of conduct towards persons of various ranks and stations: a sense very different from its original meaning.

ETNA, or **ÆTNA**, a famous burning mountain in Sicily, and the largest in Europe. See **ÆTNA**.

ETOILE, in fortification, a small fort, or redoubt, in the form of a star.

ETOLIA, or **ÆTOLIA**, a country of ancient Greece, comprehending all that tract now called the *Despotat*, or little Greece. It was separated on the east by the River *Evanus*, now the *Fidari* from the *Locrenses Ozolæ*: on the west from *Acarnania*, by the *Achelous*; on the north from the country of the *Dorians* and part of *Epirus*; and, on the south it extended to the bay of *Corinth*.

ETOLIANS, the ancient inhabitants of *Etolia*; who are said to have been a restless and turbulent people; seldom at peace among themselves, and ever at war with their neighbours. This is not improbable; but they are also represented as utter strangers to all sense of friendship and principles of honour; ready to betray their friends upon the least prospect of reaping any advantage from their treachery; in short, they were looked upon by the other states of Greece as outlaws and public robbers.

ETON, or **EATON**, a town of Bucks, 20 miles W. of London. See **EATON**.

ETRURIA, or **HETRURIA**, in ancient geography, a celebrated country of Italy, on the Tiber, bounded by that river, the *Macra*, the *Apennine*, and the *Tyrrhene Sea*. The greater part of it is now included in the duchy of *Tuscany*.

ETTINGEN, **ETTLINGEN**, or **ÆTTINGEN**, a town of Germany in the circle of *Suabia*, and margraviate of *Baden*.

ETYMOLOGY, [from *τυμη*, true, and *λογια*, discourse,] that part of grammar which considers and explains the origin and derivation of words, in order to arrive at their primary signification. It is styled by Cicero *notatio ad veriloquium*; though Quintilian chooses rather to call it *originatio*. A judicious inquiry into etymologies is thought by some of considerable use; because nations who value themselves upon their antiquity, have always looked on the antiquity of their language as one of the best titles they could plead; and the etymologist, by seeking the true and original reason of the notions and ideas fixed to each word and expression, may often furnish an argument from the traces remaining thereof, compared with the ancient uses. But a more profitable use is, that etymologies are necessary for the thorough understanding of a language. For, to explain a term precisely, there is often a necessity for recurring to its first origin, in order to speak justly and satisfactorily thereof. The force and extent of a word is generally better conceived when a person knows its origin and etymology. It is objected, however, that the art is arbitrary, and built altogether upon conjectures and appearances; and etymologists are charged with deriving their words from whence they please. Indeed, it is no easy matter to go back into the ancient British and Gaulish ages, and to follow, as it were, by the track, the various imperceptible alterations a language has undergone from age to age; and as those alterations have sometimes been merely owing to caprice, it is easy to take a mere conjecture for a regular analogy: so that it is no wonder many should be prejudiced against a science which seems to stand on so precarious a footing. It must be owned that etymologies are often so far fetched, that one can scarce see any resemblance or correspondence therein.

EU, a sea-port of France, in the department of the Lower Seine, and late province of Normandy, 15 miles N. E. of Dieppe, and 36 of Rouen.

EVACUATION, in animal economy, is the act of diminishing, attenuating, or discharging, the humours. The due evacuations of the body, and its proper nourishment, are equally necessary; and it is an object of considerable importance, that nothing remain in the constitution which should be discharged; and that whatever is conducive to its preservation, may not be uselessly wasted. If the evacuations be disordered, the most rigid adherence to dietetic rules will not contribute to the continuance or restoration of health; these rules, however, may often be dispensed with, provided the evacuations be regular.

EVANDER, in fabulous history, a famous Arcadian chief, said to have been the son of Mercury, on account of his eloquence, by the prophetess *Carmenta*. He brought a colony of his people into Italy, about sixty years before the taking of Troy; when *Faunus*, who then reigned over the Aborigines, gave him a large territory, in which he settled with his friends.

EVANGELIST, is derived from the Greek, *εωαγγελιστο*, formed of *eu*, good, and *αγγελος*, angel or messenger. This title was given in the primitive church to such as preached the gospel in different places, without being attached to any particular church. In this sense some interpreters think that Philip, one of the seven deacons, is called the evangelist, in Acts xxi. 8. St. Paul writing to Timothy, 2 Eph. iv. 5, bids him do the work of an evangelist; and in his epistle to the Ephesians, iv. 11, he ranks the evangelists after the apostles and prophets.

EVANID COLOURS are such as are of short duration, as those in the rainbow, in clouds before and after sun-set, &c. They are also called fantastical and emphatical colours.

EVANSHAM, a town of Virginia, and capital of Wythe county, 40 miles W. by S. of Christiansburg, and 518 S. W. by W. of Philadelphia.

EVANTES, in antiquity, the priestesses of Bacchus, so called, because in celebrating the orgia, they ran about as if distracted, crying *evan! evan! ohè evan!*

EVAPORATION, in chemistry, the setting of a liquor in a gentle heat or in the air, to discharge its superfluous humidity, reduce it to a proper consistence, or obtain its dry remainder. Evaporation, though generally considered as the effect of the heat and motion of the air, may be produced by a different cause. Fluids lose more by evaporation in the severest frost than when the air is moderately warm. Thus, in the great frost of 1708, it was found that the greater the cold the more considerable the evaporation. Ice itself loses much by evaporation.

EVAPORATION, in natural philosophy, is the conversion of water into vapour, which in consequence of becoming lighter than the atmosphere, is raised considerably above the surface of the earth, and afterwards by a partial condensation forms clouds. It differs from exhalation, which is properly a dispersion of dry particles from a body. We are indebted to the experiments of Saussure and Deluc, for much of our knowledge of the qualities of vapour. It is an elastic invisible fluid like common air, but lighter; being to common air of the same elasticity, according to Saussure, as 10 to 14, or according to Kirwan, as 10 to 12. When water is heated to 212°, it boils, and is rapidly converted into steam; and the same change takes place in much lower temperatures; but in that case the evaporation is slower, and the elasticity of the steam is smaller. As a very considerable proportion of the earth's surface is covered with water, and as this water is constantly evaporating and mixing with the atmosphere in the state of vapour, a precise determination of the rate of evaporation must be of very great importance in meteorology. Accordingly, many experiments have been made to determine the point by different philosophers. No person has succeeded so completely as Mr. Dalton: but many curious particulars had been previously ascertained by the labours of Richman, Lambert, Wallerius, Leidenfrost, Watson, Saussure, Deluc, Kirwan, and others.

1. The evaporation is confined entirely to the surface of the water: hence it is in all cases proportional to the surface of the water exposed to the atmosphere. Much more vapour, of course, rises in maritime countries, or those interspersed with lakes, than in inland countries.

2. Much more vapour rises during hot weather than during cold: hence the quantity evaporated depends in some measure upon temperature. The precise law has been happily discovered by Mr. Dalton. This philosopher took a cylindrical vessel of tin, whose diameter was 3½ inches, and its depth 2½ inches, filled it with water, and kept it just boiling for some time. The loss of weight in a minute was 30 grains, when the experiment was made in a close room without any draught of air; 35 grains when the vessel was placed over the fire in the usual fire-place, there being a moderate draught of air, and the room close; 40 with a brisker fire and a stronger draught; and when the draught was very strong, he supposes the evaporation might amount to 60 grains in the minute. At the temperature of 180°, the quantity evaporated was one half of what was lost at 212°.

At 164° it was $\frac{1}{3}$ of that at 212°

152	$\frac{1}{3}$
144	$\frac{1}{3}$
138	$\frac{1}{3}$

And in general the quantity evaporated from a given surface of water per minute at any temperature is to the quantity evaporated from the same surface of 212°, as the force of vapour at the first temperature is to the force of vapour at 212°. Hence, in order to discover the quantity which will be lost by evaporation, from water of a given temperature, we have only to ascertain the force of vapour at that temperature. Hence we see that the presence of atmospheric air obstructs the evaporation of water; but this evaporation is overcome in proportion to the force of the vapour. Mr. Dalton ascribes this obstruction to the vis inertia of air.

3. The quantity of vapour which rises from water, even when the temperature is the same, varies according to circumstances. It is least of all in calm weather, greater when a breeze blows, and greatest of all with a strong wind. The following table drawn up by Mr. Dalton, shews the quantity of vapour raised from a circular surface of six inches in diameter in atmospheric temperatures. The first column expresses the temperature; the second the corresponding force of vapour; the other three columns give the number of grains of water that would be evaporated from a surface of six inches in diameter in the respective temperatures, on the supposition of there being previously no aqueous vapour in the atmosphere. These columns present the extremes and the mean of evaporation likely to be noticed, or nearly such; for the first is calculated upon the supposition of 35 grains loss per minute from the vessel of 3½ inches in diameter; the second 45, and the third 55, grains per minute.

Temperature, 212°	Force of vapour in inches. 30	Evaporating force in grains.		
		120	154	189
20°	.129	.52	.67	.82
21	.134	.54	.69	.85
22	.139	.56	.71	.88
23	.144	.58	.73	.91
24	.150	.60	.77	.94
25	.156	.62	.79	.97
26	.162	.65	.82	1.02
27	.168	.67	.86	1.05
28	.174	.70	.90	1.10
29	.180	.72	.93	1.13
30	.186	.74	.95	1.17
31	.193	.77	.99	1.21
32	.200	.80	1.03	1.26
33	.207	.83	1.07	1.30
34	.214	.86	1.11	1.35
35	.221	.89	1.14	1.39
36	.229	.92	1.18	1.45
37	.237	.95	1.22	1.49
38	.245	.98	1.26	1.54
39	.254	1.02	1.31	1.60
40	.263	1.05	1.35	1.65
41	.273	1.09	1.40	1.71
42	.283	1.13	1.45	1.78
43	.294	1.18	1.51	1.85
44	.305	1.22	1.57	1.92
45	.316	1.26	1.62	1.99
46	.327	1.31	1.68	2.06
47	.339	1.36	1.75	2.13
48	.351	1.40	1.80	2.20
49	.363	1.45	1.86	2.28
50	.375	1.50	1.92	2.36
51	.388	1.55	1.99	2.44
52	.401	1.60	2.06	2.52
53	.415	1.66	2.13	2.61
54	.429	1.71	2.20	2.69
55	.443	1.77	2.28	2.78
56	.458	1.83	2.35	2.88
57	.474	1.90	2.43	2.98
58	.490	1.96	2.52	3.08

Temperature, 212°	Force of vapour in inches, 30	Evaporating force in grains.		
		120	154	189
59	.507	2.03	2.61	3.19
60	.524	2.10	2.70	3.30
61	.542	2.17	2.79	3.41
62	.560	2.24	2.88	3.52
63	.578	2.31	2.97	3.63
64	.597	2.39	3.07	3.76
65	.616	2.46	3.16	3.87
66	.635	2.54	3.27	3.99
67	.655	2.62	3.37	4.12
68	.676	2.70	3.47	4.24
69	.698	2.79	3.59	4.38
70	.721	2.88	3.70	4.53
71	.745	2.98	3.83	4.68
72	.770	3.08	3.96	4.84
73	.796	3.18	4.09	5.00
74	.823	3.29	4.23	5.17
75	.851	3.40	4.37	5.34
76	.880	3.52	4.52	5.53
77	.910	3.65	4.68	5.72
78	.940	3.76	4.83	5.91
79	.971	3.88	4.99	6.10
80	1.00	4.00	5.14	6.29
81	1.04	4.16	5.35	6.54
82	1.07	4.28	5.50	6.73
83	1.10	4.40	5.66	6.91
84	1.14	4.56	5.86	7.17
85	1.17	4.68	6.07	7.46

4. Such is the quantity of vapour which would arise in different circumstances, on the supposition that no vapour existed in the atmosphere. But this is a supposition which can never be admitted, as the atmosphere is in no case totally free from vapour. Now when we wish to ascertain the rate at which evaporation is going on, we have only to find the force of the vapour already in the atmosphere, and subtract it from the force of vapour at the given temperature: the remainder gives us the actual force of evaporation; from which, by the table, we readily find the rate of evaporation. Thus, suppose we wish to know the rate of evaporation at the temperature 59°. From the table we see that the force of vapour at 59° is 0.5 or $\frac{1}{2}$ its force at 212°. Suppose we find by trials that the force of the vapour already existing in the atmosphere is 0.25, or the half of $\frac{1}{2}$. To ascertain the rate of evaporation, we must subtract the 0.25 from 0.5; the remainder 0.25 gives us the force of evaporation required; which is precisely one-half of what it would be if no vapour had previously existed in the atmosphere. By the table we see that on that supposition a surface of six inches diameter would lose one grain by evaporation per minute, instead of two grains, which would have been converted into vapour if no vapour had previously existed in the atmosphere. If the force of the vapour in the atmosphere had amounted to 0.5, which is equal to the force of vapour at the temperature of 59°, in that case no vapour whatever would rise from the water; and if the force of the vapour already in the atmosphere exceeded 0.5, instead of evaporation, moisture would be deposited on the surface of the water. These general observations, for all of which we are indebted to Mr. Dalton, account in a satisfactory manner for all the anomalies which had puzzled preceding philosophers; and include under them all the less general laws which they had discovered. We must consider the discoveries of Mr. Dalton as the most important additions made to the science of meteorology for these many years.

5. As the force of the vapour actually in the atmosphere is seldom equal to the force of vapour of the temperature of the atmosphere, evaporation, with a few exceptions, may be considered as constantly going on.

Various attempts have been made to ascertain the quantity evaporated in the course of a year; but the difficulty of the problem is so great, that we can expect only an approximation towards a solution. From the experiments of Dr. Dobson of Liverpool in the years 1772, 1773, 1774, and 1775, it appears that the mean annual

annual evaporation from the surface of the water amounted to 36.78 inches. The proportion for every month was the following:

Inches.	Inches.
January.....1.50	July.....5.11
February.....1.77	August.....5.01
March.....2.64	September.....3.18
April.....3.30	October.....2.51
May.....4.34	November.....1.51
June.....4.41	December.....1.49

Mr. Dalton found the evaporation from the surface of the water in one of the driest and hottest days of summer rather more than 0.2 of an inch. If we believe Mr. Williams, the evaporation from the surface of land covered with trees and other vegetables is one-third greater than from the surface of water; but this has not been confirmed by other philosophers. From his experiments it appears, that in Bradford in New England the evaporation, during 1772, amounted to 42.65 inches. But from the way that his experiments were conducted, the amount was probably too great. From an experiment of Dr. Watson, made on the 2d of June 1779, after a month's drought, it appears, that the evaporation from a square inch of a grass plot amounted to 1.2 grains in an hour, or 28.8 grains in 24 hours, which is 0.061 of an inch. In another experiment, after there had been no rain for a week, the heat of the earth being 110°, the evaporation was found almost twice as great, or = 0.108 of an inch in the day. The mean of these two experiments is 0.084 inches, amounting for the whole of June to 2.62 inches. If we suppose this to bear the same proportion to the whole year that the evaporation in Dr. Dobson's experiments for June do to the annual evaporation, we shall obtain an annual evaporation, amounting to about 22 inches. This is much smaller than that obtained by Mr. Williams. But Dr. Watson's method was not susceptible of precision. He collected the vapour raised on the inside of a drinking-glass; but it was impossible that the glass could condense much more than one-half of what did rise, or would have been raised in other circumstances. But then the experiments were made in the hottest part of the day, when much more vapour is raised than during any other part of it. The most exact set of experiments on the evaporation from the earth was made by Mr. Dalton and Mr. Hoyle, during 1796, and the two succeeding years. The method which they adopted was this: Having got a cylindrical vessel of tinned iron, ten inches in diameter, and three feet deep, there were inserted into it two pipes turned downwards for the water to run off into bottles: the one pipe was near the bottom of the vessel, the other was an inch from the top. The vessel was filled up for a few inches with gravel and sand, and all the rest with good fresh soil. It was then put into a hole in the ground, and the space around filled up with earth, except on one side, for the convenience of putting bottles to the two pipes; then some water was poured on to sadden the earth, and as much of it as would be suffered to run through without notice, by which the earth might be considered as saturated with water. For some weeks the soil was kept above the level of the upper pipe, but latterly it was constantly a little below it, which precluded any water running off through it. For the first year the soil at top was bare; but for the two last years it was covered with grass the same as any green field. Things being thus circumstanced, a regular register was kept of the quantity of rain-water that ran off from the surface of the earth through the upper pipe (whilst that took place,) and also of the quantity of that which sunk down through the three feet of earth, and ran out through the lower pipe. A rain-gauge of the same diameter was kept close by to find the quantity of rain for any corresponding time. The weight of the water which ran through the pipes being subtracted from the water in the rain-gauge, the remainder was considered as the weight of the water evaporated from the earth in the vessel. The following table exhibits the mean annual result of these experiments:

Water through the two pipes.			Mean.	Mean	Mean
Inch.	Inch.	Inch.	Inch.	Rain.	Evap.
1796.	1797.	1798.			
January 1.897—	.680—	1.774+	1.450+	2.458	1.008
February 1.778—	.918—	1.122	1.273	1.801	.528
March .431—	.070—	.335	.279	.902	.623
April .220—	.295—	.180	.232	1.717	1.485
May 2.027—	2.443+	.010	1.493+	4.177	2.684
June .171—	.726	—	.299	2.483	2.184
July .153—	.025	—	.059	4.154	4.095
August —	.304	—	.168	3.554	3.386
September —	.976	—	.325	3.279	2.954
October —	.680	—	.227	2.899	2.672
November —	1.044	1.594	.879	2.934	2.055
December .200	3.077	1.878+	1.718+	3.202	1.484
6.877—	10.934—	7.379	8.402	33.560	25.158
Rain 30.629—	38.791—	31.259			
Evapor. 23.725—	27.857—	23.862			

From these experiments it appears, that the quantity of vapour raised annually at Manchester is about 25 inches. If to this we add five inches for the dew with Mr. Dalton, it will make the annual evaporation 30 inches. Now, if we consider the situation of England, and the greater quantity of vapour raised from water, it will not surely be considered as too great an allowance if we estimate the mean annual evaporation over the whole surface of the globe at 35 inches. But 35 inches from every square inch on the superficies of the globe make 94,450 cubic miles; equal to the water annually evaporated over the whole globe. Was this prodigious mass of water all to subsist in the atmosphere at once, it would increase its mass by about a twelfth, and raise the barometer nearly three inches. But this never happens; no day passes without rain in some part of the earth, so that part of the evaporated water is constantly precipitated again. Indeed it would be impossible for the whole of the evaporated water to subsist in the atmosphere at once, at least in the state of vapour.

EVASION, in law, any subtle endeavour to set aside truth, or to escape the punishment of the law. Thus, if a person says to another that he will not strike him, but will give him a pot of ale to strike him first, and accordingly he strikes, the returning of it is punishable; and if the person first striking be killed, it is murder: for no man shall evade the justice of the law by such a pretence to cover his malice.

EVATES, a branch of the Druids. Strabo divides the British and Gaulish philosophers into three sects; bards, evates, and druids. He adds, that the bards were the poets and musicians; the evates, the priests and naturalists; and the druids, moralists as well as naturalists: but Marcellus and Hornius reduce them all to two sects, viz. the Bards and Druids.

EVAUX, a town of France, in the department of Creuse, 18 miles N. N. E. of Aubusson.

EUBAGES, or **EUBATES**, an order of priests or philosophers among the ancient Celts or Gauls: some suppose them to be the same with the druids and saronide of Diodorus; and others, that they were the same with what Strabo calls Evates.

EUBŒA, or **ABANTIUS**, in ancient geography, an oblong island, stretching out between Attica and Thessaly. It is now called Negropont, from its principal town, anciently called Chalcis.

EUCALYPTUS, a genus of the hexandria monogynia class and order. Calyx superior, permanent, truncate before flowering, covered with an hemispherical deciduous lid; corolla none; capsule four-celled, opening at top, inclosing many seeds. There are two species, lofty trees of New Holland; called also the red-gum tree, from a gummy matter, in which one of them, the resinifera, abounds.

EUCHARIST properly signifies giving thanks; the word *Eucharistia* literally importing thanksgiving; being formed of *e*, good; and *charis*, thanks. This sacrament was instituted by Christ himself, and the participation of it is called communion. As to the manner of celebrating the eucharist among the primitive Christians, after the customary oblations were made, the deacon brought water

to the bishops and presbyters, standing round the table, to wash their hands. Then the deacon cried out aloud, "Mutually embrace and kiss each other;" which being done, the whole congregation prayed for the universal peace and welfare of the church, for the tranquillity and repose of the world, for the prosperity of the age, for wholesome weather, and for all ranks and degrees of men. After this followed mutual salutations of the minister and people; and then the bishop or presbyter having sanctified the elements by a solemn benediction, he brake the bread, and delivered it to the deacon, who distributed it to communicants, and after that the cup. Their sacramental wine was usually diluted or mixed with water. During the administration, they sang hymns and psalms; and having concluded with prayer and thanksgiving, the people saluted each other with a kiss of peace.

EUCHITE, or EUCHITES, [Ευχῆται, Gr. from εὐχῆ, prayer,] a sect of ancient heretics, who were first formed into a religious body towards the end of the 4th century, though their chief doctrines and discipline subsisted in Syria, Egypt, and other eastern countries, before the birth of Christ. They were thus called because they prayed without ceasing, agreeably to the words of St. Paul, 1 Thess. v. 17, imagining that prayer alone was sufficient to save them.

EUCHITES, another sect of fanatics, who, in the 12th century, infested the Greek and Eastern churches, and who were charged with believing a double Trinity, rejecting wedlock, abstaining from flesh, treating with contempt the sacraments of baptism and the Lord's supper, and the various branches of external worship, and placing the essence of religion solely in external prayer, and maintaining the efficacy of perpetual supplications to the supreme Being for expelling an evil genius, who dwelt in the breast of every mortal.

EUCHOLOGIUM, [Ευχολογιόν, Gr. i. e. a discourse on prayer; from εὐχῆ, prayer, and λόγος, discourse,] the Greek ritual, wherein are prescribed the order and manner of every thing relating to the administration of their ceremonies, sacraments, ordinations, &c.

EUCLEA, a genus of the diœcia dodecandria class and order. In both male and female the calyx is four or five-toothed; corolla four or five-parted; male stamina, twelve to fifteen. In the female, the germ is superior; styles two; berry two-celled. One species, a branching tree of the Cape.

EUCLID OF ALEXANDRIA, the celebrated mathematician, flourished in the reign of Ptolemy Lagus, about B. C. 280. He reduced all the fundamental principles of pure mathematics, which had been delivered down by Thales, Pythagoras, Endoxus, and other mathematicians before him, into regularity and order, and added many others of his own discovering; on which account he is said to be the first who reduced arithmetic and geometry into the form of a science. He likewise applied himself to the study of mixed mathematics, and especially to astronomy and optics, in which he also excelled. His works, as we learn from Pappus and Proclus, are the Elements of Geometry, Data, Introduction to Harmony, Phenomena, Optics, Catoptrics, a Treatise of the Division of Superficies, Loci ad Superficiem, Porisms, Fallacies, and four books of Conics. Of these the most celebrated is his Elements, of which there have been numberless editions in all languages. A fine edition of all his works now extant was printed in 1703, by David Gregory, Savilian professor of astronomy at Oxford. Euclid was greatly esteemed by king Ptolemy; who once asking him, if there was any shorter way of coming at Geometry than by his Elements, Euclid answered, that "there was no royal path to Geometry."

EUCLID OF MEGARA, a celebrated philosopher and logician, flourished about B. C. 400. The Athenians having prohibited the Megarians from entering their city on pain of death, this philosopher disguised himself in women's clothes to attend the lectures of Socrates. After the death of Socrates, Plato and other philosophers went to Euclid at Megara, to shelter themselves from the tyrants who governed Athens. Euclid admitted but one chief good; which he sometimes called God, sometimes Spirit, and sometimes Providence.

EUCOMIS, a genus of the class and order hexandria monogynia. Calyx inferior, six-parted, permanent, spreading; filaments united at the base into a nectary growing to the corolla. There are four species, plants of the Cape.

EUDIOMETER, an instrument for ascertaining the purity of

the atmospherical air, or the quantity of oxygenous gas contained in it, chiefly by means of its diminution on a mixture with nitrous acid, or some similar substance. After the composition of the atmosphere was known to philosophers, it was taken for granted that the proportion of its oxygen varied in different times and in different places; and that upon this variation the purity or noxious qualities of air depended. Hence it became an object of the greatest importance to be in possession of a method of determining readily the quantity of oxygen in a given portion of air. Accordingly, various methods were proposed, all of them depending upon the property which bodies possess of absorbing the oxygen of the air without acting upon its azote. These bodies were mixed with a certain known quantity of atmospherical air, in graduated glass vessels inverted over water, and the proportion of oxygen was determined by the diminution of bulk. These instruments received the name of eudiometers, because they were considered as measures of the purity of air; from ἡ εὐδία, serenity of the atmosphere, and μέτρον, a measure. The eudiometers proposed by different chemists may be reduced to five. 1. The first eudiometer was made in consequence of Dr. Priestley's discovery, that when nitrous gas is mixed with air over water, the bulk of the mixture diminishes rapidly, in consequence of the combination of the gas with the oxygen of the air, and the absorption of the nitric acid thus formed by the water. When nitrous gas is mixed with azotic gas, no diminution at all takes place. When it is mixed with oxygen gas in proper proportions, the absorption is complete. Hence it is evident, that in all cases of a mixture of these two gases, the diminution will be proportional to the quantity of the oxygen. Of course it will indicate the proportion of oxygen in air; and by mixing it with different portions of air, it will indicate the different quantities of oxygen which they contain, provided the component parts of air are susceptible of variation. Dr. Priestley's method was, to mix together equal bulks of air and nitrous gas in a low jar, and then to transfer the mixture into a narrow graduated glass tube about three feet long, in order to measure the diminution of bulk. He expressed this diminution by the number of hundredths parts remaining. Thus, suppose he had mixed together equal parts of nitrous gas and air, the sum total of this mixture was 200 (or 2.00): suppose the residuum when measured in the graduated tube to amount to 104 or (1.04), and of course that 96 parts of the whole had disappeared, he denoted the purity of the air thus tried by 104. A more convenient instrument was invented by Dr. Falconer of Bath; and Fontana greatly improved this method of measuring the purity of air. A description of his eudiometer was published by Ingenhouz, in the first volume of his Experiments: it was still farther improved by Mr. Cavendish in 1783; and Humboldt has lately made a very laborious set of experiments in order to bring it to a state of complete accuracy. But after all the exertions of these philosophers, the method of analysing air by means of nitrous gas is liable to so many anomalies, that it cannot be depended on. Priestley and Fontana have proved, that the way of mixing the two airs occasions a great difference in the result, the figure of the vessels is equally important, and so is the water over which the mixture is made. And even when all these things are the same, the impurity of the nitrous gas may occasion the most enormous differences in the results. Humboldt has shewn that the nitrous gas ought to be prepared by means of nitric acid of the density 1.170; when a much stronger or weaker acid is employed, the gas produced is always contaminated with a great proportion of azotic gas. He has pointed out the solution of sulphate of iron as proper to ascertain the purity of the nitrous gas employed, by absorbing the nitrous gas, and leaving the azotic gas or other foreign gases. He has shewn that when nitrous gas of the same degree of purity is made to mix very slowly with air, the vessel being carefully agitated during the mixture, the results, provided the experiment is performed with address, correspond with each other. And he has made it probable, that when equal quantities of air and nitrous gas, so pure as to contain only about 0.1 of azotic gas mixed with it, are agitated together slowly over water, the diminution divided by 3.55, gives the quantity of oxygen contained in the air examined. But notwithstanding the ingenuity of his experiments, the anomalies attending this method are still so great as not to render it susceptible of accuracy. For that reason it is unnecessary to give a particular description of the different eudiometers invented to ascertain the purity of air by means

means of nitrous gas. The result of the numerous experiment which have been made with nitrous gas is, that the proportion of oxygen in atmospheric air varies in different places and at different times. The minimum is about 0.22, the maximum about 0.30; consequently if this method of analysing air is to be depended on, we must consider that fluid not as a permanent chemical compound, but as a body subjected to all the variations to which accidental mixtures are liable.

2. The second kind of eudiometer was proposed by Volta. The substance employed by that philosopher to separate the oxygen from the air was hydrogen gas. His method was, to mix given proportions of the air to be examined and hydrogen gas in a graduated glass tube; to fire the mixture by an electric spark; and to judge of the purity of the air by the bulk of the residuum. But this method is not susceptible of even so great a degree of accuracy as the preceding, when the object is to ascertain the precise quantity of oxygen gas in a given bulk of air. For if too little hydrogen gas is mixed with the air, not only the whole of the oxygen will not be abstracted, but a portion of the azote will disappear in consequence of the formation of nitric acid. On the other hand, if too much hydrogen is added, part of it will remain after the firing of the mixture, and increase the bulk of the residuum. Volta's eudiometer, then, though it may have its uses, is scarcely susceptible of giving us the analysis of air.

3. For the third kind of eudiometer, we are indebted to Scheele. It is merely a graduated glass vessel, containing a given quantity of air exposed to newly prepared liquid alkaline or earthy sulphurets; or to a mixture of iron-filings and sulphur, formed into a paste by means of water. These substances absorb the whole of the oxygen or vital principle of the air, which converts a portion of the sulphur into an acid. The oxygen contained in the air thus examined, is judged of by the diminution of bulk which the air has undergone. This method is not only exceedingly simple, but it requires very little address, and yet is susceptible of as great accuracy as any other whatever. The only objection to which it is liable is its slowness; for when the quantity of air operated on is considerable, several days elapse before the diminution has reached its maximum. But this objection has been completely obviated by M. De Marti, who has brought Scheele's eudiometer to a state of perfection. He found that a mixture of iron-filings and sulphur does not answer well, because it emits a small quantity of hydrogen gas, involved by the action of the sulphuric acid formed by the absorption of the oxygen of the air upon the iron; but the hydrogenated sulphurets, formed by boiling together sulphur and liquid potash or lime-water, answered the purpose perfectly. These substances, indeed, when newly prepared, have the property of absorbing a small portion of azotic gas; but they lose this property when saturated with that gas, which is easily effected by agitating them for a few minutes with a small portion of atmospheric air. His apparatus is merely a glass tube, ten inches long, and rather less than half an inch in diameter, open at one end, and hermetically sealed at the other. The close end is divided into 100 equal parts, having an interval of one line between each division. The use of this tube is to measure the portion of air to be employed in the experiment. The tube is filled with water; and by allowing the water to run out gradually while the tube is inverted, and the open end kept shut with the finger, the graduated part is exactly filled with air. These hundredth parts of air are introduced into a glass bottle filled with liquid sulphuret of lime previously saturated with azotic gas, and capable of holding from two to four times the bulk of the air introduced. The bottle is then to be corked with a ground glass stopper, and agitated for five minutes. After this the cork is to be withdrawn while the mouth of the phial is under water; and for the greater security, it may be corked and agitated again. After this, the air is to be again transferred to the graduated glass tube, in order to ascertain the diminution of its bulk. Air examined by this process, suffers precisely the same diminution in whatever circumstances the experiments are made: no variation is observed whether the wind is high or low, or from what quarter soever it blows; whether the air tried is moist or dry, hot or cold; whether the barometer is high or low. Neither the season of the year, nor the situation of the place, its vicinity to the sea, to marshes, or to mountains, makes difference. M. De Marti found the diminution always between 0.21 and 0.23. Hence we may conclude that air is composed of

0.78 azotic gas.
0.22 oxygen gas.

1.00

Scheele indeed found, that the absorption amounted to 0.27; but that was because he neglected to saturate his sulphuret with azotic gas: for when the portion of azotic gas, which must have been absorbed, and which has been indicated by de Marti, is subtracted, the portion of oxygen in air, and indicated by his experiments, is reduced very nearly to 0.22. The trifling variations perceptible in his experiments were no doubt owing to the quantities of the mixture of sulphur and iron, by which he abstracted the oxygen, not being exactly the same at different times; the consequence of which would be, an unequal absorption of azotic gas.

4. In the fourth kind of eudiometer, the abstraction of the oxygen of air is accomplished by means of phosphorus. This eudiometer was first proposed by Acharde. It was considerably improved by Reboul, and by Seguin and Lavoisier; but Berthollet has lately brought it to a state of perfection, as it is equally simple with the eudiometer of De Marti, and scarcely inferior to it in precision. Instead of the rapid combustion of phosphorus, this last philosopher has substituted its spontaneous combustion, which absorbs the oxygen of air completely; and when the quantity of air operated on is small, the process is over in a short time. The whole apparatus consists in a narrow graduated tube of glass containing the air to be examined, into which is introduced a cylinder of phosphorus fixed upon a glass rod, while the tube stands inverted over water. The phosphorus should be so long as to traverse nearly the whole of the air. Immediately white vapours rise from the phosphorus and fill the tube. These continue till the whole of the oxygen combines with phosphorus. They consist of phosphorous acid, which falls by its weight to the bottom of the vessel, and is absorbed by the water. The residuum is merely the azotic gas of the air, holding a portion of phosphorus in solution. Berthollet has ascertained, that by this foreign body its bulk is increased one-fortieth part. Consequently, the bulk of the residuum, diminished by $\frac{1}{40}$, gives us the bulk of the azotic gas of the air examined; which bulk, subtracted from the original mass of air, gives us the proportion of oxygen gas contained in it. All the different experiments which have been made by means of this eudiometer, agree precisely in their result, and indicate that the proportions of the ingredients of air are always the same, namely, about 0.22 part of oxygen gas, and 0.78 of azotic gas. Berthollet found these proportions in Egypt and in France, and Dr. Thomson found them constantly in Edinburgh in all the different seasons of the year. Thus we see that the analysis of air by means of phosphorus, agrees precisely with its analysis by means of hydrogenated sulphurets.

5. The fifth eudiometer has been lately proposed by Mr. Davy. In it the substance used to absorb the oxygen from air is a solution of sulphate or muriate of iron in water, and impregnated with nitrous gas. A small graduated glass tube, filled with the air to be examined, is plunged into the nitrous solution, and moved a little backwards and forwards. The whole of the oxygen is absorbed in a few minutes. The state of greatest absorption ought to be marked, as the mixture afterwards emits a little gas which would alter the result. By means of this and the two preceding eudiometers, Mr. Davy examined the air at Bristol, and found it always to contain about 0.21 of oxygen. Air sent to Dr. Beddoes from the coast of Guinea gave exactly the same result. This eudiometer, then, corresponds exactly with the two last. In all these different methods of analysing air, it is necessary to operate on air of a determinate density, and to take care that the residuum is neither more condensed nor dilated than the air was when first operated on. If these things are not attended to, no dependence whatever can be placed upon the result of the experiments, how carefully soever they may have been performed. Now there are three things which alter the volume of air and other elastic fluids: 1. A change in the height of the barometer. 2. An increase or diminution of their quantity; the vessel in which they are contained remaining the same, and standing in the same quantity of water or mercury. 3. A change in the temperature of the air.

EUDOCIA, or EUDOSIA, a celebrated lady, the daughter of Leontius, a philosopher of Athens; who gave her such a learned education, that at his death, he left her only a small legacy, the

saying she was capable of making her own fortune. Pleading at Athens against her two brothers, for a share in her father's estate, without success, she carried her cause personally by appeal to Constantinople; recommended herself to Pulcheria, the sister of the emperor Theodosius II. embraced Christianity, was baptized by the name of Eudisia, (her original name being Athenais,) and soon after married to the emperor. Their union lasted a considerable time: but a difference at last taking place, on account of the emperor's jealousy, excited by Chrysapius the eunuch, she retired to Jerusalem, where she spent many years in building and adorning churches and in relieving the poor. Dupin says that she did not return thence till after the emperor's death: but Cave tells us, that she was reconciled to him, returned to Constantinople, and continued with him till his death; after which she went again to Palestine, where she spent the remainder of her life in pious works. She died A. D. 459, or 460. Cave says that on her death-bed she took a solemn oath, by which she declared herself entirely free from any stain or unchastity. She wrote a paraphrase on the first eight books of the Old Testament in heroic verse; another in prose on Daniel and Zacharias; a history of St. Cyprian and Justina, and a Life of Christ, in heroics, with many other poems, which are lost.

EUDOXIANS, a sect of heretics in the 4th century, who adhered to the errors of the Arians and Eunomians, maintaining that the Son was created out of nothing; that he had a will different from that of the Father, &c.

EUDOXIUS, the founder of the sect of the Eudoxians, was patriarch of Antioch and Constantinople, and succeeded Macedonius in the latter see, A. D. 360. He was a zealous defender of the Arian doctrine; and died A. D. 370.

EUDOXUS, a celebrated astronomer of Cnidus, in Caria, who flourished about B. C. 370. He studied geometry under Archytas, and travelled into Egypt to learn the other sciences. There he and Plato studied together for thirteen years, after which they came to Athens; where Eudoxus taught with so much renown, that even Plato is said to have envied him. Eudoxus composed "Elements of Geometry," from which, Proclus tells us, Euclid himself borrowed liberally. Cicero calls Eudoxus the greatest astronomer that ever lived, and Petronius says, he spent the latter part of his life on the top of a high mountain, that he might contemplate the stars with more convenience. Strabo says, the remains of his observatory were to be seen at Cnidus in his time. He died in his 53d year.

EVE, [הוה, Heb. *i. e.* she lived,] the mother of all mankind. See **ADAM**.

EVELYN, JOHN, a most learned writer and natural philosopher, born at Wotton in Surrey, the seat of his father, in 1620. After making the tour of Europe, he returned about 1651, and lived very retired at his rural retreat, Say's Court, near Deptford in Kent. He was very assiduous in transmitting to the Royal Society whatever fell within the compass of his inquiries; and used humbly to style himself pioneer in the service. When the number of books he published is considered, the many he left behind him unfinished and unpublished, and the variety of subjects on which he employed his time, his industry and application appear astonishing. "His life," says Mr. Walpole, "was a course of inquiry, study, curiosity, instruction, and benevolence. The works of the Creator, and the mimic labours of the creature were all objects of his pursuit. He unfolded the perfections of the one, and assisted the imperfections of the other. He adored from examination; was a courtier that flattered only by informing his prince, and pointing out what was worthy of him to countenance; and was really the neighbour of the Gospel, for there was no man that might not have been the better for him. He was one of the first promoters of the Royal Society, a patron of the ingenious and indigent, and peculiarly serviceable to the lettered world; for, besides his writings and discoveries, he obtained the Arundelian marbles for the university of Oxford, and the Arundelian library for the Royal Society: nor is it the least part of his praise, that he who proposed to Mr. Boyle the erection of a philosophical college for retired and speculative persons, had the honesty to write in defence of active life, against Sir George Mackenzie's "Essay on Solitude." He knew that retirement in his own hands was industry and benefit to mankind; but in those of others, laziness and idleness." There are five small prints of his journey from Rome

to Naples, drawn and etched by him; and among his published works are, 1. A Character of England; 2. The State of France; 3. An Essay on the first book of Lucretius De Rerum Natura; 4. The French Gardener; 5. A Panegyric on King Charles II.'s Coronation; 6. Famifugum, or the Inconveniences of the Air and Smoke of London dissipated; 7. The History and Art of Engraving on Copper; 8. A Parallel between the Ancient Architecture and Modern; 9. Sylva, or a Discourse of Forest Trees; and several others. This amiable gentleman died, full of age and honour, in 1706.

EVEN NUMBERS. See **NUMBER**.

EVENLY EVEN NUMBERS, or EVENLY ODD NUMBERS. See **NUMBER**.

EVER-GREEN, in gardening, a species of perennials, which continue their verdure, leaves, &c. all the year: such are hollies, phillyria's laurustinuses, bays, pines, firs, cedars of Lebanon, &c.

EVERLASTING PEA. See **LATHYRUS**.

EVERSHOT, a town of Dorsetshire, 12 miles N. W. of Dorchester.

EVESDROPPERS, in law, persons who stand under the eaves, walls, or windows, of a house, by day or by night, to listen after news, and carry it to others, thereby raising strife and contention in the neighbourhood. They are punishable in the court-leet, or quarter-sessions.

EVESHAM, a township of New Jersey, in Burlington county, between the forks of Moore's Creek; 16 miles E. of Philadelphia.

EVESHAM, or EVESHOLM, commonly called **ESAM**, a borough of Worcestershire, seated on a gentle ascent from the river Avon. It is 14 miles S. E. of Worcester, and 95 N. W. by W. of London.

EUGENIA, the **YAMBOO**; a genus of the monogynia order, and icosandria class of plants; natural order, Hesperideæ. Calyx quadripartite, superior; petals four; fruit a monospermous quadrangular plum. There are eleven species, natives of the East or West Indies.

EVIAN, a town of France, in the department of Mont Blanc, on the S. side of the lake of Geneva, 23 miles N. E. of Geneva.

EVICTIO, in law, signifies a recovery of lands, or tenements. When lands, &c. are evicted before rent reserved upon a lease becomes due, the lessee is not liable to pay any rent. Likewise, if on an exchange of lands, either of the parties is evicted of the land given in exchange, the party evicted may, in that case, re-enter his own lands. And a widow being evicted of her thirds, shall be endowed in the other lands of the heir.

EVIDENCE, in law, signifies proof by testimony of men upon oath, or by writings or records. It is called evidence, because thereby the point in issue, in a cause to be tried, is to be made evident. The system of evidence, as now established in our courts of common law, is very full, comprehensive, and refined; far different from, and superior to, any thing known in the middle ages;—as far superior in that as in all other improvements and refinements in science, arts, and manners. As to evidence, the common law requires no certain number of witnesses, though in some cases the statute-law does. The testimony of one single evidence is sufficient for the crown in all causes, except treason or conspiracy against the state, where there must be two: sometimes violent presumption will be admitted as evidence, without witnesses, as where a person is run through the body in a house, and one is seen to come out of that house with a bloody sword. In general, a party interested in a suit, a wife for or against her husband, unless in cases of treason, an alien infidel, persons non sane memoria, such as are convicted of felony, perjury, &c. may not be evidence in the cause; but kinsmen, though ever so near, also tenants, servants, masters, attorneys for their clients, one of the jurors upon trial, and all others that are not infamous, and who want not understanding, or are no parties in interest, may be allowed to give evidence; though the credit of servants is left to the jury: also the judge going off the bench may give evidence. Witnesses are summoned by writ of subpoena to attend on penalty of 100l. to the king, and 10l. to the party, with charges by statute 5 Eliz. c. 9. All witnesses of all religions, who believe in a future state of rewards and punishments are received, but not persons infamous in law by their crimes, nor persons directly interested in the matter in issue; and

no counsel or attorney shall be compelled to disclose the secrets intrusted to him by his client, but he may give evidence of facts which he knew by other means than for the purpose of the cause. The oath of the witness is to speak the truth, the whole truth, and nothing but the truth, and all evidence is to be given in open court. The law never gives credit to the bare assertion of any one, however high his rank or pure his morals; but requires (except in particular cases with respect to quakers) the sanction of an oath, and the personal attendance of the party in court, that he may be examined and cross-examined by the different parties; and therefore in cases depending on parole or verbal evidence, the testimony of persons who are themselves conversant with the facts they relate, must be produced; the law paying no regard, except under special circumstances, to any hearsay evidence. Thus in some cases, the memorandum in writing made at the time, by a person since deceased, in the ordinary way of his business, and which is corroborated by other circumstances, will be admitted as evidence of the fact. The general rules of evidence are, 1. The best evidence must be given that the nature of the thing is capable of. 2. No person interested in the question can be a witness; but to this there are exceptions, as first, in criminal prosecutions; secondly, for general usage, for convenience of trade, as a servant to prove the delivery of goods, though it tends to clear himself of neglect. 3. Where the witness acquires the interest by his own act, after the party who calls him has a right to his evidence. The third rule is, that hearsay of a matter of fact is no evidence; but of matter of reputation, such as a custom, it is in some sort evidence. 4. Where a general character is the matter in issue, particular facts may be received in evidence, but not where it occurs incidentally. 5. In every issue the affirmative is to be proved. 6. No evidence need be given of what is agreed, or not denied upon the pleadings. In cases of crimes, as of robbery on the highway, in an action against the hundred, and rapes of women, &c. a man or woman may be an evidence in their own cause; so likewise in private notorious cheats, where none else can be witness of the circumstances of the fact, but he that suffers. And in general the same rules prevail as those above stated, but evidence of the confessions of the party should be received with caution, and are rejected when obtained through promises or threats. Presumptive evidence should be admitted with caution, and two excellent rules are given by Sir Matthew Hale, that no one should be convicted of stealing goods of a person actually unknown, unless there is proof of a felony actually committed; and none tried for murder, until the murdered body be found. When a witness is not liable to any legal objection, he is first examined by the counsel for the party on whose behalf he comes to give evidence, as to his knowledge of the fact he is to prove. This examination, in cases of any intricacy, is a duty of no small importance in the counsel: for as on the one hand, the law will not allow him to put what are called leading questions, viz. to form them in such a way as would instruct the witness in the answers he is to give; so on the other, he should be careful that he makes himself sufficiently understood by the witness, who may otherwise omit some material circumstance of the case. The party examined must depose those facts only of which he has an immediate knowledge and recollection; he may refresh his memory with a copy taken by himself from a day-book; and if he can then speak positively as to his recollection, it is sufficient; but if he has no recollection further than finding the entry in his book, the book itself must be produced. Where the defendant had signed acknowledgements of having received money, in a day-book of the plaintiff, and the plaintiff's clerk afterwards read over the items to him, and he acknowledged them all right, it was held, that the witness might refresh his memory by referring to the books, although there was no stop to the items on which the receipt was written, for this was only proving a verbal acknowledgement, and not a written receipt. Written evidence has been divided into two classes: the one, that which is public, the other private; and this first, has been subdivided into matters of record, and others of an inferior nature. The memorials of the legislature, such as acts of parliament, and other proceedings of the two houses, were acting in a legislative character; and judgement of the King's superior courts of justice, are denominated records, and are so respected by the law, that no evidence whatsoever can be received in contradiction of them; but these are not permitted to be removed from place to place to serve a private purpose, and are therefore proved by copies of them,

which in the absence of the original, is the next best evidence. A bill in chancery has been admitted as slight evidence against the complainant; and an answer, is evidence against the defendant in equity himself, though not against others, and the whole may be read by the adverse party. Depositions in chancery, may be evidence at law, but not against others, and regularly not if the witness be alive, except when taken in perpetuum rei memoriam, &c. Matter in law ought not to be given in evidence upon a trial, but only of fact. On the question, how far persons who have been defrauded of securities, or injured by a perjury or other crime, can be witnesses in prosecuting for those offences, the event of which might possibly exonerate them from an obligation they are charged to have entered into, or restore to them money which they have been obliged to pay; the general principle now established is this: the question in a criminal prosecution or personal act, being the same with that in a civil cause in which the witnesses are interested, goes generally to the credit, unless the judgement in the prosecution where they are witnesses, can be given in evidence in this cause wherein they are interested. But though this is the general rule, an exception to it seems to be established in the case of forgery; for many cases have been decided, that a person whose hand-writing has been forged to an instrument, whereby if good he would be charged with a sum of money, or one who has paid money in consequence of such forgery, cannot be a witness on the indictment. In cases where the party injured cannot by possibility derive any benefit from the verdict in the prosecution, as in indictments for assault, and the like personal injury, his competence has never been doubted. It is a general rule that a party cannot be examined as a witness, for he is in the highest degree interested in the event of it; but where a man is not in point of fact interested, but only a nominal party, as where members of a charitable institution are defendants in their corporate character, there is no objection to an individual member being examined as a witness for the corporation; for in this case he is giving evidence for the public body only, and not for himself as an individual. Peake's N. P. Cas. 153. But N. P. 293.

EVIL, in philosophy, &c. is either moral or natural. Moral evil is the disagreement between the actions of a moral agent, and the rule of those actions whatever it is. See MORAL PHILOSOPHY. Natural evil is, whatever destroys, or any way disturbs, the perfection of natural beings: such as blindness, diseases, death, &c.

EVIL-MERODACH, king of Babylon, succeeded his father Nebuchadnezzar the Great, A. M. 3443. He had governed the kingdom during the lunacy of his father, who after seven years, having recovered his understanding, once more ascended the throne, and imprisoned his son Evil-Merodach. In this confinement, it is supposed, that Evil-Merodach made an acquaintance and friendship with Jeconiah, king of Judah, who had been carried to Babylon by Nebuchadnezzar. However, it is certain, that soon after his succession to the throne, he delivered the king of Judah out of prison, after a confinement of 37 years, heaped many favours on him, and placed him above all the other kings who were at the court of Babylon. (2 Kings xxv. 27. Jer. lii. 31.) Evil-Merodach reigned but one year, according to the chronology of archbishop Ussher; but Dr. Prideaux says, he reigned two years, and was succeeded by Neriglissar, his sister Nitocris's husband, who, having been at the head of a conspiracy that put him to death, reigned in his stead. Others will have it, that this prince was immediately succeeded by his son Belshazzar.

EULER, LEONARD, F. R. S. styled by Dr. Hutton, "one of the most extraordinary, and even prodigious, mathematical geniuses, that the world ever produced," was born at Basil, April 15, 1707. He was the son of Paul Euler, and Margaret Brucker, of an illustrious family in letters, and spent the years of his infancy, in a rural retreat at the village of Riehen, where his father was minister. He received his education in the university of Basil with a view to the church, but he devoted himself principally to mathematical studies under the famous John Bernoulli. In 1727 he followed his friends Hermann and Daniel Bernoulli to Petersburg, and was associated with them in the mathematical professorship. In 1730 he was appointed professor of natural philosophy, and on the departure of Daniel Bernoulli he succeeded him in the mathematical chair. In 1733, a problem was proposed by the academy which required expedition, and for the solution

of which several eminent mathematicians had demanded some months. The problem was solved by Euler in three days, to the great astonishment of the academy; but the violent and laborious efforts it cost him threw him into a fever, which endangered his life, and deprived him of the use of his right eye. The academy of sciences at Paris, which in 1738 had adjudged the prize to his memoir Concerning the Nature and Properties of Fire, proposed for the year 1740 the important subject of the tides; a problem whose solution required the most arduous calculations. Euler's discourse on this question was adjudged a master-piece of analysis and geometry; and it was more honourable for him to share the academical prize with such illustrious competitors as Colin MacLaurin and Daniel Bernouilli, than to have carried it away from rivals of less magnitude. Seldom if ever did such a brilliant competition adorn the annals of the academy; and perhaps no subject, proposed by that learned body, was ever treated with such accuracy of investigation and force of genius, as that which here displayed the philosophical powers of this extraordinary triumvirate. In 1741 he went to Berlin, at the invitation of the king, to assist in establishing the academy there. He continued at Berlin twenty-five years, and then returned to Petersburg, where he soon after entirely lost his sight. But still he continued his favourite pursuits, and it was in this distressing situation he dictated to his servant a tailor's apprentice, who was absolutely devoid of mathematical knowledge, his "Elements of Algebra;" which, by their intrinsic merit, in point of perspicuity and method, and the unhappy circumstances in which they were composed, have equally excited applause and astonishment. This work, though purely elementary, discovers proofs of a most inventive genius; and it is here alone that we meet with a complete theory of the analysis of Diophantus. About this time M. Euler was honoured by the Academy of Sciences at Paris with the place of one of its foreign members; and, the academical prize was adjudged to three of his memoirs, Concerning the Inequalities in the Motions of the Planets. The two prize questions, proposed by the same academy for 1770 and 1772, were designed to obtain from the labours of astronomers a more Perfect Theory of the Moon. M. Euler, assisted by his eldest son, was a competitor for these prizes, and obtained them both. He afterwards reviewed his whole theory, with the assistance of his son and Messrs. Krafft and Lexell, and pursued his researches until he had constructed the new tables, which appeared, together with the great work, in 1772. Instead of confining himself, as before, to the fruitless integration of three differential equations of the second degree, which are furnished by mathematical principles, he reduced them to the three ordinates, which determine the place of the moon; he divided into classes all the inequalities of that planet, as far as they depend either on the elongation of the sun and moon, or upon the eccentricity, or the parallax, or the inclination of the lunar orbit. All these means of investigation, employed with such art and dexterity as could only be expected from an analytical genius of the first rank, were attended with the greatest success; and it is impossible to observe, without admiration, such immense calculations on the one hand, and on the other the ingenious methods employed by this great man to abridge them, and to facilitate their application to the real motion of the moon. But this admiration becomes astonishment, when we consider at what period and in what circumstances all this was effectuated by M. Euler. It was when he was totally blind, and consequently obliged to arrange all his computations by the sole powers of his memory and genius. It was when he was embarrassed in his domestic circumstances by a dreadful fire, that had consumed great part of his substance, and forced him to quit a ruined house, of which every corner was known to him by habit, which, in some measure, supplied the place of sight. It was in these circumstances, that Euler composed a work which, alone, was sufficient to render his name immortal. Some time after this, the famous oculist, Wentzell, by couching the cataract, restored his sight; but the joy that this operation produced was of short duration. Some negligence on the part of his surgeons, and his own impatience to use an organ, whose cure was not completed, deprived him of his sight a second time; and this relapse was accompanied with tormenting pain. He, however, with the assistance of his sons, and of Messrs. Krafft and Lexell, continued his labours; neither the loss of his sight, nor the infirmities of an ad-

vanced age, could depress the ardour of his genius. He had engaged to furnish the academy of Petersburg with as many memoirs as would be sufficient to complete its acts for 20 years after his death. In 7 years he transmitted to the academy, by Mr. Golofkin above 70 memoirs, and above 250 more left behind him, were revised and completed by a friend. Such of these memoirs as were of ancient date were separated from the rest, and form a collection that was published in 1783, under the title of Analytical Works. Euler's knowledge was more universal than could well be expected in one, who had pursued, with such unremitting ardour, mathematics and astronomy as his favourite studies. He had made a very considerable progress in medical, botanical, and chemical science. What was still more extraordinary, he possessed what is generally called erudition in a very high degree. He had read the most eminent writers of ancient Rome; the civil and literary history of all ages and nations was familiar to him; and foreigners, who were only acquainted with his works, were astonished to find in the conversation of a man, who seemed solely occupied in mathematical and physical researches and discoveries, such an extensive acquaintance with the most interesting branches of literature. In this he was doubtless much indebted to a very uncommon memory, which seemed to retain every idea that was conveyed to it, either by reading or meditation. He could repeat the *Aeneid* of Virgil, from the beginning to the end, without hesitation, and indicate the first and last line of every page of the edition he used. Several attacks of a vertigo, in Sept. 1783, (which, however, did not prevent his calculating the motions of the aerostatic globes,) were the forerunners of his mild and happy passage from this scene to a better. While he was amusing himself at tea with one of his grandchildren, he was struck with an apoplexy, which terminated his illustrious career at the age of 76. His constitution was uncommonly strong and vigorous; his health was good; and the evening of his life was calm and serene, sweetened by the fame that follows genius, the public respect that is paid to exemplary virtue, and several domestic comforts which he was capable of feeling; and therefore deserved to enjoy. His works are so numerous that the printed catalogue alone extends to 50 pages; 14 of which contain those in M. S. The printed ones consist of works published separately, and works to be found in the memoirs of several academies, viz. in thirty-eight volumes of the Petersburg acts, (from six to ten papers in each volume); in several volumes of the Paris acts; in twenty-six volumes of the Berlin acts, (about five papers to each volume); in the *Acta Eruditorum*, in two volumes; in the *Miscellanea Taurinensia*; in vol. ix. of the *Society of Ulyssingue*; in the *Ephemeres* of Berlin; in the *Memoires de la Société Oeconomique*, for 1766.

EULOGY, EULOGIA, [from *eul*, bene, and *eu*, dico, q. d. *benedictum*, blessed,] a bit of consecrated bread. When the Greeks cut a loaf of bread to consecrate it, they break the rest into little bits, and distribute them among those who have not yet communicated, or who are absent; and these pieces of bread they call eulogies. The Latin church has had something like eulogies for many ages; and thence arose the use of their holy bread. The name was likewise given to loaves or cakes brought to church by the superstitious to have them blessed. It passed hence to mere presents, without any benediction. See Gretser. de Benedict. and Maledict. lib. ii. cap. 22, &c.

EUMARIDES, [of *eumagis*, easy,] among the ancients, a kind of shoes common to men and women. The eumarides were used for pomp and delicacy, being neat, and painted with various colours.

EUMENES, a Greek officer in the army of Alexander, son of a charioteer. He was the most worthy of all the officers of Alexander. He conquered Paphlagonia, and Cappadocia, of which he obtained the government, till the power and jealousy of Antigonus obliged him to retire. He joined his forces to those of Perdiccas, defeated Craterus and Neoptolemus, and killed the latter. When Craterus was afterwards killed, his remains received an honourable funeral from Eumenes, who, after weeping over the ashes of a man who once was his dearest friend, sent his remains to his relations in Macedonia. Eumenes fought against Antipater and conquered him; but after the death of Perdiccas his ally, he was conquered by Antigonus, chiefly through the treachery of his officers. Antigonus ordered Eumenes to be put to death in the prison, B. C. 315. Eumenes raised himself to power by merit alone. His skill

in public exercises first recommended him to the notice of Philip; and under Alexander, his fidelity and military accomplishments, promoted him to the rank of a general. Even his enemies revered him; and Antigonus, by whose orders he perished, honoured his remains with a splendid funeral, and conveyed his ashes to his wife and family in Cappadocia. Eumenes had such influence over the successors of Alexander, that none during his lifetime dared to assume the title of king.

EUMENES, a historian in Alexander's army.

EUMENES I. king of Pergamus, succeeded his uncle Philetærus about B. C. 264. He made war against Antiochus the son of Seleucus, and enlarged his possessions by seizing upon many cities of the kings of Syria. He lived in alliance with the Romans, and made war against Prusias king of Bithynia.

EUMENES II. succeeded his father Attalus on the throne of Asia and Pergamus. His kingdom was small and poor, but he rendered it powerful and opulent; and his alliance with the Romans contributed to the increase of his dominions after the victories obtained over Antiochus the Great. He carried his arms against Prusias and Antigonus; and died B. C. 160, after reigning 40 years, leaving the kingdom to his son Attalus II.

EUMENIDES, a name given to the Furies by the ancients. See **FURIES**. It seems to have been given them in irony, as *ευμενεια*, instead of vengeance, signifies benevolence.

EUMENIDIA, festivals in honour of the Eumenides, or Furies, celebrated annually with sacrifices of pregnant ewes, with offerings of cakes made by the most eminent youths, and libations of honey and wine.

EUMOLPIDES, the priests of Ceres at the celebration of her festivals at Eleusis; the descendants of Eumolpus, king of Thrace.

EUMOLPUS, in fabulous history, a king of Thrace, son of Neptune and Chione. He was thrown into the sea by his mother, who wished to conceal her shame from her father. Neptune saved his life, and carried him into Æthiopia, where he was brought up by a woman, one of whose daughters he married. An act of violence to his sister-in-law obliged him to leave Æthiopia, and he fled to Thrace with his son Ismarus, where he married the daughter of Tegyrus the king of the country. This connection rendered him ambitious; he conspired against his father-in-law, and fled, when the conspiracy was discovered, to Attica, where he was initiated in the mysteries of Ceres of Eleusis, and made hierophantes or high priest. He was afterwards reconciled to Tegyrus, and inherited his kingdom. He perished in battle about B. C. 1380.

EUNOMIANS, in church history, Christian heretics in the fourth century. They were a branch of Arians, and took their name and creed from Eunomius bishop of Cyzicus.

EUNOMIUS, a famous heresiarch of the fourth century, the disciple of Aetius, but more subtle than his master, as well as more bold in propagating the opinions of his sect. He died very old, about A. D. 374.

EUNUCH, is formed from *ευνυχη*, q. d. *lecti curam habet*, guardian or keeper of the bed. In Britain, France, &c. eunuchs are never made but upon occasion of some disease, which renders such an operation necessary: but in Italy they make great numbers of children, from one to three years of age, eunuchs, every year, to supply the operas and theatres of all Europe with singers. M. De La Lande, in his Voyage d'Italie, asserts, that there are public shops at Naples where this cruel operation is performed, and that over the door of these shops is inscribed *Qui si castrano ragazzi*. Yet Dr. Burney informs us, that he was not only utterly unable to see or hear of any such shops during his residence in that city, but was told, both by the natives and English settled there, that the laws against such a practice were so numerous and severe, that it was never performed but with the utmost secrecy. In the eastern parts of the world, they make eunuchs to be guards on their women. The seraglio of the eastern emperors are chiefly served and guarded by eunuchs; and yet, from good authority, we learn, that the rich eunuchs in Persia and other countries, keep seraglios for their own use! There are several severe prohibitions in Germany against the making of eunuchs. In France, under its late government, an eunuch could not marry, not even with the consent of the woman. Though the practice of castration is detestable in every point of view, yet there appears no real foundation for the injurious opinion generally entertained of eunuchs, viz. that they are all cowards, and devoid of genius for literature or any solid study. "As to genius," (says Dr. Burney,) I never

found those of the first class in music deficient in intellectual abilities for more serious studies. Indeed I have seen real genius and disposition for literary pursuits, in more than one great opera singer; and as for composition, and the theory of music, not only the best singers of the Pope's chapel ever since the beginning of the last century, but the best composers, are among the sopranis, in that service." With respect to the operation affecting the mind so much as to deprive it of all fortitude in times of danger, there is great reason to doubt the fact: most of the generals of eastern monarchs having been at all times of this class; and the bravest stand that ever was made against Alexander the Great was at Gaza, under the command of one of Darius's generals, who was an eunuch. Ammianus Marcellinus gives an account of Menophilus, an eunuch, to whom Mithridates intrusted his daughter; which proves that such unfortunate persons possess a heroism equal to that of the most determined Stoic. It is certain, that the ancients never supposed eunuchs men of inferior intellects, or that they possessed less vigour of mind than other men. At least the Persians were not of this opinion; for Herodotus relates, (Lib. vi. 32,) that when they had taken some Ionian cities, *παιδας τε τας ευειδεστας εκλεγομενοι εξεταμον, και αποειν αυτις ειναι ενορχους ευνυχους*. Herodotus, in relating the melancholy story of Hermotimus, says, that *παρὰ τοις βαρβαροις τιμιωτεροι εισι οι ευνυχους, πιστις ειναι πασης, των ενορχων*, "among the barbarians, eunuchs, are more valued than other men, on account of their universal fidelity." (Lib. viii. p. 668.) It appears from this passage, that in Persia eunuchs so far from being objects of contempt, were often promoted to the highest honours.

EUNUCHS, in church history, a sect of heretics in the third century, who were mad enough to castrate, not only those of their own persuasion, but even all others they could lay hold of. They took their rise from the example of Origen, who, misunderstanding these words of our Saviour, "and eunuchs who made themselves eunuchs for the kingdom of heaven," castrated himself. Those who, out of similar imprudent zeal, made themselves eunuchs, were, by the council of Nice, condemned and excluded from holy orders.

EVOCATION, [*evocatio*, Lat.] among the ancient Romans, a religious ceremony always observed by them at the undertaking of a siege, wherein they solemnly called upon the gods and goddesses of the place to forsake it and come over to them. Without performing this ceremony, they either thought the place could not be taken, or that it would be a sacrilege to take the gods prisoners. They took it for granted that their prayer was heard, and that the gods had deserted the place and come over to them, provided they were able to make themselves masters of it.

EVOLI, an ancient town of Naples, in the province of Principato Citra, 15 miles E.S.E. of Salerno.

EVOLVENT, in the higher geometry, a term used by some for the involute, or curve resulting from the evolution of a curve, in contradistinction to that evolute, or curve supposed to be opened and evolved.

EVOLUTE, [from *e*, out of, and *volvo*, to roll,] in the higher geometry, a curve first proposed by M. Huygens, and since much studied by mathematicians. It is any curve supposed to be evolved, by having a thread wrapped close upon it, fastened at one end, and beginning to evolve or unwind the thread from the other end, keeping the part evolved or wound off tight stretched: then this end of the thread will describe another curve, called the involute. Such is the curve BCF, (Plate LIX. fig. 13.) for if a thread, FCM, be wrapped about, or applied to, the said curve, and then unwound again, the point M thereof will describe another curve, AMM, called by Mr. Huygens, a curve described from evolution. The part of the thread, MC, is called the radius of the evolute, or of the osculatory circle described on the centre C, with the radius MC. Hence, 1. when the point B falls in A, the radius of the evolute MC is equal to the arch BC; but if not, to AB and the arch BC. 2. The Radius of the evolute CM is perpendicular to the curve AM. 3. Because the radius MC of the evolute continually touches it, it is evident from its generation, that it may be described through innumerable points, if the tangents in the parts of the evolute are produced until they become equal to their corresponding arches. 4. The evolute of the common parabola is a parabola of the second kind, whose parameter is $\frac{2}{3}$ of the common one. 5. The evolute of a cycloid is another cycloid equal and similar to it. 6. All the arches of evolute

curves are rectifiable, if the radii of the evolute can be expressed geometrically. Those who desire a more particular account of these curves, may refer to sir Isaac Newton's and Mac-Laurin's Fluxions, also Rowe's, Simpson's, and Vince's Fluxions.

EVOLUTION. See ARITHMETIC and ALGEBRA.

EVOLUTION, in the art of war, the motion made by a body of troops, when they are obliged to change their form and disposition, in order to preserve a post, or occupy another, to attack an enemy with more advantage, or to be in a condition of defending themselves the better. See TACTICS and DOUBLING.

EVOLVULUS, a genus of the tetragynia order and pentandria class of plants; natural order Campanaceæ. Calyx pentaphyllous; corolla quinquefid, verticillated; capsule trilocular; seeds solitary. It has seven species, natives of the West or East Indies.

EVONYMUS, the SPINDLE TREE: a genus of the monogynia order, and pentandria class of plants; natural order Dumosæ. Corolla pentapetalous; capsule pentagonal, quinquelocular, quinquevalved, coloured; seeds hooded. There are eight species, trees, or shrubs, with the smaller branches four-cornered.

EUPAREA, a genus of the class and order pentandria monogynia. Calyx five-leaved; corolla, five or twelve-petaled; berry superior, one-celled; seeds many. One species, an herbaceous plant of New Holland.

EVORA, or **ELVORA**, a city of Portugal, capital of the province of Alentejo; fortified with twelve bastions, and two half-bastions. It is seated among mountains, 65 miles E. of Lisbon.

EVOUTS, an island in the South Sea, 15 miles S. of Terra del Fuego.

EUPATORGIA, a town of Russia, in Taurida, on the Black Sea, 68 miles S.W. of Perekop.

EUPATORIUM, or **EUPATORY**, **HEMP AGRIMONY**: a genus of the polygamia aqualis order, and syngenesia class of plants; natural order, Compositæ. Receptacle naked; pappus feathery; calyx imbricated, oblong; style semibifid, long. There are forty-nine species, many of them herbaceous flowery perennials, producing annual stalks from two to three or five feet high, terminated by clusters of compound flowers of a red, purple, or white, colour. They are chiefly propagated by seeds, or parting the roots in autumn or spring. One of them, viz.

E. CANNABINUM, or **WATER HEMP AGRIMONY**, is a native of Britain. It is found wild by the sides of rivers and ditches, and has pale red blossoms. It has an acrid smell, and a very bitter taste, with a considerable share of pungency. The leaves are much recommended for strengthening the tone of the viscera, and is an aperient; it is said to have excellent effects in the dropsy, jaundice, cachexies, and scorbutic disorders.

EUPATRIDÆ, in antiquity, a name given by Theseus to the nobility of Athens, as distinguished from Geomori and Demiurgi. The Eupatridæ, by Theseus's establishment, had the right of choosing magistrates, teaching and dispensing the laws, and interpreting religious mysteries.

EUPHEMIA, or **ST. EUPHEMIA**, an ancient sea-port of Naples, 50 miles N.E. of Reggio.

EUPHEMISM, [from *eu*, good, and *φημι*, to say,] a representation of good qualities, a figure in oratory, in which a harsh expression is changed for one less offensive.

EUPHONIA, or **EUPHONY**, [*euphonia*,] in grammar, an easiness, smoothness, and elegance, of pronunciation. The word is formed of *eu*, good, and *φωνη*, voice. Quintilian calls euphonia, "vocalitas;" Scaliger, "facilis pronuntiatio." Euphonia is properly a kind of figure whereby we suppress a too harsh letter, or convert it into a smoother. There are many examples in all language.

EUPHORBIA, **SPURGE**, a genus of the trigynia order, and dodecandria class of plants; natural order, Tricocceæ. Corolla four or five petaled, placed on the calyx; calyx one-leaved, bellying; capsule tricoceous. There are ninety-eight species. These are milky plants, mostly herbaceous, a few shrubby upright for the most part, very few of them creeping. The juice of most of the species is so acrid that it corrodes and ulcerates the body wherever it is applied; so that physicians have seldom ventured to prescribe it internally. Warts, or corns, anointed with the juice, presently disappear. A drop of it put into the hollow of an aching tooth, gives relief, like other corrosives, by destroying the nerve. Some people rub it behind the ears, that it may blister.

E. CAPENSIS, a native of the Cape of Good Hope, supplies the Hottentots with an ingredient for poisoning their arrows. Their method of making this poison is by first mixing the juice extracted from the euphorbia with the substance of a caterpillar peculiar to another plant. They point their arrows with this composition, which is supposed to be the most effectual poison of the whole country. The euphorbia itself is also used for this purpose, by throwing the branches into fountains of water frequented by wild beasts, which, after drinking the water thus poisoned, seldom get a thousand yards from the brink of the fountain before they fall down and expire. No animal escapes which drinks of such water, though the flesh is not injured by the poison.

E. ESULA, another of the foreign species, is such a violent corrosive, that, if applied to any part of the body, it produces a violent inflammation, which is soon succeeded by a swelling that degenerates into a gangrene, and generally proves mortal. See Plate LXV.

EUPHORBBIUM, a gum resin, obtained from the euphorbia officinalis, a native of Ethiopia, by making incisions in the plant. It is brought from Africa in the form of tears, is soluble in alcohol. It has no smell; after a time it communicates a burning taste to the tongue. It is regarded as poisonous.

EUPHRASIA, **EUPHRASY**, or **EYE-BRIGHT**: a genus of the angiospermia order, and didynamia class of plants; natural order, Personatæ. Calyx four-clelt, cylindric; capsule two-celled, ovate, oblong; lower anthers have a little thorn at the base of one of the lobes. There are nine species, two are natives of Britain.

EUPHRATES, a river which all ancient geographers agree rises in Armenia Major; but in what particular spot, or in what direction it afterwards shapes its course, they greatly differ. Modern geographers describe the Euphrates, as rising from two sources; the one about a day's journey, the other two day's journey from Erzerum. They both lie to the eastward, on high mountains, covered with snow almost all the year round. The plain of Erzerum is inclosed between two fine streams, which, when united, are called the Euphrates, or the Frat. It first divides Armenia from Natolia; then Syria from Diarbeck; after which it runs through Irac Arabia till it meets the Tigris. It is also the N. E. boundary of the great desert of Arabia.

EUPHRATES, a river of Africa, in the country of Whidah, on the Slave Coast.

EUPHROSINE, one of the three Graces.

EUPLÆA, a name of Venus.

EURE, a river of France, which rises in the forest of Logny, near Pointgoin, and falls into the Seine above Point d'Arche.

EURE, a department of France, so named from the river which crosses it; bounded on the N. by the dept. of the Lower Seine; on the E. by that of the Oise; on the S. by those of the Eure and Loire, and the Orne; and on the W. by that of Calvados. It includes part of the late province of Normandy. Evreux is the capital.

EURE, and **LOIRE**, a department of France. The rivers Eure and Loire run through it. It contains the late province of Beauce. Chartres is the capital.

EVREUX, an ancient town of France, in the department of Eure, and late province of Normandy, 25 miles S. of Rouen, and 55 N. W. of Paris.

EURIPIDES, a celebrated Greek poet, who excelled in tragedy, born about B. C. 468, in the isle of Salamis, on the day that Xerxes was defeated. He learned rhetoric under Prodicus, morality under Socrates, and natural philosophy under Anaxagoras; but at 18 years of age abandoned philosophy, for dramatic poetry. He used to shut himself up in a cave to compose his tragedies, which were extremely applauded by the Greeks. The Athenian army, commanded by Nicias, being defeated in Sicily, the soldiers purchased their lives and liberties by reciting the verses of Euripides. Euripides frequently intersperses through them moral sentences, and severe reflections on the fair sex; whence he was called the woman-hater. He was, nevertheless, married; but the scandalous lives of his two wives drew upon him the railery of Aristophanes, and other comic poets; which occasioned his retiring to the court of Archelaus, king of Macedon, where he was well received. That prince was fond of learned men, and drew them to him by his liberality. Solinus says, he made Euripides his minister of state, and gave him other extraordinary proofs of his



British Miles

600
300

EUROPE

Longitude as East from London.

Longitude as West from London.

his esteem. But a few years after, an unhappy accident put an end to his life. He was walking in a wood, in deep meditation; when, happening upon Archelaus's hounds, he was by them torn in pieces. It is not certain whether his death happened by chance, or through envy of some courtiers. Archelaus buried him with great magnificence; and the Athenians were so much afflicted at his death, that the whole city went into mourning. Of 92 tragedies which he composed, only 19 remain: the most valuable editions of which are those of Aldus, in 1503, 8vo; of Plantin, in 1570, 16mo; of Commelin, in 1597, 8vo; of Paul Stevens, in 1604, 4to; and of Joshua Barnes, in 1694, folio.

EURIPUS, now the **NEGROPONT**, a canal or strait which divides the island of Eubœa from the continent of Greece. In one place it is so narrow, that a galley can scarce pass through it. The agitations of the Euripus were much spoken of by the ancients. Some say that the canal has a flux and reflux six times in 24 hours; others, that it ebbs and flows seven times a-day: but Livy does not allow this flux and reflux to be so regular. Father Babin, a Jesuit of great learning, who made many observations on the spot during his long abode in the island of Negropont, tells us, that the Euripus is regular in its ebbing and flowing the first eight days of the moon: the same regularity he observed from the 14th to the 20th day inclusive, and in the three last days: but in the other days of the lunar month, it is not so regular; for it sometimes ebbs and flows 11, 12, 13, and 14, times in a natural day. In this place, it is said, Aristotle drowned himself out of chagrin, for not being able to account for so unusual a motion.

EURIPUS, has since become a general name for all straits, where the water is in great motion and agitation.

EURITHMY, [from *ευ*, easily, and *ρυθμος*, number, or order,] in architecture, sculpture, painting, &c. is a kind of majestic appearance, with the exact proportion between all the parts of any building, or picture.

EUROCLYDON, [of *ευρος*, the east wind, and *κλυδων*, a wave,] is a species of wind, of which we have an account only in Acts xxvii. 14, and concerning the nature of which critics have been much divided. Bochart, Grotius, Bentley, and others, substitute another reading, supported by the Alexandrian MS. and the Vulgate, viz. *Ευροκλυδων*, or Euro-aquilo; but Mr. Bryant defends the common reading, and considers the Euroclydon, *ἡ εὐροκλυδων*, as an E. wind that causes a deep sea or vast inundation. Dr. Bentley supposes that the mariners in the ship, the voyage of which is recited in this passage, were Romans; but Mr. Bryant maintains that they were Greeks of Alexandria, and that the ship was an Alexandrian ship employed in the traffic of carrying corn to Italy; and therefore, that the mariners had a name in their own language for the particular typhonic or stormy wind here mentioned. He also shews from the passage itself, that the tempestuous wind called Euroclydon, beat (*κατ' αὐτὴν*) upon the island of Crete; and therefore, as this is a relative expression, referring to the situation of the person who speaks of it, who was at that time to the windward or south of it, the wind blew upon shore, and must have come from the S. or S. E. which, he adds, is fully warranted by the point where the ship was, and the direction it ran in afterwards, which was towards the N. and N. W.

EUROPA, in fabulous history, a daughter of Agenor king of Phœnicia and Telephassa. Jupiter became enamoured of her, and to seduce her, assumed the shape of a bull, and mingled with the herds of Agenor, while Europa and her female attendants were gathering flowers. Europa caressed the beautiful animal; and at last had the courage to sit upon his back. The god retired towards the shore, crossed the sea, and carried Europa in safety to Crete; where, assuming his original shape, he declared his love. The nymph consented, and became mother of Minos, Sarpedon, and Rhadamanthus. After this she married Asterius, king of Crete, who adopted her sons. Some suppose that Europa lived about B. C. 1552.

EUROPE, one of the four general divisions of the world, called by the people of Asia, Frankistan, is bounded on the N. by the Frozen Ocean, on the W. by the Western Ocean, on the S. by the Mediterranean, which separates it from Africa; and on the E. by Asia. It is situated between Lon. 9. 35. W. and 72. 25. E. and between Lat. 35° and 72° N. Europe is about 3600 miles in length, from Cape St. Vincent in Portugal, to the Oby in Russia; and 2700 miles in breadth, from Cape Matapan, in the Morea, to the North Cape in Lapland. It is much less than Asia and Afri-

ca; but in many respects surpasses them both. Europe, excepting a small part of Lapland and Russia, is situated in the temperate zone; whence its inhabitants neither feel the extremities of heat, nor of cold. It cannot boast of rich mines of gold, silver, and precious stones; nor does it produce sugar or spices, nor elephants, camels, &c.; but it abounds with corn, wine, fruits, sheep, horses, black cattle, and all the necessaries of life. It is much more populous, and better cultivated than Asia, Africa, or America; it is more full of cities, towns, and villages, great and small, and its buildings are more solid and commodious. Europe may be divided into 11 great parts, including their dependencies: 1. Sweden; 2. Denmark and Norway; 3. Russia; 4. Germany; 5. Batavia, or Holland; 6. France; 7. Switzerland; 8. Spain; 9. Italy; 10. Turkey; and 11. the Islands. The greatest cities are, London, Paris, Amsterdam, Constantinople, Moscow, and Rome. The principal islands are Great Britain, Ireland, the Hebrides, the Orkneys, Iceland, the Ferro isles, Sicily, Sardinia, Corsica, Candy, Majorca, Minorca, Funen, Rugen, Bornholm, Oesel, Gothland, Zealand, &c. The languages are the Italian, French, Spanish, and Portuguese, which are the dialects of the Latin; the German, Flemish, Dutch, Swedish, Danish, and English, which proceed from the Teutonic; the Slavonian, which reigns (though in disguise) in Poland, Russia, Bohemia, and a great part of Turkey in Europe; the Celtic, of which there are dialects in Wales, the Highlands of Scotland, Ireland, Bretagne in France, and Lapland; the modern Greek, and several others. The population of Europe is estimated at 150 millions; but it is doubtless capable of supporting a much greater number. There are five principal religions in Europe, viz. the Mohammedan, in Turkey; the Greek, in many parts of Turkey, in all Muscovy, and in several parts of Polish Russia; the Roman Catholic in Spain, Portugal, and Italy; and the Protestant, in its two chief divisions of Lutheran and Calvinist, but with considerable differences, in Great Britain, Denmark, Sweden, and Norway. There is a mixture of Catholics and Protestants in Ireland, Switzerland, Germany, Poland, Hungary, and Belgium; besides many Jews, and some Pagans in Lapland and the northern parts of Muscovy. The chief rivers are the Danube, Dniester, Dnieper, Vistula, Volga, Dwina, Bog, Oby, Don, Scheldt, Rhine, Rhone, Seine, Loire, Garonne, Forth, Tweed, Tajo, Thames, Tay, Tiber, Shannon, and Severn. The principal lakes are those of Constance, Geneva, Lausanne, Wener, Ladoga, and Onega. The chief mountains are the Alps, Appennines, and Pyrenees. See the above countries, towns, &c. in their order.

EUROPEANS, the inhabitants of Europe. They are all white, and incomparably more handsome than the Africans, and even than most of the Asiatics. The Europeans surpass both in arts and sciences, especially in those called liberal; in trade, navigation, and in military and civil affairs; being, at the same time, more prudent, more valiant, more generous, more polite, and more sociable than they.

EURYA, in botany, a genus of the dodecandria monogynia class and order. Calyx five-leaved, calyced; corolla five-petaled; stamina thirteen; capsule five-celled. One species, viz. *E. japonica*, a native of Japan.

EURYANDRA, in botany, a genus of the polyandria trigynia class and order; natural order, Coadunata. Calyx five-leaved; corolla three-petaled; filament much dilated at the tip, with twin disjoined anthers; follicles three. One species, viz. *E. scandens*, a native of new Caledonia.

EURYDICE, in fabulous history, the wife of Orpheus, who, flying from Aristæus that endeavoured to ravish her, was slain by a serpent.

EURYSTHEUS, in fabulous history, king of Argos and Mycenæ, son of Amphitryon, or, according to others, of Sthenelus and Nicippe, the daughter of Pelops. Juno hastened his birth by two months, that he might come into the world before Hercules the son of Alcmena, as the younger of the two was doomed by Jupiter to be subservient to the will of the other.

EURYTHMY, [*ευρυθμία*,] in architecture, painting, and sculpture, is a certain majesty, elegance, and easiness, appearing in the composition of divers members, or parts of a body, painting or sculpture, and resulting from the fine proportion of it.

EUSEBIUS, surnamed **PAMPHILUS**, one of the most learned men of his time, born in Palestine in the reign of Gallienus. He was the intimate friend of Pamphilus the martyr; and after his death took his name. He was ordained bishop of Cæsarea in

313. He had a considerable share in the contest relating to Arius; whose cause he and several other bishops defended, being persuaded that Arius had been unjustly persecuted by Alexander, bishop of Alexandria. He assisted at the council of Nice in 325; when he made a speech to the emperor Constantine on his coming to the council, and was placed next him on his right hand. He was present at the council of Antioch, in which Eustathius, bishop of that city, was deposed; but though he was chosen by the bishop and people of Antioch to succeed him, he refused it. In 335 he assisted at the council of Tyre held against Athanasius; and at the assembly of bishops at Jerusalem, at the dedication of the church there. By these bishops he was sent to the emperor Constantine to defend what they had done against Athanasius; when he pronounced the panegyric on that emperor, during the public rejoicings, in the thirtieth year of his reign. Eusebius died in 338. He wrote, 1. An Ecclesiastical History, of which Valesius has given a good edition in Greek and Latin; but the best is the Cambridge edition, 3 vols. folio, 1720. 2. The Life of Constantine: 3. A Treatise against Hierocles: 4. Chronicon: 5. Preparationes Evangelicæ: 6. Demonstratio Evangelica, an invaluable work: the best edition yet published is that of Franc. Vigero. Greek and Latin, Rothomag, 1628.

EUSTACHIAN TUBE, in anatomy, begins from the interior extremity of the tympanum, and runs forward and inwards in a bony canal, which terminates with a portion of the temporal bone. See ANATOMY.

EUSTATHIANS, a name given to the Catholics of Antioch in the 4th century, on occasion of their refusal to acknowledge any other bishop beside St. Eustathius, deposed by the Arians. This denomination was given them during the episcopate of Paulinus, whom the Arians substituted to St. Eustathius, about A. D. 330, when they began to hold their assemblies apart.

EUSTATHIANS, a sect of heretics in the 4th century, denominated from their founder Eustathius, a monk so foolishly fond of his own profession, that he condemned all other conditions of life. Whether this Eustathius was the same with the bishop of Sebastia and chief of the Semiarisians, is not certain.

EUSTATHIUS, a monk of the 4th century, who excluded married people from salvation; prohibited his followers from praying in their houses; and obliged them to quit all they had as incompatible with the hopes of heaven.

EUSTATHIUS, Archbishop of Thessalonica, in the 12th century, under the emperors Emanuel, Alexander, and Andronicus Comnenus. He was an eminent grammarian: and wrote commentaries upon Homer, and Dionysius the geographer. The best edition of his commentaries on Homer is that of Rome, printed in Greek, in 1542, in 4 vols. folio. His commentaries on the Periegesis of Dionysius were printed by Mr. Hudson at Oxford, in 1697, 8vo. He was alive in 1194.

EUSTATIA, or **EUSTATIUS**, Sr. one of the Caribbee islands, belonging till very lately to the Dutch. It is little else than a huge mountain, which formerly has, in all probability, been a volcano.

EUSTATIUS ST. or EUSTATIA TOWN, the capital of the above island. Lon. 63. 5. W. Lat. 17. 29. N.

EUSTEPHIA, in botany, a genus of the hexandria monogynia class and order. Corolla superior, tubular, cylindrical, bifid; nectary six cavities in the tube of the corolla; filaments, tricuspidate, distinct. It has one species, viz. the coccinea.

EUSTYLE, [from *ευσταλός*, of *eu*, proper, and, *σταλός*, a column,] in architecture, is a sort of building in which the pillars are placed at the most convenient distance one from the other.

EUTHYMIA, [from *eu*, good, and *θυμος*, the mind,] such a state of the mind, as could not be ruffled either by good or bad fortune, by sickness or health, good or evil.

EUTYCHES, an archimandrite or abbot of a monastery at Constantinople, who began to propagate his opinion against the two natures in Christ, A. D. 448. He did not, however, seem quite consistent in his sentiments: for he allowed of two natures before the union; he believed that the soul of Jesus Christ had been united to the divinity before the incarnation; but he allowed no distinction of natures in Jesus Christ since his incarnation; alleging that the Divine Nature had swallowed up the human.

EUTYCHIANS, ancient heretics, who denied the two natures in Christ; thus denominated from Eutyches.

EUTYCHIANS, another sect, half Arian; half Eunomian; which arose at Constantinople in the 4th century.

EUTYCHIUS, the founder of the last mentioned sect, with one Theopronius, were the movers of all the changes made by the Eunomians in the administration of baptism; which consisted, according to Nicephorus, in only using one immersion, and not doing it in the name of the Trinity, but in memory of the death of Jesus Christ.

EUXINE, or **BLACK SEA**, forms part of the boundary betwixt Europe and Asia. It receives the Dnieper, the Danube, and other large rivers; and extends from 28° to 41° Lon. E. and from 40° to 46° Lat. N. The ancients imagined this sea to have been originally only a lake, which broke first in the Propontis, and then into the Aegean, washing away by degrees the earth which first kept it within bounds, and formed the two channels of the Bosphorus Thracius and Hellespont, now the Dardanelles.

EWEL, a town of Surrey, 10 miles N. E. by N. of Dorking, and 13 S. E. by E. of London.

EWRY, an office in the king's household, where they take care of the linen for the king's table, lay the cloth and serve up water in silver ewers after dinner.

EX, a Latin preposition often prefixed to compounded words; sometimes meaning *out*, as exhaust, to draw out; sometimes only enforcing the meaning, and sometimes producing little alteration.

EX OFFICIO, among lawyers, signifies the power a person has, by virtue of his office, to do certain acts without being applied to.

EX POST FACTO, in law, something done after another; thus an estate granted may be good by matter *ex post facto*, that was not so at first, as in case of election.

EX, in geography, a river of Somersetshire, which rises in a barren tract of land, called Exmoor; runs by Tiverton, washes the walls of Exeter; and falls into the English channel at Exmouth, after a course of about 40 miles.

EXACTION, in law, a wrong done by an officer, or a person in pretended authority, in taking a reward or fee that is not allowed by law. A person guilty of exaction may be fined and imprisoned.

EXACUM, a genus of the monogynia order, and tetrandria class of plants; natural order, Rotaceæ. Calyx four-leaved; corolla salver-shaped, with an inflated tube; capsule two-furrowed, two-celled, many-seeded, bursting at the top. There are ten species.

EXÆRESIS, in surgery, the operation of extracting, or taking away, something that is hurtful to the human body.

EXAGGERATION, in rhetoric, a kind of hyperbole, whereby things are augmented or amplified, by saying more than the truth, either as to good or bad. There are two kinds of exaggeration; the one of things, the other of words. The first is produced, 1. By a multitude of definitions. 2. By a multitude of adjuncts. 3. By a detail of causes and effects. 4. By an enumeration of consequences. 5. By comparisons. And 6. By the contrast of epithets and rational inference. Exaggeration by words is effected, 1. By using metaphors. 2. By hyperboles. 3. By synonymous terms. 4. By a collection of splendid and magnificent expressions. 5. By periphrasis. 6. By repetition. And, lastly, by confirmation with an oath: as for example, "Parietes, medius fidius, gratias tibi agere gestiunt."

EXAGGERATION, in painting, a method by which the artist, in representing things, charges them too much, or makes them too strong, either in respect of the design or colouring. It differs from caricature, in that the latter perverts or gives a turn to the features of a face, &c. which they had not; whereas exaggeration only heightens or improves what they had.

EXALTATION, in astrology, is a dignity which it is pretended a planet acquires in certain signs or parts of the zodiac, which dignity is supposed to give it an extraordinary efficacy and influence. Thus the 15° of cancer is the exaltation of Jupiter.

EXALTATION, in chemistry, signifies an operation by which a substance has its properties changed, and raised to a higher degree of efficacy or virtue.

EXALTATION OF THE CROSS, a feast of the Latin church, held on the 14th September in memory of the emperor Heraclius having brought back the true cross of Jesus Christ on his shoulders,

ders, to the place on mount Calvary, from which it had been carried away 14 years before by Cosroes king of Persia, when he took Jerusalem, in the reign of Phocas.

EXAMINATION, in devotion. See **SELF-EXAMINATION**.

EXAMINATION. Justices before whom any person shall be brought for manslaughter or for felony, or for suspicion thereof, before they commit such prisoner, shall take his examination, and information of those who bring him, of the fact and circumstances; and as much thereof as shall be material to prove the felony, shall be put in writing within two days after the examination; and the same shall certify in such manner as they should do if such prisoner had been bailed, upon such pain as in the act 1 and 2 P. and M. c. 13, is limited.

EXAMINERS, in chancery, two officers of that court, who examine, upon oath, witnesses in causes depending there, where the witnesses live in London or near it. In the country, above 20 miles from London, on the parties joining in commission, witnesses are examined by commissioners, who are usually counselors or attorneys not concerned in the cause.

EXAMPLE, in a moral sense, is either taken for a precedent, for our admonition, that we may be cautioned against the faults or crimes which others have committed; or, for a pattern for our imitation. In the latter sense, the example of our Saviour is most proper to form us to holiness. There is no example of a mere man that is to be followed without limitation; but the example of Christ is absolutely perfect; his conversation was a living law.

EXAMPLE, in rhetoric, denotes an imperfect kind of argumentation; whereby it is pleaded, that a thing which happened on some former occasion will happen again on the present one; from the similitude of the cases.

EXANTHEMA, [*εξανθημα*], among physicians, denotes any kind of efflorescence or eruption, as the measles, purple spots in the plague, or malignant fevers, &c. According to Dr. Cullen it is an order in the class pyrexia, and includes all contagious diseases, beginning with fever, and followed by an eruption on the skin.

EXARCH, [*Εξαρχος*], an appellation given, by the eastern emperors to certain officers sent into Italy, in quality of vicars or prefects, to defend that part of Italy, which was yet under their obedience; particularly the city of Ravenna against the Lombards, who had made themselves masters of the greatest part of the rest.

EXARCH, in the eastern church antiquity, a superior over several monasteries; the same that we otherwise call Archimandrite; being exempted, by the patriarch of Constantinople, from the jurisdiction of the bishops.

EXARCH also denotes an officer, still subsisting in the Greek church; being a kind of deputy or legate a latere of the patriarch, whose office it is to visit the provinces allotted him, to inform himself of the lives of the clergy; take cognizance of ecclesiastical causes; the manner of celebrating divine service; the sacraments, particularly confession; the observance of the canons; monastic discipline; affairs of marriages, divorces, &c.

EXARCHUS, a title given by Homer, Philo, and other ancient authors, to the choragus or master of the singers, in the ancient choruses, or him who sung first: the word *αρχων*, or *αρχομαι*, signifying equally to begin, and to command.

EXAUCTORATIO, in the ancient Roman military discipline, differed from the Missio, which was a full discharge, and took place after they had served in the army 20 years; whereas the exauكتورatio was only a partial discharge, which was granted after seventeen years service.

EXCALCEATION, among the Hebrews, a law, whereby a widow, whom her husband's brother refused to marry, had a right to summon him to a court of justice; and, upon his refusal, might excalceate him, i. e. pull off one of his shoes, and spit in his face, by way of ignominy.

EXCELLENCY, a title anciently given to kings and emperors, but now to ambassadors, and other persons, who are not qualified for that of highness, and yet are to be elevated above the other inferior dignities. In England and France the title is now peculiar to ambassadors, but very common in Germany and Italy. Those it was first appropriated to, were the princes of the blood of the several royal houses; but they quitted it for that of highness, upon several great lords assuming excellency.

EXCENTRIC, or **EXCENTRICAL**, [from *εξ*, ex, *κεντρον*, centrum, the centre,] deviating from a centre.

EXCENTRIC ANOMALY, in astronomy, or Anomaly of the Centre, is an arc AQ of the excentric circle, intercepted between the aphelion A, and the right line QH, drawn through the centre P of the planet perpendicular to the line of the apsis AB. See Plate LIX. fig. 14.

EXCENTRIC CIRCLE, or **EXCENTRIC**, in the ancient Ptolemaic astronomy, was the very orbit of the planet itself, which it was supposed to describe about the earth, and to be excentric with it; called also the deferent.

EXCENTRIC CIRCLE, in the new astronomy, is the circle described from the centre of the orbit of a planet, with half the greatest axis as a radius; or the circle that circumscribes the elliptic orbit of the planet; as the circle AQB. Plate LIX. fig. 14.

EXCENTRIC EQUATION, in the old astronomy, is an angle made by a line drawn from the centre of the earth, with another line drawn from the centre of the excentric, to the body or place of any planet. This is the same with the prosthapheresis; and is equal to the difference, accounted in an arch of the ecliptic, between the real and apparent place of the sun or planet.

EXCENTRIC PLACE OF A PLANET, IN ITS ORBIT, is the heliocentric place, or that in which it appears as seen from the sun.

EXCENTRIC PLACE OF A PLANET, IN THE ECLIPTIC, is the point of the ecliptic to which the planet is referred as viewed from the sun; and which coincides with the heliocentric longitude.

EXCENTRICITY, in the ancient astronomy, is the distance between the centre of a planet and the centre of the earth. That the planets have such an excentricity, is allowed on all sides, and may be evinced from various circumstances; and especially this, that they sometimes appear larger and at others less; which can only proceed from hence, that their orbits being excentric to the earth, in some parts of those orbits the planets are nearer to us, and in others more remote. The excentricities of the sun and moon are sufficiently proved, both from eclipses, from the moon's greater and less parallax at the same distance from the zenith, and from the sun's continuing longer by eight days in the northern hemisphere than in the southern one. See **ASTRONOMY**.

EXCENTRICITY, in the new astronomy, is the distance CS, Plate LIX. fig. 14, between the sun S and the centre C of a planet's orbit; or the distance of the centre from the focus of the elliptic orbit; called also the simple or single excentricity. When the greatest equation of the centre is given, the excentricity of the earth's orbit may be found by the following proportion; viz. As the diameter of a circle in degrees, is to the diameter in equal parts; so is the greatest equation of the centre in degrees, to the excentricity in equal parts. Or, since it is found that the sun's greatest apparent semi-diameter is to his least, as $32' 43''$ to $31' 38''$, or as $1963''$ to $1898''$; the sun's greatest distance from the earth will be to his least, or AS to SB, as 1963 to 1898 ; of which the half dif. is $32\frac{1}{2} = CS$, and half sum $1930\frac{1}{2} = CB$; wherefore, as $1930\frac{1}{2} : 32\frac{1}{2} :: 1 : .016335 = CS$ the excentricity to the mean distance or semi-axis 1; which is nearly the same as before. See **ASTRONOMY**.

EXCENTRICITY, DOUBLE, is the distance between the two foci of the elliptic orbit, and is equal to double the single excentricity above given.

EXCEPTION, in law, denotes a stop or stay to an action; and is either dilatory or peremptory, in proceedings at common law; but in chancery it is what the plaintiff alleges against the sufficiency of an answer, &c. An exception is the denial of what is taken to be good by the other party, either in point of law or pleading. The counsel in a cause are to take all their exceptions to the record at one time, and before the court has delivered any opinion on it.

EXCEPTION TO EVIDENCE, is where a demurrer is offered in any civil cause, for the insufficiency of the evidence given, and the court does not agree to it; in such case, the court, upon request, is to seal a bill of exceptions to the evidence, which may be heard on a writ of error. A plaintiff or defendant may also allege any exception to the judge's opinion, praying the same to be allowed; and if the judge refuse it, then the party concerned is to write it down, and, when signed by counsel, require the judge to seal the same, to be heard afterwards.

EXCEPTIONS

EXCEPTIONS IN DEEDS AND WRITINGS, is the saving of a particular thing out of a general one granted by deed, as a room, shop, or cellar out of a house; a field, or timber trees, out of land, &c.

EXCESS, in arithmetic and geometry, is the difference between any two unequal numbers or quantities, or that which is left after the less is taken from or out of the greater.

EXCHANGE, in architecture, a place in most trading cities, wherein the merchants, negociants, agents, bankers, brokers, interpreters, and other persons concerned in commerce, meet on certain days, and at certain hours, to confer together of matters relating to exchanges, remittances, payments, adventures, assurances, freightments, and other mercantile negotiations, both by sea and land. In Holland, the late Flanders, and several cities of France, these places are called burses; at Paris and Lyons, places de change; and in the Hanse Towns, colleges of merchants. These assemblies are held with so much exactness, and merchants and negotiants are so indispensably required to attend at them, that absence alone makes a man suspected of bankruptcy. The most considerable exchanges in Europe, are that of Amsterdam, and that of London, called the Royal Exchange. Even in the time of the ancient Romans, there were places for the merchants to meet, in most of the considerable cities of the empire.

EXCHANGE, in arithmetic. See **ARITHMETIC**. The operations are only different applications of the Rule of Three, or of Practice; to perform which, it is necessary to know the value of the coins and monies of account of different countries, and their proportions to each other; for which see the various tables under the articles **MONEY** and **COINS**.

EXCHANGE, in ancient commerce, an agreement, whereby one thing was trucked or given for another. The first commerce carried on among men was by exchange; people furnished each other mutually with what things they wanted; but such exchanges were clogged with two considerable difficulties. 1. On account of the unequal value of commodities; and, 2. Because every body had not just what might accommodate the person with whom he would exchange. To remove these inconveniencies, money was invented for a common medium; and instead of exchanging, buying and selling were introduced. There are some nations among whom the primitive way of exchange still obtains; and even the most civilized people must sometimes have recourse to this method. Such, e. g. is the trade of several cities of the North and Baltic Sea, where the French exchange their wines and brandies for wood, metals, hemp, and furs.

EXCHANGE, in modern commerce, is the receiving or paying of money in one country for the like sum in another, by bills of exchange. See **BILL**. The punctuality of acquitting these obligations is essential to commerce; and no sooner is a merchant's accepted bill protested, than he is considered as a bankrupt. For this reason, the laws of most nations have given very extraordinary privileges to bills of exchange. Were the claims of merchants to linger under the formalities of courts of law when liquidated by bills of exchange, faith, confidence, and punctuality, would quickly disappear, and the great engine of commerce would be totally destroyed. A regular bill of exchange is a mercantile contract, in which four persons are concerned, viz. 1. The drawer, who receives the value. 2. His debtor, in a distant place, upon whom the bill is drawn, and who must accept and pay it. 3. The person who gives value for the bill, to whose order it is to be paid: and, 4. The person to whom it is ordered to be paid, creditor to the third. By this operation, reciprocal and equal debts, due in two distant parts, are paid by a sort of transfer of debtors and creditors. Thus A in London is creditor to B in Paris, value 100*l*. C again in London is debtor to D in Paris for a like sum. By the operation of the bill of exchange, the London creditor is paid by the London debtor; and the Paris creditor is paid by the Paris debtor; consequently, the two debts are paid, and no money is sent from London to Paris nor from Paris to London. In this example, A is the drawer, B is the acceptor, C is the purchaser of the bill, and D receives the money. Two persons here receive the money, A and D; and two pay the money, B and C; which is just what must be done when two debtors and two creditors clear accounts. This is the plain principle of a bill of exchange; which, among other advantages, prevents all risk of loss by shipwreck, robbery, &c. which might hap-

pen from remitting payment in coin. But when the reciprocal debts are not equal, there arises a balance on one side. Suppose London to owe Paris a balance, value 100*l*. An exchanger, finding a demand for a bill upon Paris for 100*l*. when Paris owes no more to London, sends 100*l*. to his correspondent at Paris in coin, at the expence (suppose) of 1*l*.; and then, having become creditor on Paris, he can give a bill for the value of 100*l*. upon his being repaid his expence, and paid for his risk and trouble. When merchants have occasion to draw and remit bills for the liquidation of their own debts, active and passive, in distant parts, they meet upon 'Change; where, (to continue the example,) the creditors upon Paris, when they want money for bills, look out for those who are debtors to it. The debtors to Paris again, when they want bills for money, seek for those who are creditors upon it. This market is constantly attended by brokers, who relieve the merchant of the trouble of searching for those he wants. To the broker every one communicates his wants, so far as he finds it prudent; and by going about among all the merchants, the broker discovers the side upon which the greater demand lies, for money or for bills. This renders secrecy very essential to individuals among the merchants. If the London merchants want to pay their debts to Paris, when there is a balance against London, it is their interest to conceal their debts, and especially the necessity they may be under to pay them: lest those who are creditors upon Paris should demand too high a price for the exchange above par. On the other hand, those who are creditors upon Paris, when Paris owes a balance to London, are as careful in concealing what is owing to them by Paris, lest those who are debtors to Paris should avail themselves of the competition among the Paris creditors, to obtain bills for their money, below their value at par. A creditor upon Paris, who is pressed for money at London, will abate something of his debt, in order to get money for it. Thus the merchants upon 'Change, from their separate and jarring interests, are constantly interested in the state of balance. Those who are creditors upon Paris, fear the balance due to London; those who are debtors to Paris, dread a balance due to Paris. The brokers determine the course of the day; and the most intelligent merchants dispatch their business before the fact is generally known. In this complicated operation, the interest of trade and of the nation is concerned in the proper method of paying and receiving the balances, and in preserving a just equality of profit and loss among all the merchants, relative to the real state of the balance. Unequal competition among men engaged in the same pursuit, consequently draws along with it bad consequences to the general undertaking; and secrecy in trade will be found more useful to merchants in their private capacity, than to the trade they are carrying on. This operation of exchange is of such a nature, that it is hardly possible for a merchant to carry on the business of these bills, without the assistance of the brokers upon many occasions. When merchants come upon 'Change, they are so full of jealousies, that they will not open their minds to one another. The broker is a confidential man between parties, and brings them together. Besides the merchants who circulate among themselves their reciprocal debts and credits arising from their importation and exportation of goods, there is another set of merchants who deal in exchange; by the importation and exportation of money and bills. Were there never any balance on the trade of nations, exchangers and brokers would find little employment: reciprocal and equal debts would easily be transacted openly between the parties themselves. But when balances come to be paid, exchange becomes intricate; and merchants are so much employed in particular branches of business, that they are obliged to leave the liquidation of their debts to a set of men, who make it turn out to the best advantage to themselves. Whenever a balance is to be paid, that payment costs an additional expence to those of the place who owe it, over and above the value of the debt. If, therefore, this expence be a loss to the trading man, he must either be repaid this loss by those whom he serves, that is, by the nation; or the trade he carries on will become less profitable. It is therefore plain, that the expence of high exchange upon paying a balance is a loss to a people, not to be compensated by enriching the few individuals among them who gain by contriving methods to pay it off. Whatever renders the profit upon trade precarious or uncertain, is a loss to trade in general.

EXCHANGE is sometimes also used for the agio, or profit allowed

lowed for the monies, advanced in any one's behalf. Thus it is a fixing of the actual and momentary value of money. Silver as a metal has a value like all other merchandise; and an additional value, as it is capable of becoming the sign of other merchandise. If it was no more than a mere merchandise, it would perhaps lose much of its nominal value. As a money, silver has a value which the prince in some respects can fix, but in others he cannot. The prince establishes a proportion between a quantity of silver, as a metal, and the same quantity, as money. He fixes the proportion between the several metals made use of as money; he establishes the weight and standard of every piece of money; in fine, he gives to every piece that ideal value already mentioned. The value of money in all these respects, may be stiled its positive value, because it may be fixed by law. The coin of every state has also a relative value as compared with the money of other countries. This relative value is established by the exchange, and greatly depends on its positive value. It is fixed by the current course of commerce, and by the general opinion and consent of merchants, but never by the decrees of the prince, because it is liable to incessant variations, depending upon the accidental circumstances of trade, the money transactions between nations, the state of the public credit, &c. Nations in fixing this relative value are chiefly guided by that country which possesses the greatest quantity of specie. If she has as much specie as all the others together, the others regulate theirs by her standard; and this regulation between all the others will nearly agree with the regulation made with this principal nation. The relative abundance or scarcity of specie, in different countries, forms what is called the course of exchange, and this plenty or scarcity, on which the mutability of the course of exchange depends, is not real but relative: *e. g.* when the French have greater occasion for funds in Holland than the Dutch have for funds in France, specie is said to be common in France, and scarce in Holland; and vice versa. For performing the cases of exchange with different countries, see ARITHMETIC.

EXCHANGE, ARBITRATION OF. See ARITHMETIC.

EXCHANGE, COURSE OF. See ARITHMETIC. When the course of exchange rises above par, the country where it rises may be certain, that the balance of trade runs against them. Suppose Britain to import from Hamburg goods to the value of 100,000*l.* at par, and export only to the value of 80,000*l.* In this case, bills on Hamburg, will be scarce in Britain, and consequently will rise in value; and after the 80,000*l.* is paid, bills must be procured from other places at a high rate to pay the remainder, so that perhaps 120,000*l.* may be paid for bills to discharge a debt of 100,000*l.* Though the course of exchange be in a perpetual flux, and rises or falls according to the circumstances of trade; yet the exchanges of London, Holland, Hamburg, and Venice, have hitherto in a great measure regulated those of all other places in Europe.

EXCHANGE, DRY, CAMBIUM SICCU, or USURER'S EXCHANGE, consists in giving money at one place, to be repaid it after a certain time in the same place, with a certain sum over, which is usually more than common interest. The ceremony of a real exchange is observed in this fictitious kind, which is only a method of borrowing money. The borrower draws a bill of exchange on an imaginary person, perhaps at Amsterdam, at the price the exchange then goes at, and delivers it to the lender. After the time fixed, a protest comes from Amsterdam for non-payment, with the re-exchange of the money from thence to London; all which, with costs, besides a deduction perhaps at the making of the bargain, the borrower must pay.

EXCHANGE, PAR OF. See ARITHMETIC. When money of the same standard and weight in one country, yields money of the same standard and weight in another, the exchange is then said to be at par. Thus in the year 1744, the par between France and Holland was nearly at 54 gros to the French crown of three livres; when the exchange is above 54 gros, the French say it is high; when below 54 gros, it is low. When the exchange is below par between one country and another, the former loses as debtor and buyer, and gains as creditor and seller. Thus if France owes Holland a certain number of gros, the more of these there are in a crown, the more crowns she has to pay; and as there must be the same number of gros to buy the same quantity of merchandise, while the exchange is low, every French crown is worth fewer gros. On the contrary, if France is creditor for a certain number

of gros, the less of them there are in a crown, the more crowns she will receive; and if France sells her merchandise in Holland for a certain number of gros, the more crowns will she receive, in proportion as each crown contains fewer of these gros. The same reasoning will apply, mutatis mutandis, to the commercial intercourse of other countries, and to any par of exchange. A merchant may send his stock into a foreign country, when the exchange is below par, without injuring his fortune; because, when it returns, he recovers what he had lost; but a prince, who sends only specie into a foreign country, which can never return, is always a loser. The par of exchange between Great Britain and the principal places in Europe, with which, in time of peace, we have any commercial intercourse, is as follows:

PAR, IN STERLING		L. s. d.	
Amsterdam	1 rixdollar	=	0 4 6½
Antwerp	1 ducat	=	0 9 3
Augsburgh	1 florin	=	0 3 1½
Berlin	1 rixdollar	=	0 4 0
Bilboa	1 piastre	=	0 3 7
Bologna	1 dollar	=	0 4 3
Bolsenna	1 rixdollar	=	0 3 8
Bremen	1 ditto	=	0 3 6
Breslau	1 ditto	=	0 3 3
Brunswick	1 ditto	=	0 4 6
Cadiz	1 piastre	=	0 3 7
Cologn	1 rixdollar	=	0 4 6
Cracow	1 ditto	=	0 4 6
Dantzic	13½ florins	=	1 0 0
Denmark	1 rixdollar	=	0 4 6
Dresden	1 ditto	=	0 4 6
Embsen	1 ditto	=	0 3 6
Florence	1 crown	=	0 5 4½
Frankfort	1 florin	=	0 3 0
Genoa	1 pezzo	=	0 4 6
Hamburgh	1 ducat	=	0 9 4½
Leghorn	1 piastre	=	0 4 6
Leipsic	1 rixdollar	=	0 4 6
Liege	1 ditto	=	0 4 6
Lisbon	1 milree	=	0 5 7½
Lyons	1 crown	=	0 2 5½
Madrid	1 piastre	=	0 3 7
Malaga	1 ditto	=	0 3 7
Middleburg	1 rixdollar	=	0 4 6½
Milan	1 ducat	=	0 4 7
Naples	1 ditto	=	0 3 4½
Narva	1 rixdollar	=	0 4 6
Norway	1 ditto	=	0 4 6
Nuremberg	1 ditto	=	0 4 6
Oporto	1 milree	=	0 5 7½
Osnaburgh	1 rixdollar	=	0 4 6
Paris	1 crown	=	0 2 5½
Revel	1 rixdollar	=	0 4 6
Riga	1 ditto	=	0 4 6
Rome	1 crown	=	0 6 1½
Rotterdam	1 rixdollar	=	0 4 6½
Rouen	1 crown	=	0 2 5½
Russia	1 ruble	=	0 4 5
Seville	1 piastre	=	0 3 7
Sicily	1 crown	=	0 5 0
Stetten	1 mark	=	0 1 6
Stockholm	34½ dollars	=	1 0
Strasburg	1 rixdollar	=	0 4 6
Switzerland	1 ditto	=	0 4 6
Turkey	1 asper	=	0 4 6
Venice	1 ducat	=	0 4 2½
Vienna	1 rixdollar	=	0 4 8

EXCHANGE, REAL, is used for the profit which a merchant, negotiant, or broker, makes of a sum of money received, and for which a bill of exchange is drawn, payable in some other place, and by some other person, for the interest of his money, and the reward of his negotiation. This profit is exceedingly various; being sometimes two, sometimes three, four, or even ten and fifteen per cent, according as the alloy of the species differs, or as money

money is more or less plentiful, or bills of exchange more or less scarce, in the places. This kind is sometimes called mercantile or mixed exchange.

EXCHANGE, SMALL, is used to denote the profit allowed for exchanging one species of money for another. This is also called natural or pure exchange, &c.

EXCHANGE WITH AMERICA, FRANCE, GERMANY, HOLLAND, &c. See **ARITHMETIC**.

EXCHEQUER, in the British jurisprudence, an ancient court of record, in which all causes concerning the revenues and rights of the crown are heard and determined. It took this name from the cloth that covered the table of the court, which was party-coloured, or chequered. It is said to have been erected by William the Conqueror, its model being taken from a like court established in Normandy long before that time. Anciently its authority was so great, that it was held in the king's palace, and its acts were not to be examined or controlled in any other of the king's courts; but, at present, it is the last of the four courts at Westminster. In the exchequer, some reckon seven courts, viz. those of pleas, accounts, receipts, exchequer chamber (which is an assembly of all the judges on difficult matters in law,) errors in the exchequer, errors in the king's bench, and, lastly, the court of equity in the exchequer. But the exchequer, for the dispatch of business, is generally divided into two parts. Officers of the receipt may take one penny in the pound, as their fee for sums issued out: and they are obliged, without delay, to receive the money brought thither; and the money received is to be put into chests under three different locks and keys, kept by three several officers. All sheriffs, bailiffs, &c. are to account in the exchequer; and in the lower part, termed the receipt, the debtors of the king, and persons in debt to them, the king's tenants, and the officers and ministers of the court, are privileged to sue one another, or any stranger, and to be sued in the like actions as are brought in the courts of king's bench and common pleas. The judicial part of the exchequer is a court both of law and equity. The court of law is held in the office of pleas, according to the course of common law, before the barons: in this court, the plaintiff ought to be a debtor or accountant to the king; and the leading process is either a writ of subpoena, or quo minus, which last goes into Wales, where no process out of courts of law ought to run, except a *capias utlagatum*. The court of equity is held in the exchequer chamber before the treasurer, chancellor, and barons; but, generally, before the barons only: the lord chief baron being the chief judge to hear and determine all causes. The proceedings in this part of the exchequer are by the English bill and answer, according to the practice of the court of chancery; with this difference, that the plaintiff here must set forth, that he is a debtor to the king, whether he is so or not. It is in this court of equity that the clergy exhibit bills for the recovery of their tithes, &c. Here too the attorney-general exhibits bills for any matters concerning the crown; and a bill may be exhibited against the king's attorney by any person aggrieved in any cause prosecuted against him on behalf of the king; to be relieved therein: in which case, the plaintiff is to attend on the attorney general, with a copy of the bill; and procure him to give an answer thereto; in the making of which he may call in any person interested in the cause, or any officer, or others, to instruct him, that the king be not prejudiced thereby, and his answer is to be put in without oath. Besides the business relating to debtors, farmers, receivers, accountants, &c. all penal punishments, intrusions, and forfeitures upon popular actions, are matters likewise cognizable by this court; where there also sits a puisne baron, who administers the oaths to high sheriffs, bailiffs, auditors, receivers, collectors, surveyors, and searchers of all the customs, &c. The court of exchequer in Scotland has the same privileges and jurisdiction as that of England; and all matters competent to the one are competent to the other.

EXCHEQUER BILLS. Bills or tickets issued by the Exchequer, payable out of the produce of a particular tax, are generally out of the supplies granted for the year, and receivable in all payments to the exchequer. The first bills of this kind were issued in 1697, as a more convenient kind of security than the tallies and orders for repayment then in use, and were partly intended to supply the want of money during the recoinage then undertaken. With this view, of late years the total amount of outstanding Exchequer bills (exclusive of those charged on specific branches of the revenue)

has usually been about twelve millions. The interest payable on them has been at various rates according to the current rate of interest at the time they were issued. The daily transactions between the bank and the exchequer are chiefly carried on by bills of 1000l. each, which are deposited by the bank in the exchequer to the amount of the sums received by them on government account; the bank-notes and cash thus received by the bank being retained by them, as the detail part of the money-concerns of government is all transacted at the bank. The instalments on loans are paid into the receipt of the exchequer by these exchequer-bills of 1000l. each, which are received again by the bank as cash, either for the amount of dividends due, or in re-payments of advances; and as, while deposited in the exchequer, they are considered merely as a pledge or security, they of course continue to bear interest, till the advance on which the bank first received them is paid off. Exchequer-bills, though the same in their nature and solidity, differ in their origin from navy-bills in this, that they are issued in anticipation of revenue, and circulated by the bank of England to raise money. During the recess of parliament, there is a sum left to the credit of the chancellor of the exchequer, to serve in cases of exigency. The bank makes advances to the amount voted, for which the exchequer issues bills. There is a standing contract between government and the bank for the trouble and expence attending the issue and circulation of these bills. Notice is given by public advertisement, and the payment is made at the exchequer-bill office Westminster.

EXCHEQUER, BLACK BOOK OF THE, an ancient statistical work under the keeping of the two chamberlains of the exchequer; said to have been composed, in 1175, by Gervais of Tilbury, nephew of king Henry II. and divided into several chapters. Herein is contained a description of the court of England, as it then stood, its officers, their rank, privileges, wages, perquisites, power, and jurisdiction; and the revenues of the crown, in money, grain, and cattle. Here we find, that for one shilling, as much bread might be bought as would serve 100 men a whole day; that the price of a fat bullock was only 12s. and of a sheep 4s. &c.

EXCHEQUER, CHANCELLOR OF THE. See **CHANCELLOR**.
EXCISE, [from the Belgic *accusae*, tribute;] an inland duty or imposition, paid sometimes upon the consumption of the commodity, or frequently upon the wholesale, which is the last stage before the consumption. This is doubtless the most economical way of taxing the subject; the charges of levying, collecting, and managing, the excise duties, being considerably less in proportion than in other branches of the revenue. It also renders the commodity cheaper to the consumer, than charging it with customs to the same amount would do, because generally paid in a much later stage of it. But, at the same time, the rigour and arbitrary proceedings of excise laws seem hardly compatible with the temper of a free nation. For the frauds that might be committed in this branch of the revenue, unless a strict watch be kept, make it necessary, wherever it is established, to give the officers a power of entering and searching the houses as deal in exciseable commodities, at any hour of the day, and even, in many cases, of the night. And the proceedings, in case of transgressions, are so summary and sudden, that a man may be convicted in two days time in the penalty of many thousand pounds, by two commissioners of justices of the peace: to the total exclusion of the trial by jury, and disregard of the common law. For which reason, though lord Clarendon tells us, that to his knowledge the earl of Bedford (who was made lord treasurer by king Charles I. to oblige his parliament) intended to have set up the excise in England, yet it never made a part of that unfortunate prince's revenue; being first introduced, on the model of the Dutch prototype, by the parliament itself after its rupture with the crown. Yet such was the opinion of its general unpopularity, that when in 1642 "aspersions were cast by malignant persons upon the house of commons, that they intended to introduce excises, the house for its vindication therein did declare, that these rumours were false and scandalous, and that their authors should be apprehended and brought to condign punishment." Its original establishment was in 1643; and its progress was gradual; being at first laid upon those persons and commodities where it was supposed the hardship would be least perceivable, viz. the makers and venders of beer, ale, cyder, and perry; and the royalists at Oxford soon followed the example of their brethren at Westminster, by imposing a similar duty: both sides protesting, that it should

should be continued no longer than to the end of the war, and then be utterly abolished. But the parliament at Westminster soon after imposed it on flesh, wine, tobacco, sugar, and such a multitude of other commodities, that it might be fairly denominated general: in pursuance of the plan laid down by Mr. Pymme (who seems to have been the father of the excise,) in his letter to Sir John Hotham, signifying, "that they had proceeded in the excise to many particulars, and intended to go on farther; but that it would be necessary to use the people to it by little and little." And afterwards, when the nation had been accustomed to it for a series of years, the succeeding champions of liberty boldly and openly declared "the impost of excise to be the most easy and indifferent levy that could be laid upon the people;" and accordingly continued it during the whole usurpation. Upon king Charles II's return, it having then been long established, and its produce well known, some part of it was given to the crown, (in 12 Car. II.) by way of purchase for the feudal tenures and other oppressive parts of the hereditary revenue. Various additions to the original duties were made at subsequent periods, and the excise being extended to candles, soap, starch, hides, and other articles, it became one of the most productive branches of the public revenue; the gross produce, in the year 1732, being 2,964,617l. About this time Sir Robert Walpole, who was of opinion that taxes on consumable commodities, to which every citizen contributes in proportion to his consumption, and which being included in the price of the commodity are insensibly paid, constituted the most eligible mode of raising the revenue necessary for the public service; formed a project for the gradual abolition not only of the taxes on land, houses, and windows, but likewise the customs, by the substitution of productive excise duties. He was influenced in the formation of this scheme by a knowledge of the gross and shameless frauds then daily practised in the collection of the customs; and which, from the very nature of those frauds, and the extreme facility of committing them, he had no hope to remedy: he thought, therefore, that to convert the greater part of the customs into duties of excise, would be equally advantageous to government and to the fair trader; and that the excise laws might be so ameliorated that, notwithstanding the odium generally attached to them as oppressive and arbitrary, no just ground of complaint should remain. With a view, therefore, to the execution of this plan, he obtained a revival of the salt duties, which had been repealed some years before; but upon proposing, in the following year, to transfer the duties on wine and tobacco to the excise, so much clamour was raised against the measure that the minister, after some perseverance, thought it prudent to relinquish this favourite project. The defeat of this scheme was celebrated by general rejoicings, as a deliverance from the greatest political danger: had it succeeded, between four and five millions a year would have been raised under the excise system, in addition to the excise duties then subsisting. The various additional duties which at different times have been imposed, and which the progress of the public expenditure has rendered necessary, have greatly increased the produce of the excise, and rendered it the most important branch of the public revenue, which now amounts to more than twenty millions annually. The duties which it comprehends are divided into the permanent consolidated duties, the temporary war taxes, and the annual duties; the latter consists of the old annual malt duty, and of an additional malt-duty, which with some duties on tobacco and snuff, and some custom duties, have, since the project for selling the land-tax, been granted annually in lieu thereof.

Excise Laws. For more easily levying the revenue of the excise, the kingdom of England and Wales is divided into about fifty collections, some of which are called by the names of particular counties, others by the names of great towns; where one county is divided into several collections, or where a collection comprehends the contiguous parts of several counties, every such collection is subdivided into several districts, within which there is a supervisor; and each district is again subdivided into outrides and footwalks, within each of which there is a gauger or surveying officer. The commissioners or sub-commissioners, in their respective circuits and divisions, shall constitute, under their hands and seals, so many gaugers as they shall find needful.

Arrears of duties. By several acts of parliament, all articles in the possession of persons subject to the excise laws, together with all the materials and utensils of whatsoever description, are made

liable for the arrears of duties, whether these be single or double duties; and if a trader, being in arrears for the single duties, becomes a bankrupt, and is convicted after the assignment of his effects, the double duties are a lien upon the exciseable commodities, utensils, and materials, in the hands of his assignees, and the commissioners or magistrates, may authorize the penalty to be levied upon all such commodities, and all the materials, preparations, utensils, and vessels for making thereof, in the custody of the bankrupt, or any person or persons in trust for him: 2 Doug. 411.

Bonds, for the exportation of exciseable commodities, are to be taken by officers of excise, and they are to be given generally upon all exciseable articles, at the place where exported.

Forgery of any stamps, licences, certificates, permits, or any other excise documents, is by various statutes made a capital felony.

Licences. In all cases where licenses are required, the licence will only sanction the business carried on in that particular place for which such licence was granted; but when the business is carried on by partners, one licence will be sufficient to cover the firm.

Officers of Excise. The officers of excise are to be appointed, and may be dismissed, replaced, or altered, by the commissioners, under their hands and seals; their salaries are allowed and established by the treasury; and by 1 W. & M. c. 24. s. 15, if it is proved by two witnesses, that any officer has demanded or taken any money, or other reward whatever, except of the king, such offender shall forfeit his office. By several statutes, no process can be sued out against any officer of excise, for any act done in the execution of his office, until one month after notice given, specifying the cause of action, and the name and abode of the person who is to begin, and the attorney who is to conduct the action; and within one month after such notice, the officer may tender amends, and plead such tender in bar; and having tendered insufficient or no amends, he may, with leave of the court, before issue joined, pay money into court. Officers of excise are empowered to search, at all times of the day, enter warehouses, or places for tea, coffee, &c. But private houses can only be searched upon oath of the suspicion: before a commissioner or justice of peace, who can by their warrant authorise a search.

Permits. Persons dealing in exciseable commodities are entitled to permits for removing the same to different places in certain quantities, and under certain regulations. These permits are written upon a peculiar species of paper, manufactured expressly for the purpose; and by 23 Geo. III. c. 70. s. 11, no permit paper is to be delivered out before it shall be filled up agreeably to the request note of a trader; and officers knowingly granting any false permit, making false entries in the counterpart thereof, or receiving any commodities into stock with a false or forged permit, are to be transported for seven years.

Samples. Officers of excise are, by various acts, empowered to take samples of exciseable commodities, paying the prices therein regulated for the same.

Seizures. When an officer makes a seizure of any spirits, or any other articles, he must lay his hand on the casks, vessels, &c. so seized, and declare that he seizes such spirits, &c. and the casks or vessels containing the same, for the use of his majesty and of himself; but if the officer happen to be alone when he makes such seizure, he must afterwards, in the presence of witnesses, again lay his hand upon such cask, vessel, &c. and repeat the same declaration of seizure. All informations on seizures must be laid in the names of the officers making the same. By 41 Geo. III. c. 96, commissioners of excise are empowered to make restitution of exciseable goods.

Scales and Weights. By various acts of parliament, traders subject to the excise laws, are to keep just and sufficient scales and weights, under penalty of 100l. for every such offence, and the scales and weights may be seized by the officer. Traders, manufacturers, and dealers liable to the excise duties, are to assist the officers in weighing stock; and forcibly obstructing, or using any art or contrivance to prevent or impede the officers from taking a true account, incurs a penalty of 100l.

EXCISION, in a scripture sense, means the cutting off of a person from his people, by way of punishment for some sin. The Jews, Selden informs us, reckon up thirty-six crimes, to which they pretend this punishment is due.

Excision,

EXCISION, in surgery, the cutting out, or off, any part of the body.

EXCITABILITY, [*incitabilitas*, Lat.] a term literally signifying a capability of being excited; first used by the late Dr. Brown, to express that quality, substance, property, or principal, on which the phenomena of life depend. See **BRUNONIAN SYSTEM**. "We know not," says the Doctor, "what excitability is, or in what manner it is affected by the exciting powers. But whatever it be, a certain quantity, or energy, (or as Dr. Beddoes expresses it, in the second edition of Brown's Elements,—“a certain portion,”) of it, is assigned to every being upon the commencement of its living state. The quantity, or energy, is different in different animals, and in the same animal at different times.”—“The seat of excitability, in the living body, is medullary nervous matter and muscular solid. The excitability is inherent in it, but not different in different parts of its seat. This fact is proved by the production (or rousing into exertion) of sense, motion, the mental functions, and passions, immediately, instantaneously, and not in a series of successive operations. Different exciting powers are applied to different parts of the nervous system, none to them all at once; but wherever they are applied, every one immediately affects the whole excitability.” Elem. Med. XVIII. XLVIII. first edition.

EXCITABILITY, ACCUMULATED, INCREASED, or SUPERABUNDANT, is that state of the excitability, which is produced by withholding, or withdrawing the usual stimuli for some time, and hence inducing direct debility. Dr. Brown mentions as a familiar instance of it, “that debility which dram-drinkers experience the day after debauch, in consequence of which their hands shake till they are re-excited by their favourite cordial.” Elem. Med. XLIII. Note n.

EXCITABILITY, DEFICIENT, EXHAUSTED, or WORN-OUT, is the opposite of the accumulated, being that state which is produced by too long continued or excessive application of the exciting powers. Dr. Brown mentions as “an instance of it, that debility which arises from intoxication;” elsewhere styled indirect debility. Elem. Med. XLIII. Note n.

EXCITATION, in electricity. See **ELECTRICITY**.

EXCITEMENT, [*incitatio*, Lat.] in Dr. Brown's System of Medicine, “the effect of the exciting powers acting upon the excitability,” Elem. Med. XVI. “The excitement,” says Dr. Beddoes, “may be too great, too small, or in just measure. By too great excitement weakness is induced, because the excitability becomes defective; this is indirect debility: when the exciting powers or stimulants are withheld, weakness is induced; and this is direct debility. Every power that acts on the living frame produces excitement by expending excitability.” Elem. Med. 2d edit. p. cxxvii.

EXCLUSION, or BILL OF EXCLUSION, a bill proposed about the close of the reign of king Charles II. for excluding the duke of York, the king's brother, from the throne, on account of his being a papist.

EXCLUSION, in mathematics, is a method of coming at the solution of numerical problems, by previously throwing out of our consideration such numbers as are of no use in solving the question.

EXCECARIA, a genus of the triandria order, and dicecia class of plants; natural order, Tricoeca. Male amentum, naked; calyx and corolla none; styles three; capsule tricoecous. It has two species.

EXCLAMATION, in rhetoric, a figure that expresses the violent and sudden breaking out, and vehemence of any passion. Such is that in the second book of Milton's Paradise Lost:

O unexpected stroke, worse than of death!

Must I thus leave thee, Paradise? Thus leave

Thee, native soil; these happy walks and shades,

Fit haunt of gods? See **ORATORY**.

EXCOMMUNICATION, an ecclesiastical interdict; exclusion from the fellowship of the church.

EXCOMMUNICATION is founded on a natural right which all societies have, of excluding out of their body such as violate their laws; and it was originally instituted for preserving the purity of the church; but ambitious ecclesiastics converted it by degrees into an engine for promoting their own power, and inflicted it on the most frivolous occasions. The power of excommunication, as well as other acts of ecclesiastical discipline, was lodged in the

hands of the clergy, who distinguished it into the greater or lesser.

EXCOMMUNICATION, THE GREATER, called *πεντης ἀφορισμός*, i. e. total separation and anathema, consisted in an absolute and entire exclusion from the church and the participation of all its rites. When any person was thus excommunicated, notice was given of it by circular letters to the most eminent churches all over the world, that they might all confirm this act of discipline, by refusing to admit the delinquent to their communion. The consequences of this excommunication were very terrible. The excommunicated person was avoided in civil commerce and outward conversation. No one durst receive him into his house, or eat at the same table with him; and when dead, he was denied the solemn rites of burial.

EXCOMMUNICATION, THE LESSER, simply called *ἀφορισμός*, i. e. separation or suspension, consisted in excluding men from the participation of the eucharist, and the prayers of the faithful. But they were not expelled the church; for they had the privilege of being present at the reading of the Scriptures, the sermons, and the prayers of the catechumens and penitents. This excommunication was inflicted for less crimes; such as neglecting to attend the service of the church, misbehaviour in it, and the like.

EXCOMMUNICATION AMONG THE HEATHEN. A seclusion from religious rites was also in use under paganism. Such as were excommunicated were forbidden to assist or attend at the sacrifices, or to enter within the temples; and were afterwards delivered over to the demons and furies of hell, with certain imprecations; which was called among the Romans *diris devovere*. See **EXECRATION**. The Druids among the ancient Britons and Gauls, likewise excommunicated rebels, and interdicted the communion of their mysteries to such as refused to acquiesce in their decisions.

EXCOMMUNICATION IN THE CHURCH OF ENGLAND. The form of excommunication in the church of England anciently ran thus: “By the authority of God the Father Almighty, the Son, and Holy Ghost, and of Mary the blessed mother of God, we excommunicate, anathematize, and sequester from the pale of holy mother church, &c.” The causes of excommunication in England are, contempt of the bishop's court, heresy, neglect of public worship and the sacraments, incontinency, adultery, simony, &c. It is described to be twofold. The less is an ecclesiastical censure, excluding the party from the participation of the sacraments: the greater proceeds farther, and excludes him not only from these, but from the company of all Christians. But if the judge of any spiritual court excommunicates a man for a cause of which he has not the legal cognizance, the party may have an action against him at common law, and he is also liable to be indicted at the suit of the king. Heavy as the penalty of excommunication is, there are many who would despise the brutum fulmen of mere ecclesiastical censures, especially when pronounced by a petty surrogate in the country, for railing or contumelious words, for non-payment of fees or costs, or other trivial cause. The law, therefore, steps into their aid, and lends a supporting hand to an otherwise tottering authority; imitating herein the policy of the ancient British Druids. By the common law, an excommunicated person is disabled to do any act that is required to be done by one that is *probus et legalis homo*. He cannot serve upon juries; cannot be a witness in any court; and cannot bring an action to recover lands or money due to him. And if, within 40 days after the sentence has been published in the church, the offender does not submit to the sentence of the spiritual court, the bishop may certify such contempt to the king in chancery. Upon which there issues out a writ to the sheriff of the county, called from the bishop's certificate a *significavit*; or from its effect, a writ *de excommunicato capiendo*; and the sheriff shall thereupon take the offender and imprison him in the county jail, till he is reconciled to the church, and such reconciliation certified by the bishop; upon which another writ *de excommunicato deliberando*, issues out of the chancery to release him.

EXCOMMUNICATION IN THE CHURCH OF ROME. The Romish pontifical mentions three kinds of excommunication, viz. 1. The minor, incurred by those who have any correspondence with an excommunicated person. 2. The major, which falls upon those who disobey the commands of the holy see, or refuse to submit to certain points of discipline, in consequence of which they are excluded

cluded from the church militant and triumphant, and delivered over to the devil and his angels. 3. Anathema, which is properly that pronounced by the pope against heretical princes and countries. In former ages, these papal fulminations were most terrible things; but at present they are formidable to few or none.

EXCORIATION, in medicine and surgery, the galling, or rubbing off of the cuticle, especially of the parts between the thighs and about the anus. In adults, it is occasioned by riding, much walking, or other vehement exercise, and may be cured by vulnerary applications. In children there is often an excoriation, not only of the parts near the pudenda, chiefly of the groin and scrotum, but likewise in the wrinkles of the neck and under the arms: proceeding from the acrimony of urine and sweat; and occasioning itching pains, crying, restlessness, &c. The parts affected should be often washed with warm water, and sprinkled with drying powders, as chalk, or hartshorn, but especially tutty, or lapis calaminaris, which may be tied loosely in a rag, and the powder shaken out on the parts; but ceruse, which some nurses use in this way, is very dangerous.

EXCREMENTS, are the fibrous parts of the aliments, mixed with the bile, saliva, and other fluids. Urine and the faeces are the gross excrements that are discharged out of the bladder and belly. Sweat, or the matter perspired by the pores, in consequence of heat or violent exercise, may also be considered as excrementitious. But we cannot agree with those who consider as excrements, those secretions from the blood, which answer very important ends in the animal economy; such as the saliva, bile, pancreatic juice, lymph, and semen. Nay even the nails, hair, horns, and hoofs, of animals, have been considered by some as excrementitious parts. But these are much more properly stiled by others excrescences. As to the fluid secretions above-mentioned, there is this evident distinction between them and the excrements of the body, that the former are of the highest utility, while the latter are expelled as no longer capable of rendering the animal any service, but on the contrary, if long retained, would prove injurious. See **FÆCES**.

EXCRESCENCE, in surgery, a preternatural tumour upon the skin, either in the form of a wart or tubercle. If they are born with a person, as they frequently are, they are called *nævi materni*, or marks from the mother; but if the tumour is large, so as to depend from the skin, like a fleshy mass, it is then called a sarcoma. See **SURGERY**.

EXCRETION, or **SECRETION**, in physiology, a separation of some fluid from the blood by means of the glands. See **PHYSIOLOGY**.

EXCRETORY DUCTS, in anatomy, a term applied to certain little vessels, destined for the reception of a fluid, secreted in certain glandules, and other viscera, for the excretion of it in the appropriated places.

EXCUBILE, in antiquity, the watches and guards kept in the day by the Roman soldiers, contradistinguished from the *vigilæ* which were kept in the night.

EXCULPATION, **LETTERS OF**, in Scots law, a writ or summons issued by authority of the court of justiciary, at the instance of a pannel, for citing witnesses to prove his defences, or his objections to any of the jury or witnesses cited against him.

EXCUSATI, in church history, slaves, who flying to any church for sanctuary, were excused and pardoned by their masters; but these were obliged to take an oath to that purpose before they could have them again; and, if they broke the oath, they were punished and fined as persons guilty of perjury.

EXECRATION, in antiquity, a kind of punishment, consisting of direful curses and marks of infamy: such was that used against Philip of Macedon by the Athenians. A general assembly of the people being called, they made a decree, that all the statues and images of that king, and of all his ancestors, should be demolished, and their very name razed; that all the festivals, sacred rites, priests, and whatever else had been instituted in honour of him, should be profaned; that the very places where there had been any monument or inscription to his honour, should be detestable; that nothing should be set up, or dedicated in them, which could be done in clean places; and, lastly, that the priests, as often as they prayed for the Athenian people, allies, armies, and fleets, should as many times detest and execrate Philip, his children, kingdom, land and sea forces, and the whole race and name of the Macedonians. At the taking and demolishing of cities, it was

usual amongst the Jews, Greeks, and Romans, to pronounce curse upon, and load with direful execrations, the rebuilders of them.

EXECUTION, in a general sense, the act of accomplishing, finishing, or achieving, any thing to be done.

EXECUTION, in law, the completing or finishing of some act, as of judgement, deed, &c. and it usually signifies the obtaining of possession of any thing recovered by judgement of law. Sir Edward Coke observes, that there are two sorts of executions; the one final; and the other a quousque, that tends to an end. An execution final, is that which makes money of the defendant's goods; or extends to his lands, and delivers them to the plaintiff, who accepts the same in satisfaction; and this is the end of the suit, and the whole that the king's writ requires to be done. The writ of execution with a quousque, though it tends to an end, yet is not final, as in the case of a *capias ad satisfac.* where the defendant's body is to be taken, in order that the plaintiff may be satisfied for his debt. Executions are either in personal, real, or mixed actions. In a personal action, the execution may be made three ways, viz. by the writ of *capias ad satisfaciendum*, against the body of the defendant; *fieri facias*, against his goods; or *eligit*, against his lands. See **ELIGIT**, and **FIERI FACIAS**. In a real and mixed action, the execution is by writ of *habere facias sasinam*, and *habere possessionem*. See **HABERE**. Writs of execution bind the property of goods only from the time of delivery of the writ to the sheriff; but the land is bound from the day of the judgement obtained: and here the sale of any goods for valuable consideration, after a judgement, and before the execution awarded, will be good. It is otherwise as to lands, of which execution may be made, even on a purchase after the judgement, though the defendant sell such land before execution. Likewise, sheriffs may deliver in execution all the lands whereof others shall be seised in trust for him, against whom execution is had on a judgement, &c. When any judgement is signed, the execution may be taken out immediately thereon; but if it be not issued within a year and a day after, where there is no fault in the defendant, as in the case of an injunction, writ of error, &c. there must be a *scire facias*, to revive the judgement; though, if the plaintiff sues out any writ of execution within the year, he may continue it after the year is expired. After judgement against the defendant, in an action wherein special bail is given, the plaintiff is at liberty to have execution against such defendant, or against his bail: but this is understood where the defendant does not render himself, according to law, in safeguard of the bail; and execution may not regularly be sued forth against a bail, till a default is returned against the principal: also if the plaintiff take the bail, he shall never take the principal. It is held that an execution may be executed after the death of the defendant: for his executor, being privy thereto, is liable as well as the testator. The execution is an entire thing, so that he who begins must end it: therefore, a new sheriff may distrain an old one, to sell the goods seized on a distringas, and to bring the money into court.

EXECUTION OF CRIMINALS, must be according to the judgement; and the king cannot alter a judgement from hanging to beheading, because no execution can be warranted, unless it be pursuant to the judgement. This, being the completion of human punishment, in all cases, as well capital as otherwise, must be performed by the legal officer, the sheriff, or his deputy. Murderers are to be executed the day next but one after conviction, unless it be Sunday, and anatomised; for which reason they are generally tried on a Friday.

EXECUTION, in music, a term applicable to every species of musical performance; but more particularly used to express a facility of voice or finger in running rapid divisions, and other difficult and intricate passages: it includes, in a general sense, taste, feeling, grace, and expression.

EXECUTOR, is a person appointed by the testator, to carry into execution his will and testament after his decease. The regular mode of appointing an executor, is by naming him expressly in the will; but any words indicating an intention of the testator to appoint an executor will be deemed a sufficient appointment. Any person capable of making a will, is also capable of being an executor: but in some cases, persons who are incapable of making a will, may nevertheless act as executors, as infants, or married women; to obviate, however, inconveniences which have occurred respecting the former, it is enacted by stat. 38 Geo. III. c. 89, that where an infant is sole executor, administration, with the

will annexed, shall be granted to the guardian of such infant, or such other person as the spiritual court shall think fit, until such infant shall have attained the age of twenty-one; when, and not before, probate of the will shall be granted him. An executor derives his authority from the will and not from the probate, and is therefore authorized to do many acts in execution of the will, even before it is proved, such as the releasing, paying, or receiving of debts, assenting to licences, &c. but he cannot proceed until he has obtained probate. If an executor die before probate, administration must be taken out with the will annexed; but if an executor die, his executor will be executor to the first testator, and no fresh probate will be needed. It will be sufficient if one only of the executors prove the will; but if all refuse to prove, they cannot afterwards administer, or in any respect act as executors. If an executor become a bankrupt, the court of chancery will appoint a receiver of the testator's effects, as it will also upon the application of a creditor, if he appear to be wasting the assets. If an executor once administers, he cannot afterwards renounce; and the ordinary may in such case issue process to compel him to prove the will. 1 Mod. 213. If an executor refuse to take upon him the execution of the will, he shall lose the legacy therein contained. If a creditor constitute his debtor his executor, this is at law a discharge of the debt, whether the executor acts or not, provided, however, there be assets sufficient to discharge the debts of the testator. The first duty of an executor or administrator is to bury the deceased in a suitable manner; and if the executor exceed what is necessary in this respect, it will be a waste of the substance of the testator. The next thing to be done by the executor is to prove the will, which may be done either in the common form, by taking the oath to make due distribution, &c. or in a more solemn mode, by witnesses to its execution. By stat. 37 Geo. III. c. 9. s. 10, every person who shall administer the personal estate of any person dying without proving the will of the deceased, or taking out letters of administration within six calendar months after such person's decease, shall forfeit 50*l*. Upon proving the will, the original is to be deposited in the registry of the ordinary, by whom a copy is made upon parchment under his seal, and delivered to the executor or administrator, together with a certificate of its having been proved before him, and this is termed the probate. If all the goods of the deceased lie within the same jurisdiction, the probate is to be made before the ordinary or bishop of the diocese, where the deceased resided; but if he had goods and chattels to the value of 5*l*. in two distinct dioceses or jurisdictions, the will may be proved before the metropolitan or archbishop of the province in which the deceased died. An executor, by virtue of the will of the testator, has an interest in all the goods and chattels, whether real or personal, in possession or in action of the deceased; and all goods and effects coming to his hands will be the assets to make him chargeable to creditors and legatees. An executor or administrator stands personally responsible for the due discharge of his duty; if, therefore, the property of the deceased is lost, or through his wilful negligence becomes otherwise irrecoverable, he will be liable to make it good; and also where he retains money in his hands longer than is necessary, he will be chargeable not only with interest but costs, if any have been incurred. But one executor shall not be answerable for money received, or detriment occasioned by the other, unless it has been by some act done between them jointly. An executor or administrator has the same remedy for recovering debts and duties, as the deceased would have had if living. Neither an executor nor administrator can maintain any action, for a personal injury done to the deceased, when such injury is of such a nature for which damages may be received; in actions, however, which have their origin in breach of promise, although the suit may abate by the death of the party, yet it may be revived either by his executors or administrators, who may also sue for rent in arrear, and due to the deceased in his lifetime. By the custom of merchants, an executor or administrator may indorse over a bill of exchange or promissory note. An executor or administrator may also, on the death of a lessee for years, assign over the lease, and shall not be answerable for rent after such assignment; nor shall he be liable for rent due after the lessee's death, from premises which in his life-time he had assigned to another. An executor or administrator is bound only by such covenants in a lease as are said to run with the land. The executor or administrator, previous to the distribution of the property of the deceased,

must take an inventory of all his goods and chattels, which must, if required, be delivered to the ordinary upon oath. He must then collect, with all possible convenience, all the goods and effects contained in such an inventory; and whatever is so recovered that is of a saleable nature, and can be converted into money, is termed assets, and makes him responsible to such amount to the creditors, legatees, and kindred of the deceased. The executor or administrator having collected in the property, is to proceed to discharge the debts of the deceased, which he must do according to the following priorities, otherwise he will be personally responsible. 1. Funeral expences, charges of proving the will, and other expenditures incurred by the execution of his trust. 2. Debts due to the king on record, or by speciality. 3. Debts by particular statutes, as by 30 C. II. c. 23. Forfeitures for not burying in woollen; money due for poor-rates, and money due to the post-office. 4. Debts of record, as judgements, statutes, recognizances, and those recognized by a decree of a court of equity; and debts due on mortgage. 3 Peere Wms, 401. 5. Debts on special contracts, as bonds or other instruments under seal, and also rent in arrear. 6. Debts on simple contract, viz. such as debts arising by mere verbal promise, or by writing not under seal, as notes of hand, servants' wages, &c. The executor is bound at his peril to take notice of debts on record, but not of other special contract, unless he receive notice. If no suit be actually commenced against an executor or administrator, he may pay one creditor in equal degree the whole debt, though there should be insufficient remaining to pay the rest; and even after the commencement of a suit, he may by confessing judgement to other creditors of the same degree, give them a preference. Executors and administrators are also allowed, amongst debts of equal degree, to pay themselves first: but they are not allowed to retain their own debt, to the prejudice of others in a higher degree; neither shall they be permitted to retain their own debts, in preference to that of their co-executor or co-administrator of equal degree; but both shall be charged in equal proportion. A mortgage made by the testator must be discharged by the representative out of the personal estate, if there be sufficient to pay the rest of the creditors and legatees. Where such mortgage, however, was not incurred by the deceased, it is not payable out of the personal estate. See LEGACIES, and ASSETS.

EXECUTOR DE SON TORT, or an executor of his own wrong, a person that takes upon him the office of an executor by intrusion, without being so constituted by the testator, or appointed by the ordinary to administer. Such a person is chargeable to the rightful executor, as also to all the testator's creditors and legatees, so far as the goods amount to, which he wrongfully possessed.

EXECUTORY ESTATE. Estates executory, are when they pass presently to the person to whom conveyed, without any afteract, 2 Inst. 513; and leases for years, rents, annuities, condition, &c. are called inheritances executory. Id. 293.

EXECUTORY DEVISE, is defined a future interest, which cannot vest at the death of a testator, but depends upon some contingency which must happen before it can vest. Abr. Eq. 186. An executory devise differs from a remainder, in three very material points: 1. That it needs not any particular estate to support it. 2. That by it a fee-simple, or other less estate, may be limited after a fee-simple. 3. That hereby a remainder may be limited of a chattel interest, after a particular estate for life created in the same. 2 Black. 172.

EXECUTORY DEVISES OF TERMS FOR YEARS. If a farmer devises his term A for life, the remainder to another, though A have the whole estate, (for that is in him during life,) and so no remainder can be limited over, at common law, yet it is good by way of executory devise. 1 Rol. Abr. 610.

EXEDRÆ, in antiquity, halls with many seats, where the philosophers, rhetoricians, and men of learning, met for discourse and disputation. The word occurs in ecclesiastical writers as a general name for such buildings as were distinct from the main body of the churches, and yet within the limits of the church, taken in its largest sense. Among the exedræ the chief was the Baptistery.

EXEGESIS LINEA, or **NUMEROSA**, [from *ἐξήγησις*, of *ἐξ*, out, and *ἡγήσασθαι*, I lead,] is the lineal or numeral solution or extraction of roots out of the affected equations in algebra.

EXEGESIS, in the Scots universities, is an exercise among the students

students in divinity, in which a question is stated by the respondent, who is then opposed by other students in their turns; during which the professor solves the difficulties which the respondent cannot overcome.

EXEGETES, [from *ἐξηγεῖται*, to explain,] among the Athenians, persons learned in the laws, whom the judges used to consult in capital causes.

EXEGETICA, in algebra, the art of finding, either in numbers or lines, the roots of the equation of a problem, according as the problem is either numerical or geometrical.

EXEMPLAR denotes the image, conceived in the mind of the artist, whereby he conducts his work.

EXEMPLIFICATION OF LETTERS PATENT, denotes a copy made from the enrolment, and sealed with the great seal; which is as effectual to be shewed, or pleaded as the original.

EXEMPTIONS, in law. Peers are exempted from being sworn upon inquests; and knights, clergymen, and others, from appearing at the sheriff's turn. Persons of 70 years of age, surgeons, apothecaries, butchers, &c. are exempted from serving on juries; and justices of the peace, attorneys, &c. from parish offices.

EXERCISE, among physicians, is either active or passive. The active is walking, hunting, dancing, playing at bowls, and the like; as also speaking, and other joint exertions of the body and mind. The passive is riding in a coach or on horseback; sailing, &c. Exercise may be continued to a beginning of weariness, and ought to be used before dinner in a pure light air. Journeys into the country contribute greatly to preserve and re-establish health. Exercise increases the circulation of the blood, attenuates the fluids; promotes a regular perspiration, and a due secretion of all the humours; accelerates the animal spirits; facilitates their distribution into all the fibres of the body; strengthens the parts; creates an appetite, and helps digestion. Boerhaave recommends bodily exercise in diseases of a weak and lax fibre. By riding on horseback, says his commentator, the pendulous viscera of the abdomen are shaken every moment, and gently rubbed one against another, while in the mean time the pure air acts on the lungs with greater force. But a weak man should not ride with a full stomach, but either before dinner, or after the digestion is near finished; for when the stomach is distended, weak people do not bear these concussions. Sailing is also an exercise of great use to weak people. To strengthen the body by muscular motion, running, leaping, and other active exercises, are to be used. In these we should begin with the most gentle, such as walking, and increase it by degrees till we come to running. Those exercises of the body are more especially serviceable which exercise the mind at the same time. The ancients appointed rewards for those who excelled in gymnastic exercises; that the bodies of their youth might thus be hardened for warlike toils. But, though nothing is more conducive to health than moderate exercise, yet violent exercise dissipates the spirits, weakens the body, destroys the elasticity of the fibres, and exhausts the fluid parts of the blood. Great care should therefore be taken, to proportion the degree of exercise to the strength of the patient. Swinging has often been found very beneficial to consumptive and other debilitated persons.

EXERCISE, in military affairs, is the ranging of a body of soldiers in form of battle, and making them perform the several motions and military evolutions with different management of their arms, in order to make them expert therein. See **MANUAL EXERCISE**.

EXERCISE, in the royal navy, is the preparatory practice of managing the artillery and small arms, in order to make the ship's crew perfectly skilled therein, so as to direct its execution successfully in the time of battle. See **NAVY**, and **NAVAL TACTICS**.

EXERCISE may also be applied with propriety to the forming of our fleets into orders of sailing, lines of battle, &c. an art which the French have termed evolutions, or tactics. See **NAVAL TACTICS**.

EXERCISES are also understood of what young gentlemen learn in the academics and riding-schools, such as fencing, drawing, riding the great horse, &c. The delicate springs of our frail machines lose their activity and become enervated, and the vessels are choked by obstructions, when we totally desist from exercise,

and the consequences necessarily affect the brain: a very studious and sedentary life is therefore equally prejudicial to the body and the mind. An inclination to study is highly commendable: but it ought not to inspire us with an aversion to society. The natural lot of man is to live among his fellows: and whatever may be our situation in life, there are a thousand occasions where a man must desire to render himself agreeable.

EXERCITOR, in Scots law, he who employs a ship in trade, whether he be owner, or only freights her from the owner.

EXERGASIA, or **EXPOSITION**. See **ORATORY**.

EXERGUE, or **EXERGUM**, [of *ἐξ*, from, and *ἐργον*, the work,] the circular space between the work and edge of a coin or medal, on which the inscription or motto is usually placed.

EXETER, [*q. d.* Excester, *i. e.* a city upon the Ex,] the capital of Devonshire, anciently called Isex, and Isia Damnoniorum. It is large, populous, and wealthy, with gates, walls, and suburbs; the circumference is about three miles. It is 31 miles N. N. E. of Dartmouth, and 78 S. W. of Bristol.

EXETER, a bishopric of England, comprehending the counties of Cornwall and Devonshire. The bishop's seat was transferred to Exeter, from Crediton, by Edward the Confessor.

EXETER, a town and river of New Hampshire.

EXETER, a town of North Carolina, in New Hanover county, 36 miles N. of Wilmington.

EXFOLIATION, the scaling of a bone, or its rising into thin laminae.

EX GRAVI QUERELA, in law, is a writ, that lies for the person to whom any lands or tenements in fee are devised by will, and the heir of the devisor enters thereon, and detains them from the devisee. Also, where a person devises such lands to another in tail with the remainder over in fee: here if the tenant in tail enter, and is seised by force of the entail, and afterwards he dies without issue, the person in remainder, or reversion, may bring this writ to execute the devise.

EXHALATION and **EVAPORATION** are often used synonymously, but accurate writers distinguish them, appropriating the latter to the raising of moist fumes from liquid bodies, and the former to the emission of dry effluvia from solid bodies, as earth, fire, minerals, &c. In this sense, exhalations are dry and subtle corpuscles, loosened from hard terrestrial bodies, either by the heat of the sun, the action of the air, or some other cause; and emitted upwards to a certain height in the atmosphere, where, mixing with the vapours, they help to form clouds, and return back in rain, mist, &c.

EXHAUSTED RECEIVER, in pneumatics, a glass or other vessel, applied on the plate of an air-pump, where the air is extracted out of it by the working of the pump. Things placed in it are said to be in vacuo. See **PNEUMATICS**.

EXHAUSTIONS, in mathematics, or the method of exhaustions, is a way of proving the equality of two magnitudes, by a *reductio ad absurdum*; shewing, that if one be supposed either greater or less than the other, there will arise a contradiction. It is founded upon the exhausting of a quantity by continually taking away certain parts of it. This method was of frequent use among the ancient mathematicians; as Euclid, Archimedes, &c. It is founded on what Euclid says in his 10th book; viz. that those quantities whose difference is less than any assignable quantity, are equal; for if they were unequal, be the difference ever so small, yet it may be so multiplied, as to become greater than either of them; if not so, then it is really nothing. This he assumes in the proof of prop. 1. book x. which imports, that if, from the greater of two quantities, be taken more than its half, and from the remainder more than its half, and so continually, there will, at length, remain a quantity less than either of those proposed. Thus: two quantities, A and B, are equal, when, if to or from one of them, as A, any other quantity, as d, be subtracted, however small it be, then the sum or difference is respectively greater or less than the other quantity B, viz. d being an indefinitely small quantity.

if $A + d$ be greater than B,

and $A - d$ less than B,

then is A equal to B.

On this foundation it is demonstrated, that if a regular polygon of infinite sides be inscribed in, or circumscribed about, a circle; the space, which is the difference between the circle and the polygon, will,

will, by degrees, be quite exhausted, and the circle become equal to the polygon. See Archimed. de Dimens. Circuli; Wallis's Algebra, Ch. 73; and Ronayne's Alg. part 3, p. 395. Upon the method of exhaustions depends the method of indivisibles introduced by Cavalieri, which is but a shorter way of expressing the method of exhaustions; as also Wallis's Arithmetic of Infinites, which is a farther improvement of the method of indivisibles; and hence also the methods of increments, differentials, fluxions, and infinite series.

EXHEREDATION, in the civil law, with us ordinarily called disinheriting, is the father's act of excluding his son from inheriting his estate.

EXHIBIT, in law, is where a deed, or other writing, being produced in a chancery suit to be proved by witnesses, the commissioner, appointed for the examination, certifies on the back of the writing, that it was shewn to the witness at his examination, and by him sworn to.

EXHIBITION, a benefaction settled for the benefit of scholars in the universities, that are not on the foundation.

EXHIBITION, in law, a production of titles, and other proofs of a matter in contest.

EXHORTATION, in rhetoric, differs only from Suasion, in that the latter principally endeavours to convince the understanding, and the former to work on the affections.

EXHUMATION, [from *ex*, out of, and *humus*, ground,] the act of digging up a body interred in holy ground, by the authority of the judge.

EXIDEUIL, a town of France, in the department of Dordogne; 30 miles S. of Limoges.

EXIGENT, in law, a writ which lies where the defendant in a personal action cannot be found, nor any effects of his within the county, by which he may be attached or distrained.

EXIGENTERS, four officers in the court of common pleas, who make all exigents and proclamations in actions where process of outlawry lies.

EXILE. See **BANISHMENT**. Among the Romans *exilium* properly signifies an interdiction or exclusion from water or fire; the necessary consequence of which was, that the interdicted person must betake himself into some other country, since there was no living without fire and water. Thus Cicero, ad Herenn. observes that the form of the sentence did not express *exilium*, but only *aqua et ignis interdictio*: and that "exile was not properly a punishment, but a voluntary flying and avoiding the punishment decreed."

EXILES, or **EXILLES**, a town and fort of Piedmont, seated on the Doria, 5 miles W. S. W. of Suza, and 40 N. E. of Embrun.

EXILIUM. See **EXILE**.

EXISTENCE, that whereby any thing has an actual essence, or is said to be. See **ESSENCE**.

EXITERIA, in antiquity, oblations or prayers to the gods for a prosperous journey: also feasts celebrated by the Greeks with sacrifices, when their generals undertook expeditions against an enemy.

EXLUNZA, a town of Spain, 5 miles S. of Leon.

EXMOUTH, a sea-port on the S. coast of Devonshire, at the mouth of the Ex, 10 miles S. of Exeter.

EXOACANTHA, a genus of the class and order pentandria digynia. Involucrum spiny. Flowers all hermaphrodite, with equal inflexions; seeds ovate, striated. There is one species.

EXOCETUS, or the **FLYING FISH**, in ichthyology, a genus of the order abdominales. Head scaly; teeth none; jaws connected on each side; gill membrane, ten-rayed; pectoral fins very long and large, and giving, to a certain degree, the power of flight. There are three species. The *E. exillens*, or the Mediterranean flying-fish, is about fourteen inches long, and is found principally in the Mediterranean and Atlantic Seas, frequently alone, and sometimes in small companies. By the extraordinary length of its pectoral fins it is enabled to quit the water, and support a flight, about three feet above the surface, for the distance of eighty or a hundred yards, after which it is obliged to return to the water and moisten its fins, which, even in this short progress, become hard and dry. See Plate LV.

EXODIARY, in the ancient Roman tragedy, the person who, after the play was ended, sung the Exodium.

EXODIUM, in the ancient Greek drama, one of the four divisions of tragedy; the part that included the catastrophe and unravelling of the plot; answering nearly to our fourth and fifth acts.

EXODIUM, among the Romans, consisted of certain humorous verses rehearsed by the exodiary at the end of the *Fabulae Atellanæ*.

EXODIUM, in the Septuagint, signifies the end or conclusion of a feast. It is particularly used for the 8th day of the feast of tabernacles, which, it is said, had a special view to the commemoration of the exodus or departure out of Egypt.

EXODUS, or **EXODY**, [ἐξὸς,] departure; journey from a place: the second book of Moses is so called, because it describes the journey of the Israelites from Egypt.

EXOMPHALOS, [ἐξ and ὀμφαλός,] a navel rupture. See **HERNIA** and **SURGERY**.

EXORCISM, [ἐξορκισμός,] the form of adjuration, or religious ceremony by which evil and malignant spirits are driven away.

EXORCISM means also the power of expelling devils from persons possessed. The Jews made great pretences to this power. Josephus tells several wonderful tales of the great success of several exorcists.

EXORDIUM, in rhetoric, is the preamble or beginning, serving to prepare the audience for the rest of the discourse. Exordiums are of two kinds, either just and formal, or vehement and abrupt. The last are most suitable on occasions of extraordinary joy, indignation, or the like. All exordiums should be composed with a view to captivate the good will, or attract the attention of the audience. The first may be done by paying them some compliment: thus St. Paul, "I think myself happy, king Agrippa, because I shall answer for myself this day before thee, touching all the things whereof I am accused of the Jews, especially because I know thee to be expert in all customs and questions which are among the Jews." See **ORATORY**.

EXOSTOSIS, [ἐξ and ὄστος,] any protuberance of a bone that is not natural, as often happens in venereal cases.—Quincy.

EXOTERIC and **ESOTERIC**, terms denoting external and internal, applied to the double doctrine of the ancient philosophers; the former public, the latter secret. The exoteric was that which they openly professed and taught to the world; the esoteric was confined to a small number of chosen disciples. This method was derived originally from the Egyptians; who according to Herodotus, Diodorus Siculus, Strabo, Plutarch, &c. had a twofold philosophy, one secret and sacred; the other public and common. The same practice also obtained among the Persian Magi, the Druids of the Gauls, and the Brachmans of India.

EXOTIC, [ἐξωτικός,] an appellation denoting a thing to be the produce of foreign countries. Exotic plants of the hot climates are very numerous, and require the utmost attention of the gardener to make them thrive with us. The best method of packing exotic plants for a voyage, especially if they be such as will perish above ground, is to set their roots as closely as possible in wooden boxes, filled with proper soil, and provided with handles: this operation may be performed three weeks before they are shipped. During fair weather, they should be exposed upon the deck, but in wet or unfavourable seasons, they ought to be removed, or covered with a tarpawlin. If exotics be conveyed to a colder climate, they require very little moisture; but, if they are sent from a cold to a warmer country, it will be necessary to water them liberally.

EXPANSION, among metaphysicians, denotes the idea we have of lasting distance, all whose parts exist together.

EXPANSION, as generally employed in science, denotes an increase of the bulk of any body by a power acting from within. It may be laid down as a general rule, to which there is no known exception, that every addition or abstraction of caloric makes a corresponding change in the bulk of the body which has been subjected to this alteration in the quantity of its heat. In general, the addition of heat increases the bulk of a body, and the abstraction of it diminishes its bulk; but this is not uniformly the case, though the exceptions are not numerous. Indeed these exceptions are not only confined to a very small number of bodies, but even in them they do not hold, except at certain particular temperatures, while at all other temperatures these bodies are increased in

in bulk when heated, and diminished in bulk by being cooled. We may therefore consider expansion as one of the most general effects of heat. It is certainly one of the most important, as it has furnished us with the means of measuring all the others. Though all bodies are expanded by heat and contracted by cold, and this expansion in the same body is always proportional to some function of the quantity of caloric added or abstracted; yet the absolute expansion or contraction has been found to differ exceedingly in different bodies. In general, the expansion of gaseous bodies is greatest of all; that of liquids is much smaller, and that of solids the smallest of all. Thus, 100 cubic inches of atmospheric air, by being heated from the temperature of 32° to that of 212° , are increased to 137.5 cubic inches; while the same augmentation of temperature only makes 100 cubic inches of water assume the bulk of 104.5 cubic inches; and 100 cubic inches of iron, when heated from 32° to 212° , assume a bulk scarcely exceeding 100.1 cubic inches. From this example, we see that the expansion of air is more than eight times greater than that of water, and the expansion of water about 45 times greater than that of iron. An accurate knowledge of the expansion of gaseous bodies being frequently of great importance in chemical researches, many experiments have been made to ascertain it; yet, till lately, the problem was unsolved. The results of philosophers were so various and discordant, that it was impossible to form any opinion on the subject. This was owing to the want of sufficient care in excluding water from the vessels in which the expansion of the gases was measured. The heat which was applied converted portions of this water into vapour, which, mixing with the gas, totally disguised the real changes in bulk which it had undergone. To this circumstance we are to ascribe the difference in the determinations of de Luc, general Roy, Saussure, d'Ivernois, &c. Fortunately the problem has lately engaged the attention of Mr. Dalton of Manchester, and M. Gay Lussac; and their experiments, made with the proper precautions, have solved the problem. Mr. Dalton's experiments are distinguished by a simplicity of apparatus which adds greatly to their value, as it puts it in the power of others to repeat them without difficulty. It consists merely of a glass tube, open at one end, and divided into equal parts; the gas to be examined was introduced into it after being properly dried, and the tube is filled with mercury at the open end to a given point; heat is then applied, and the dilatation is observed by the quantity of mercury which is pushed out. Mr. Gay Lussac's apparatus is more complicated, but equally precise; and as his experiments were made on larger bulks of air, their coincidence with those of Mr. Dalton adds considerably to the confidence which may be placed in the results. From the experiments of these philosophers it follows, that all gaseous bodies whatever undergo the same expansion by the same addition of heat, supposing them placed in the same circumstances. It is sufficient then to ascertain the law of expansion observed by any one gaseous body, in order to know the exact rate of dilatation of them all. Now, from the experiments of Gay Lussac we learn, that air, by being heated from 32° to 212° , expand from 100 to 137.5 parts; the increase of bulk on 180° is then 37.5 parts; or, supposing the bulk at 32° to be unity, the increase is equal to 0.375 parts; this gives us 0.00203, or $\frac{1}{493}$ th part, for the expansion of air for 1° of the thermometer. Mr. Dalton found, that 100 parts of air, by being heated from 55° to 212° , expanded to 132.5 parts; this gives us an expansion of 0.00207, or $\frac{1}{483}$ th part, for 1° ; which differs as little from the determination of Lussac as can be expected in experiments of such delicacy. From the experiments of Mr. Dalton, it appears that the expansion of air is almost perfectly equable; that is to say, that the same increase of bulk takes place by the same addition of caloric at all different temperatures. It is true, indeed, that the rate of diminution appears to diminish as the temperature increases. Thus the expansion from 55° to $133\frac{1}{2}^{\circ}$, or for the first $77\frac{1}{2}$ degrees, was 167 parts; while the expansion from $133\frac{1}{2}^{\circ}$ to 212° , or for the next $77\frac{1}{2}^{\circ}$, was only 158 parts, or 9 parts less than the first. But this difference, in all likelihood, is chiefly apparent; for de Luc has demonstrated that the thermometer is not an accurate measure of the increase of heat. From the experiments of Gay Lussac, it appears that the steam of water, and the vapour of ether, undergo the same dilatation with air when the same addition is made to their temperature. We may conclude then that all elastic fluids expand equally and uniformly by heat; and that

this expansion is nearly equable, though not perfectly so. The following table gives us the bulk of a given quantity of air at all temperatures from 32° to 212° .

Tem.	Bulk.	Tem.	Bulk.	Tem.	Bulk.
32°	100000	59°	105616	86°	111232
33	100208	60	105824	87	111440
34	100416	61	106032	88	111648
35	100624	62	106240	89	111856
36	100832	63	106448	90	112064
37	101040	64	106656	91	112272
38	101248	65	106864	92	112480
39	101456	66	107070	93	112688
40	101664	67	107280	94	112896
41	101872	68	107488	95	113104
42	102080	69	107696	96	113312
43	102288	70	107904	97	113520
44	102496	71	108112	98	113728
45	102704	72	108320	99	113936
46	102912	73	108528	100	114144
47	103120	74	108736	110	116224
48	103328	75	108944	120	118304
49	103536	76	109152	130	120384
50	103744	77	109360	140	122464
51	103952	78	109568	150	124544
52	104160	79	109776	160	126624
53	104368	80	109984	170	128704
54	104576	81	110192	180	130784
55	104784	82	110400	190	132864
56	104992	83	110608	200	134944
57	105200	84	110816	210	137024
58	105408	85	111024	212	137440

The expansion of liquid bodies differs from that of the elastic fluids, not only in quantity, but in the want of uniformity with which they expand when equal additions are made to the temperature of each. This difference seems to depend upon the fixity or volatility of the component parts of the liquid bodies; for in general those liquids expand most by a given addition of heat, whose boiling temperatures are lowest, or which contain in them an ingredient which readily assumes the gaseous form. Thus mercury expands less when heated to a given temperature than water, which boils at a heat much inferior to mercury; and alcohol is much more expanded than water, because its boiling temperature is lower. In like manner nitric acid is much more expanded than sulphuric acid; not only because its boiling point is lower, but because a portion of it has a tendency to assume the form of an elastic fluid. We may consider it therefore as a pretty general fact, that the higher the temperature necessary to cause a liquid to boil, the smaller the expansion is which is produced by the addition of a degree of heat; or, in other words, the expansibility of liquids is nearly inversely as their boiling temperature. Another circumstance respecting the expansion of liquids deserves particular attention. The expansibility of every one seems to increase with the temperature; or, in other words, the nearer a liquid is to the temperature at which it boils, the greater is the expansion produced by the addition of a degree of caloric; and, on the other hand, the farther it is from the boiling temperature, the smaller is the increase of bulk produced by the addition of a degree of caloric. Hence it happens, that the expansion of those liquids approaches nearest to equability whose boiling temperatures are highest; or, to speak more precisely, the ratio of the expansibility increases the more slowly, the higher the boiling temperature. These observations are sufficient to shew, that the expansion of liquids is altogether unconnected with their density. It depends upon the quantity of heat necessary to cause them to boil, and to convert them into elastic fluids. But we are altogether ignorant at present of the reason why different liquids require different temperatures to produce this change. The following table will give the reader a precise notion of the rate of expansion

pansion of those liquids which have been hitherto examined by chemical philosophers.

Temp.	Mer- cury.	Lin- seed oil.	Sul- phuric acid.	Nitric acid.	Water.	Oil of turpen- tine.	Alco- hol.
30°	100000	100000					100000
40	100081		99752	99514			100539
50	100183		100000	100000	100023	100000	101105
60	100304		100279	100486	100091	100460	101688
70	100406		100558	100990	100197	100993	102281
80	100508		100806	101530	100332	101471	102890
90	100610		101054	102088	100694	101931	103517
100	100712	102760	101317	102620	100908	102446	104162
110	100813		101540	103196		102943	
120	100915		101834	103776	101404	103421	
130	101017		102097	104352		103954	
140	101119		102320	105132		104573	
150	101220		102614		102017		
160	101322		102893				
170	101424		103116				
180	101526		103339				
190	101628		103587		103617		
200	101730		103911				
212	101835	107250			104577		

The expansion of solid bodies is so small, that a micrometer is necessary to detect the increase of bulk. As far as is known, the expansion is equable, at least the deviation from perfect equality is insensible. The following table exhibits the expansion of most of the solids which have been hitherto examined. Most of the experiments were made by Smeaton.

Temp.	Plati- num.	Anti- mony.	Steel.	Iron.	Cast- iron.	Bis- muth.
32°	120000	120000	120000	120000	120000	120000
212	120104	120130	120147	120151		120167
White heat.			123428	121500	122571	

	Cop- per.	Cast- brass.	Bras- wire	Tin.	Lead.	Zinc.
32°	120000	120000	120000	120000	120000	120000
212	124204	120225	120232	120298	120344	120355

	Hammer- ed zinc.	Zinc. 8. Tin 1.	Lead 2. Tin 1.	Brass 2. Zinc 1.	Pewter.	Copper 3. Tin 1.
32°	120000	120000	120000	120000	120000	120000
212	120373	120323	120301	120247	120274	120218

The expansion of glass is a point of great importance, as it influences the result of most experiments on temperature. It has been examined with much precision by M. de Luc. The rate of its expansion, as settled by that philosopher, may be seen in the following table:

Temp.	Bulk	Temp.	Bulk.	Temp.	Bulk.
32°	100000	100°	100023	167°	100056
50	100006	120	100033	190	100069
70	100014	150	100044	212	100083

From this table it appears, that when glass is heated one degree, it undergoes an expansion which amounts nearly to $\frac{1}{100000}$ of the whole bulk. On the supposition that metals expand equably, the expansion of a mass of metal, by being heated a given number of degrees, is as follows: let a = the expansion of the mass in length for 1° , which must be found by experiment; b = the number of degrees whose expansion is required; s = the solid contents of the metallic mass; x = the expansion sought; then $x = 3bas$. The property which bodies possess of expanding, when heat is applied to them, has furnished us with an instrument for measuring the relative temperature of bodies. See THERMOMETER. Having considered the phenomena and laws of expansion as far as they are understood, it will be proper to state the exceptions to this general effect of heat, or the cases in which expansion is produced not by an increase, but by a diminution of temperature. These exceptions may be divided into two classes. The first class comprehends certain liquid bodies which have a maximum of density corresponding with a certain temperature; and which, if they are heated above that temperature, or cooled down below it, undergo in both cases an expansion or increase of bulk. The second class comprehends certain liquids which suddenly become solid when cooled down to a certain temperature; and this solidification is accompanied by an increase of bulk. Water furnishes us with the most remarkable example of the first class of bodies. Its maximum of density corresponds with $42^\circ.5$ of Fahrenheit's thermometer, as has been lately ascertained by Mr. Dalton. If it be cooled down below $42^\circ.5$, it undergoes an expansion for every degree of temperature which it loses; and at 32° the expansion amounts, according to Mr. Dalton, to $\frac{1}{100000}$ of the whole expansion which water undergoes when heated from $42^\circ.5$ to 212° . With this more recent experiments coincide very nearly: for by cooling 100000 parts in bulk of water, from $42^\circ.5$ to 32° , they were converted to 100031 parts. We are indebted to the ingenuity of Mr. Dalton for the discovery of a very unexpected fact, that the expansion of water is the same for any number of degrees above or below the maximum of density. Thus if we heat water ten degrees above $42^\circ.5$, it occupies precisely the same bulk as it does when cooled down ten degrees below $42^\circ.5$. Therefore the density of water at 32° and at 53° is precisely the same. Mr. Dalton succeeded in cooling water down to the temperature of 5° without freezing, or $37^\circ.5$ below the maximum point of density; and during the whole of that range, its bulk precisely corresponds with the bulk of water the same number of degrees above $42^\circ.5$. Thus the bulk of water at 5° is the same as the bulk of water at 80° . The scale of expansion, therefore, which has been given for the expansion of water when heated, answers also for its expansion when cooled, provided the table begin at $42^\circ.5$, as is done in the table of the expansion of water. From this table it appears that the expansion of water, the original bulk being 100000, may be expressed pretty nearly by the following numbers:

Temp.	Expan.
$82^\circ.5$	6 ^a
$102^\circ.5$	8 ^a
$122^\circ.5$	10 ^a
$142^\circ.5$	12 ^a
$162^\circ.5$	14 ^a

The greatest deviation from these numbers is towards the beginning of the scales, when owing to the smallness of the expansion, it is difficult to measure it with precision. It leads us to this remarkable conclusion, that the squares of the natural numbers beginning at 6 indicate the increase of bulk which 10000 parts of water experience for every ten degrees they are heated above $32^\circ.5$, or cooled below $12^\circ.5$. This rule will give the reader a more precise idea of the rate at which water expands when heated or cooled, than a bare inspection of the table could do. A considerable number

number of liquids has been tried to ascertain whether any of them, like water, have a temperature in which their density is a maximum, and which expand when cooled below that temperature. Sulphuric acid has no such point, neither have the oily bodies; but some solutions of salt in water begin to expand before they become solid. These solutions, however, when cooled down sufficiently, crystallize with such rapidity, that it is extremely difficult to be certain of the fact, that they do begin to expand before they crystallize. That class of bodies which undergo an expansion when they change from a liquid to a solid body by the diminution of temperature, is very numerous. Not only water when converted into ice undergoes such an expansion, but all bodies which by cooling assume the form of crystals. The prodigious force with which water expands in the act of freezing has been long known to philosophers. Glass bottles filled with water are commonly broken in pieces when the water freezes. The Florentine academicians burst a brass globe whose cavity was an inch in diameter, by filling it with water and freezing it. The force necessary for this effect was calculated by Muschenbroek at 27720 lbs. But the most complete set of experiments on the expansive force of freezing water are those made by major Williams at Quebec, and published in the second volume of the Edinburgh Transactions. This expansion has been explained, by supposing it the consequence of a tendency which water, in consolidating, is observed to have to arrange its particles in one determinate manner, so as to form prismatic crystals, crossing each other at angles of 60° and 120°. The force with which they arrange themselves in this manner must be enormous, since it enables small quantities of water to overcome so great mechanical pressures. Various methods have been tried to ascertain the specific gravity of ice at 32°; that which succeeded best was to dilute spirits of wine with water till a mass of solid ice put into it remained in any part of the liquid without either sinking or rising. The specific gravity of such a liquid is 0.92, which of course is the specific gravity of ice, supposing the specific gravity of water at 60° to be 1. This is an expansion much greater than water experiences even when heated to 212°. We see from this, that water, when converted into ice, no longer observes that equable expansion measured by Mr. Dalton, but undergoes a very rapid and considerable augmentation of bulk. The very same expansion is observed during the crystallization of most of the salts; all of them at least which shoot into prismatic forms. Hence the reason that the glass vessels in which such liquids are left, usually break to pieces when the crystals are formed. This expansion of these bodies cannot be considered as an exception to the general fact, that bodies increase in bulk when heat is added to them; for the expansion is the consequence, not of the diminution of heat, but of the change in their state from liquids to solids, and the new arrangement of their particles which accompanies or constitutes that change. It must be observed, however, that all bodies do not expand when they become solid. There are a considerable number which diminish in bulk; and in these the rate of diminution in most cases is rather increased by solidification. When liquid bodies are converted into solids, they either form prismatic crystals, or they form a mass in which no regularity of arrangement can be perceived. In the first case, expansion accompanies solidification; in the second place, contraction accompanies it. Water and all the salts furnish instances of the first, and tallow and oils are examples of the second. In these last bodies the solidification does not take place instantaneously, as in water and salts, but slowly and gradually: they first become viscid, and at last quite solid. Most of the oils, when they solidify, form very regular spheres. The same thing happens to honey, and to some metals. It has been thought that all combustible liquids contract, when they become solid, while incombustible liquids expand; but there are exceptions to this rule. Sulphuric acid does not by congelation alter its appearance; but cast iron, and perhaps sulphur also, expand in the act of congelation.

EX PARTE, a term used in the court of chancery, when a commission is taken out and executed by one side or party only, upon the other parties neglecting or refusing to join therein. When both the parties proceed together, it is called a joint commission.

EX PARTE TALIS, a writ that lies for a bailiff or receiver, that having auditors assigned to pass his accounts, cannot procure from them reasonable allowance, but is cast into prison; in which case the practice is to sue this writ out of the chancery, directed to the sheriff to take the four mainpernors to bring his body before the

barons of the exchequer, on a certain day, and to warn the lord to appear at the same time.

EXPECTANCY, ESTATES IN, are of two sorts; one created by act of the parties, called a remainder; the other, by act of law, called a reversion.

EXPECTANT, in law signifies having relation to, or depending on: thus, where land is given to a man and his wife, and to their heirs, they have a fee simple estate; but if it be given to them and the heirs of their bodies begotten, they have an estate tail, and a fee expectant, which is opposed to fee simple.

EXPECTATION, in the doctrine of chances, is applied to any contingent event, and is capable of being reduced to the rules of computation. Thus a sum of money in expectation, when a particular event happens, has a determinate value before that event happens; so that if a person is to receive any sum, *e. gr.* 10l. when an event takes place, which has an equal probability of happening and failing, the value of the expectation is half that sum, or 5l. and in all cases the expectation of obtaining any sum is estimated, by multiplying the value of the sum expected by the fraction which represents the probability of obtaining it. The expectation of a person who has three chances in five of obtaining 100l. is equal to $\frac{3}{5} \times 100$ or 60l. and the probability of obtaining 100l. in this case is equal to $\frac{3}{5} = \frac{60}{100}$. See **CHANCES**.

EXPECTATION OF LIFE. See **ANNUITIES**.

EXPECTORANTS, in pharmacy, medicines which promote expectoration; such as squills, &c.

EXPECTORATION, the act of evacuating or bringing up phlegm, or other matters out of the trachea, lungs, &c. by coughing, hawking, spitting, &c.

EXPEDITATION, in the forest laws, signifies the cutting out of the balls of a dog's fore-feet for the preservation of the king's game. Every one living near the park, that keeps any great dog not expeditated forfeits 3s. 4d. to the king. In mastiffs, not the ball of the feet, but the three claws are to be cut to the skin.

EXPERIMENT, in philosophy, is the trial of the result or effect of the applications and motions of natural bodies, in order to discover some of their motions and relations, whereby to ascertain some of their phenomena or causes.

EXPERIMENTAL PHILOSOPHY, that philosophy which proceeds on experiments, which deduces the laws of nature, and the properties and powers of bodies, and their actions upon each other, from sensible experiments and observations. The business of experimental philosophy is to inquire into and to investigate the reasons and causes of the various appearances or phenomena of nature, and to make the truth or probability thereof obvious and evident to the senses, by plain, undeniable, and adequate experiments, representing the several parts of the grand machinery and agency of nature. In our enquiries into nature, we are to be conducted by those rules and maxims which are found to be genuine, and consonant to a just method of physical reasoning; and these rules of philosophizing are by the greatest master in science, sir Isaac Newton, reckoned four, which are as follows: 1. More causes of natural things are not to be admitted, than are both true, and sufficient to explain the phenomena; for nature does nothing in vain, but is simple, and delights not in superfluous causes of things. 2. And, therefore, of natural effects of the same kind, the same causes are to be assigned, as far as it can be done: as of respiration in man and beasts, of the descent of stones in Europe and America, of light in a culinary fire and in the sun, and of the reflection of light in the earth and in the planets. 3. The qualities of natural bodies which cannot be increased or diminished, and agree to all bodies in which experiments can be made, are to be reckoned as the qualities of all bodies whatsoever: thus, because extension, divisibility, hardness, impenetrability, mobility, the vis inertiae, and gravity, are found in all bodies which fall under our cognizance or inspection, we may justly conclude they belong to all bodies whatsoever, and are therefore to be esteemed the original and universal properties of all natural bodies. 4. In Experimental philosophy, propositions collected from the phenomena by induction are deemed (notwithstanding contrary hypotheses) either exactly or very nearly true, till other phenomena occur, by which they may be rendered either more accurate, or liable to exception. This ought to be done, lest arguments of induction should be destroyed by hypotheses. These four rules of philosophizing are premised by sir Isaac Newton to his

third book of the Principia; and more particularly explained by him in his Optics, where he exhibits the method of proceeding in philosophy, the first part of which is as follows: As in mathematics, so in natural history, the investigation of difficult things, by way of analysis, ought always to precede the method of composition. This analysis consists in making experiments and observations, and in drawing general conclusions from them by induction (*i. e.* reasoning from the analogy of things by natural consequence,) and admitting no objections against the conclusions, but what are taken from experiments or certain truths. And although the arguing from experiments and observation, by induction, be no demonstration of general conclusions, yet it is the best way of arguing which the nature of things admits of, and may be looked on as so much the stronger, by how much the induction is more general; and if no exception occur from phenomena, the conclusion may be pronounced generally; but if at any time afterwards any exception shall occur from experiments, it may then be pronounced with such exceptions: by this way of analysis we may proceed from compounds to ingredients, and from motions to the cause producing them; and, in general, from effects to their causes; and from particular causes to more general ones, till the argument ends in the most general: this is the method of analysis. And that of synthesis, or composition, consists in assuming causes, discovered and established as principles, and by them explaining the phenomena, proceeding from them, and proving the explanations. See PHILOSOPHY, and PHYSICS.

EXPERIMENTUM CRUCIS, a capital or decisive experiment; thus termed, either on account of its being like a cross, or direction post, placed in the meeting of several roads, as guiding men to the true knowledge of the nature of that thing they are inquiring after; or on account of its being a kind of torture, whereby the nature of the thing is as it were extorted by force.

EXPIATION, in a figurative sense, is applied to the pardon procured to the sins of the penitent by the merit of Christ's death.

EXPIATION, among the Heathens, was of several kinds; by sacrifices and religious washing. They were used for effacing a crime, averting any calamity, and on numberless other occasions, as purifying towns, temples, &c. and armies before and after battle. And they were performed for whole cities, as well as particular persons.

EXPIATION, among the Jews, was chiefly by sacrifice, whether for sins of ignorance, or to purify themselves from certain pollutions.

EXPIATION, THE FEAST OF, among the Jews, called by our translators the day of atonement, was held on the 10th day of Tisri, the seventh month of the Jewish year, answering to part of September and October. See Levit. xvi. xxiii. 27, &c.

EXPIRATION, in physic, that part of respiration whereby the air is expelled, or driven out of the lungs.

EXPIRATION, in chemistry, is applied to all sorts of evaporation, and subtle effluvia, that go off into the air.

EXPIRATION is also used for the end of any term agreed upon. It likewise signifies death.

EXPLOSION, in natural philosophy, a sudden and violent expansion of an aerial or other elastic fluid, by which it instantly throws off any obstacle, sometimes with incredible force, and in such a manner as to produce the most astonishing effects upon the neighbouring objects. Explosion differs from expansion, in that the latter is a gradual and continued power, acting uniformly for some time; whereas the former is always sudden, and only of momentary duration. The expansions of solid substances do not terminate in violent explosions; on account of their slowness, and the small space through which the metal, or other expanding substance, moves; though their strength may be equally great with that of the most active aerial fluids. Thus we find, that though wedges of wood, when wetted, will cleave solid blocks of stone, they never throw them to any distance, as is the case with gunpowder. On the other hand, it is seldom that the expansion of any elastic fluid bursts a solid substance, without throwing the fragments of it to a considerable distance, the effects of which are often very terrible. The reasons of the above phenomena are, 1. The immense velocity with which the aerial fluids expand, when effected by considerable degrees of heat; and, 2. Their celerity in acquiring heat, and being affected by it, which is much superior to that of solid substances. Thus air, heated as much as iron, when brought to a white heat, is expanded to four times its bulk; but

the metal will not be expanded the 500th part of the space. In the case of gun-powder, the velocity with which the flame moves is calculated by Mr. Robins, in his Treatise upon Gunnery, to be no less than seven thousand feet in a second, or nearly seventy-nine miles per minute. Hence the impulse of the fluid is inconceivably great, and the obstacles on which it strikes are hurried off with vast velocity, though much less than that just mentioned; for a cannon bullet, with the greatest charge of powder that can be conveniently given, does not move at a greater rate than two thousand four hundred feet per second, or little more than twenty-seven miles per minute. The velocity of the bullet again is promoted by the sudden propagation of the heat through the whole body of air, as soon as it is extricated from the materials of which the gun-powder is made; so that it is enabled to strike all at once, and thus greatly to augment the momentum of the ball. It is evident that this contributes very much to the force of the explosion, by what happens when powder is wetted or mixed with any substance, which prevents it from taking fire all at once. In this case the force of the explosion, even when the same quantity of powder is made use of, is vastly inferior to that of dry powder. Upon these principles we may conclude, that the force of an explosion depends, 1. On the quantity of elastic fluid to be expanded. 2. On the velocity it acquires by a certain degree of heat; and, 3. On the celerity with which the degree of heat affects the whole of the expandible fluid. These three take place in the greatest perfection where the electric fluid is concerned; as in cases of lightning, earthquakes, and volcanoes.

EXPONENT, [from *expono*, to shew,] in algebra, is a number placed over any power or involved quantity, to shew to what height the root is raised: thus 2 is the exponent of x^2 , and 4 the exponent of x^4 , &c. See ALGEBRA.

EXPONENTIAL CALCULUS. See CALCULUS.

EXPONENTIAL CURVE is that whose nature is defined or expressed by an exponential equation; as the curve denoted by $a^x = y$, or by $x^a = y$. The area of any exponential curve, whose nature is expressed by this exponential equation $x^a = y$

(making $1 + v = x$) will be $\frac{1}{0.1.2} v^2 + \frac{1}{0.1.2.3} v^3 - \frac{1}{0.1.2.3.4} v^4 + \frac{1}{0.1.2.3.4.5} v^5 - \frac{1}{0.1.2.3.4.5.6} v^6$, &c.

EXPONENTIAL EQUATION is one in which is contained an exponential quantity: as the equation $a^x = b$, or $x^a = ab$, &c.

EXPONENTIAL QUANTITY is a quantity whose power is a variable quantity, as x^a , a^x . Exponential quantities are of several degrees and orders, according as the exponents themselves are more or less involved. If the exponent be a simple quantity, as 2^x , it is called an exponential of the first or lowest degree; but when the

exponent itself is an exponential of the first degree as 2^x it is called an exponential of the second degree. In like manner, if the

exponent itself be an exponential of the second degree, as 2^{x^2} , it is called an exponential of the third degree, &c.

EXPORTATION. See TRADE.

EXPOSING, in the Latin church, the sacrament is said to be exposed when it is shewn in public uncovered on festival days, and during the time of plenary indulgences.

EXPOSING OF CHILDREN, a barbarous custom practised by most ancient nations, excepting the Thebans, who had an express law, whereby it was made capital to expose children, and ordained that such as were not in a condition to educate them should bring them to the magistrates, to be brought up at the public expence. Among the other Greeks, when a child was born, it was laid on the ground; and if the father designed to educate his child, he immediately took it up: but if he forbore to do this, the child was carried away and exposed.

EXPRESSED OILS, in chemistry, such oils as are obtained from bodies only by pressing. See OIL.

EXPRESSION, in algebra, any algebraical quantity, simple or compound; as $3a$, $2ab$, or $4ax + d$, &c.

EXPRESSION, in chemistry, or pharmacy, denotes the act of pressing out the juices of vegetables, which is one of the three ways of obtaining them; the other two being by infusion and decoction. See PHARMACY.

EXPRESSIO.

EXPRESSION, in painting, is the distinct exhibition of character in the general object of the work, or of sentiment in the characters or persons represented. In the latter case it consists either in representing the body in general and all its parts severally, in actions most peculiarly suitable to the design of the picture, and marking thereby the emotions of the soul in the various figures, or in portraying in the face the appearances of the passions. In this sense the term expression has been frequently confounded with passion; but the former implies a representation of its object agreeable to its nature and character, and to the office it holds on the picture; while the latter denotes merely a particular turn or motion of the body, or of the muscles and features of the face, which marks any violent agitation of the soul: so that every passion is an expression, but not every expression a passion. See **PAINTING** and **DRAWING**.

EXPRESSION, in rhetoric, elocution, diction, or choice of words in a discourse. Beautiful expression is the natural and true light of our thoughts: it is to this we owe all the excellencies in discourse, which gives a kind of vocal life and spirit. As the principal end of discourse is to be understood, the first thing we should endeavour to obtain is a richness of expression, or habit of speaking so well as to make our thoughts easily understood. See **ORATORY**.

EXSPUITION, [*expusio*, Latin,] a discharge of saliva by spitting.

EXTASY, [*ecstasy*,] a transport which suspends the function of the senses, by the intense contemplation of some extraordinary or supernatural object, or when God impresses on the imagination the extraordinary ideas of any thing he would reveal.

EXTASY, in medicine, a species of catalepsy, when a person perfectly remembers after the paroxysm is over, the ideas he conceived during the time it lasted. In an extasy there must be an unusual tension of the sensory, as is common in delirium, &c.

EXTEND, in law, signifies to value the lands or tenements of a person bound by a statute, &c. who has forfeited the same, at such an indifferent rate, that by the yearly rent the creditor in time may be paid his debt. See **EXTENT**.

EXTENDI FACIAS, a writ to extend lands, &c. See the preceding article.

EXTENSION, in philosophy, one of the common and essential properties of body, or that by which it possesses or takes up some part of universal space, which is called the place of that body. Extension is threefold, 1. Either into length only, and then it is called a line. Or, 2. Into length and breadth, which is called a superficies. Or, 3. Into length, breadth, and depth, which is called a solid; being the three dimensions according to the quantity of which the magnitude or bulk of bodies are estimated. See **LINE**, **SUPERFICIES**, and **SOLID**. See also **PHYSICS** and **METAPHYSICS**.

EXTENSOR, an appellation given to several muscles, from their extending or stretching the parts to which they belong.

EXTENT, in law, is used for, 1. a writ to the sheriff for the valuing of lands or tenements; and 2. the act of the sheriff, or commissioner, upon this writ.

EXTENUATION, a figure in rhetoric, the opposite of the hyperbole. The Greeks call it *σβαλιν*.

EXTERMINATION, or **EXTERMINATING**, in algebra, is used for taking away. Thus algebraists speak of exterminating surds, fractions, and unknown quantities, out of equations. See **MACLAUR. ALGEBR. part. i. chap. 12**, where we have some general theorems for the exterminating of unknown quantities in given equations. See also **ALGEBRA**, in this work.

EXTERNAL ANGLES, are the angles on the outside of any right-lined figure, when all the sides are severally produced, and they are all, taken together, equal to four right angles. See **GEOMETRY**.

EXTINGUISHMENT, in law, is a consolidation, where one has due to him a yearly rent, and afterwards purchases the lands out of which the rents arise; both the property and the rent being thus united in one possessor, the rent is said to be extinguished.

EXTIRPATIONE, in law, a judicial writ that lies against a person, who, after a verdict found against him for land, &c. maliciously overthrows a house, or extirpates any trees upon it.

EXTIRPATION, in surgery, the cutting off of any part entirely, as a wen, &c. or the eating of it away, as a wart, &c. by corrosive medicines.

EXTISPEX, [Lat.] in antiquity, the person who drew presages from viewing the entrails of animals offered in sacrifice.

EXTORTION, in law, is an illegal manner of wresting any thing from a man, either by force, menace, or authority. It is also the exaction of unlawful usury, winning by unlawful games, and taking more than is due under pretence of right, as excessive tolls in millers, &c. At the common law, extortion is punishable by fine and imprisonment; and the statute of 3 Eliz. 1, c. 30, has enacted, that officers of justice guilty of extortion for the expedition of business, &c. shall render to the party treble value. There are likewise divers other statutes for punishing extortions of sheriffs, bailiffs, gaolers, clerks of the assize, and of the peace, attorneys, solicitors, &c.

EXTRA, a Latin preposition signifying without, and used in composition with other words, as for instance, 1. Extra-judicial, where judgement is given in a cause that is not depending in the court where the same passed; or whereon the judgement has no jurisdiction. 2. Extra-parochial, which is said of places out of the bounds of any parish, or freed from the duties of a parish. The greatest part of the forests in England are extra-parochial.

EXTRACTION, in genealogy, implies the stock or family from which a person is descended.

EXTRACTION, in surgery, is the drawing of any foreign matter out of the body by the hand, or by the help of instruments. See **SURGERY**.

EXTRACTION OF ROOTS, in algebra and arithmetic, the methods of finding the roots of given numbers or quantities. See **ALGEBRA**, and **ARITHMETIC**.

EXTRACTOR, in midwifery, an instrument for extracting children by the head.

EXTRACTS, in pharmacy, are those medicinal preparations obtained by boiling vegetable substances in water, and evaporating the strained decoction in broad, shallow vessels, to a thick consistence. Thus the most active parts of the plants are separated from the useless insoluble earthy matter. As extraction is a chemical process, generally performed by the apothecary, we shall only observe, that the following extracts are directed to be kept in the shops by the London college: viz. extract of broom-tops; of cascarrilla; of chamomile; of Peruvian bark with, and without, its resin; of colocynth compounded with aloe, scammony, &c.; of gentian; of liquorice; of black hellebore; of jalap; of log-wood; of white poppy; of rue; of savin; of senna; of wild cucumbers, &c.

EXTRADOS, the outside of an arch of a bridge, vault, &c.

EXTRAJUDICIAL, in law, is when judgement is given in a cause, not depending in that court where it is given, or wherein the judge has no jurisdiction.

EXTRAORDINARIUM, among the Romans, was a body of men consisting of a third part of the foreign horse, and a fifth of the foot, which was separated from the rest of the forces borrowed from the confederate states with great policy and caution, to prevent any design that they might entertain against the natural forces.

EXTRAVAGANTES, decretal epistles published after the Clementines; so called, because at first they were not ranged with the other papal constitutions, but seemed to be detached from the canon law. They were afterwards inserted in the body of the canon law.

EXTRAVASATION, arises from the bursting or breaking of one or more of the blood-vessels, after contusions, fractures, and other injuries of the head, as well as other parts of the body: this accident is attended with such a copious discharge of blood, as frequently occasions the most violent pain, and death itself, unless the patient be timely relieved. See **MEDICINE** and **SURGERY**.

EXTREME, and **MEAN PROPORTION**, in geometry, is when a line is so divided, that the whole line is to the greater segment, as that segment is to the other: or, when the line is so divided, that the rectangle under the whole line, and the less segment, is equal to the square of the greater segment.

EXTREMES, in logic, denote the two extreme terms of the conclusion of a syllogism, viz. the predicate and subject. They are called extremes, from their relation to another term, which is a medium or mean between them. The predicate, as being likewise had in the first proposition, is called the *major extremum*, greater extreme; and the subject, as being put in the second or

minor proposition, is called the minus extremum, less extreme. Thus, in the syllogism, man is an animal; Peter is a man, therefore Peter is an animal; the word animal is the greater extreme, Peter the less extreme, and the man the medium. See SYLLOGISM, and LOGIC.

EXTREMES CONJUNCT, and **EXTREMES DISJUNCT**, in spherical trigonometry, are, the former the two circular parts that lie next the assumed middle part, and the latter are the two that lie remote from the middle part. These were terms applied by lord Napier, in his universal theorem for resolving all right-angled and quadrantal spherical triangles, and published in his *Logarithmorum Canonis Descriptio*, 1614. In this theorem, Napier condenses into one rule, in two parts, the rules for all the cases of right-angled spherical triangles, which had been separately demonstrated by Pitiscus, Lansbergius, Copernicus, Regiomontanus, and others. See TRIGONOMETRY.

EXTREME UNCTION. See UNCTION.

EXTREMITIES OF FIGURES in painting, are the head, hands, and feet. These should be drawn with more nicety and exactness, or more terminated than other parts; and thus help to render the action more expressive.

EXTRINSIC, among metaphysicians, is taken in various senses: as, 1. a thing's not belonging to the essence of another; in which sense, the efficient cause and end of a thing are said to be extrinsic: 2. a thing's not being contained within the capacity of another; in which sense, those causes are called extrinsic which introduce something into a subject from without, as when a fire introduces heat: 3. a thing added or applied to another; in which sense accidents and adherents are said to be extrinsic to the subjects to which they adhere: 4. the vision is said to be extrinsic from some form which does not exist in that thing, but is adjacent to it, or by some means or other without it.

EXVERRÆ, or **EXVERRIÆ**, in antiquity, a kind of besom, used in cleansing houses out of which a dead person had been carried.

EXVERRIATOR, or **EVERRIATOR**, a title given to the heir of one deceased, from his being obliged to perform the ceremony of sweeping with the exverræ. See the last article.

EXUVIÆ, [Lat.] cast skins; cast shells; whatever is thrown off, or shed by animals.

EXUVIÆ, is also used for some shells, and other marine bodies, frequently found in the bowels of the earth; supposed to have been deposited there at the deluge, as being the real spoils of once living creatures.

EYBENSTADT, or **EYBENSTOCK**, a considerable mine town of Upper Saxony, seven miles S. W. of Schwartzenberg.

EYE, [*oculus*], in anatomy, the organ of sight; or that part of the body, whereby visible objects are represented to the mind. See ANATOMY, and OPTICS. A new-born child never keeps its eyes fixed on any one object, but continually changes from one to another; and if a hand is put before them, the child will not wink. Hence some have thought that new-born infants have no sight, but this is a mistake. The true reason why their eyes are in perpetual motion is, that they have not yet acquired the habit of examining one thing at once with their eyes: their not winking at the approach of the hand, arises from their want of experience how easily their eyes may be hurt; but in a few days they get the habit of winking, and afterwards wink spontaneously at the approach of danger.

EYE OF A DOME, an aperture at the top of a dome, as that of the Pantheon at Rome, or of St. Paul's at London: it is usually covered with a lantern.

EYE, in agriculture and gardening, signifies a little bud, inserted into a tree by way of graft. See GRAFTING.

EYE OF A TREE, a small pointed knot to which the leaves stick, and from which the shoots or sprigs proceed. See GEMMA.

EYE, a river of Scotland, which rises in the N. W. of Berwickshire, and falls into the British ocean at Eyemouth.

EYE, a town of Suffolk, near the borders of Norfolk, 21 miles N. of Ipswich.

EYE, a town of Norway, 36 miles S. of Bergen.

EYE, BULL'S. See ALDEBARAN, and BULL'S EYE.

EYE OF A BLOCK, in naval affairs, that part of the rope-strop which is fastened to some necessary place in the ship: the strop is a sort of wreath, or rope formed into a ring, and fixed round the block for the double convenience of strengthening the block, and fastening it in any place where it is wanted.

EYE-BRIGHT. See EUPHRASIA.

EYE-BROWS. See ANATOMY.

EYE-LIDS. See ANATOMY.

EYEMOUTH, a town of Scotland, at the mouth of the Eye, 9 miles N. by W. of Berwick. Lon. 1. 50. W. Lat. 55. 50. N.

EYERLANDT, an island of Batavia, in the department of the Texel, at the entrance into the Zuyder Zee.

EYESDALE, a small island of Scotland, on the coast of Argyshire, S. E. of Mull; famous for slates.

EYMOUTIERS, a town of France, in the department of Dordogne; 15 miles N. of Périgueux.

EYMOUTIERS, a town of France, in the department of Upper Vienne, 18 miles N. of Limoges.

EYNDHOVEN, or **EIENHOVEN**, a town of Batavia, in the department of Dommel and Scheldt, and late province of Dutch Brabant; 17 miles S. of Bois-le-duc.

EYRAC, or **IRAC**, **AGEMI**, the principal province of Persia, anciently called Parthia.

EYRAC, or **IRAC**, **ARABIA**, a province of Turkey in Asia, 345 miles in length, and 190 in breadth. Bagdad is the capital.

EZAGEN, or **EZAGUEN**, an ancient and opulent town in the kingdom of Fez, and province of Habat, 60 miles S. of Tetuan.

EZEKIEL, [עִזְקִיָּאל, Heb. *i. e.* the strength of God,] a celebrated prophet and priest among the Jews, who was carried captive to Babylon with Jeconiah, and began his prophesies in the fifth year of the captivity, A. M. 3409. He was cotemporary with Jeremiah, who prophesied at the same time in Judea. He foretold many events, particularly the destruction of the temple, the fatal catastrophe of those who revolted from Babylon to Egypt, and the happy return of the Jews to their own land.

EZEKIEL, a canonical book of the Old Testament, referring chiefly to the degenerate manners and corruptions of the Jews of those times. It abounds with fine sentences and rich comparisons, and shews the author to have had much learning.

EZEL, an island of Russia, in the Baltic, of a triangular form, eight miles in circumference.

EZETOVA, a river of Russia, which runs into the Gulf of Ob-skala.

EZRA, [עֶזְרָא, Heb. *i. e.* a helper,] an eminent author, priest, and lawyer, among the Jews, and a chief director of their church and state under Artaxerxes I. See ESDRAS. This illustrious author was also the restorer and publisher of the canon of the Old Testament.

EZRA, a canonical book of the Old Testament; comprehending the history of the Jews from the time of Cyrus's edict for their return, to the 20th year of Artaxerxes Longimanus. It specifies the number of Jews who returned, and Cyrus's proclamation for the rebuilding of the temple, together with the laying of its foundation, the obstruction it met with, and the finishing thereof in the reign of Darius.

F.

F, the sixth letter of the alphabet, and fourth consonant, is by some reckoned a mute, and by others a semi-vowel: it has much the same sound with the Greek ϕ , or *ph*; in English words, and is only written in words of Latin origin, *ph* being used instead of it in those derived from the Greek. Suetonius tells us, that the emperor Claudius invented the *f*, and two other letters; and that it had the force of *v* consonant, and was wrote inverted *g*. I. *F*, in music, is the fourth note in rising, in this order of the gamut, ut, re, mi, fa. It likewise denotes one of the Greek keys in music, destined for the bass. II. As an abbreviation, *F*, in physical prescriptions; stands for fiat, i. e. let it be done, or made up. Thus *f. s. a.* signifies fiat secundum artem. *F*, in the civil law, doubled thus, *ff*, signifies the pandects. See **PANDECTS**. *F*, in the criminal law, was a stigma put upon felons with a hot iron, on their being admitted to the benefit of clergy; by stat. 4 Hen. 7. c. 13. III. *F*, as a numeral, anciently signified 40, and when a dash was added at top, (thus *F̄*) it stood for 40,000.

FA, in music, the fourth note of the gamut. See **F**. Musicians distinguish two *fa*'s, viz. the flat, marked with a *b*, or $\flat$; and the sharp, or natural, marked thus *♯*, and called also *biquadro*.

FAABORG, a sea-port town of Denmark, on the S. coast of the isle of Funen, 17 miles S. of Oldensee. Lon. 10. 16. E. Lat. 55. 12. N.

FABA, in botany. See **VICIA**.

FABER, a fish of the zeus kind, called in English doree, or john doree. See **ZEUS**.

FABIANE, a river of N. America, in Louisiana, which runs S. E. and falls into the Mississippi, in Lat. 39. 30. N.

FABIUS, the surname of a powerful patrician family at Rome, who derived their name from *faba*, a bean, because some of their ancestors cultivated this pulse. They were once so numerous that they took upon themselves to wage a war against the Veientes. They came to a general engagement near the Cremera, in which all the family, consisting of 306 men, were slain, A. U. C. 277. There only remained one boy, whose tender age had detained him at Rome, and from him descended the noble Fabii of the following ages.

FABIUS MAXIMUS, QUINTUS, a celebrated Roman, who from a dull and inactive childhood was raised to the highest offices of the state. In his first consulship he obtained a victory over Liguria, and the fatal battle of Thrasymenus occasioned his election to the dictatorship. In this important office he began to oppose Hannibal, not by fighting him in the open field, like his predecessors, but by continually harassing his army by countermarches and ambuscades, from which he received the surname of Cunctator, or the Delayer. Hannibal sent him word, that "if he was as great a captain as he would be thought, he ought to come into the plain and give him battle." But Fabius coldly replied, "that if he was as great a captain as he would be thought, he would do well to force him to fight." Such operations for the commander of the Roman armies gave offence to some: and Fabius was even accused of cowardice. He, however, continued firm in his resolution; and patiently bore to see his master of horse raised to share the dictatorial dignity with himself, by his enemies at home. When he had laid down his office of dictator, his successors, for a while, followed his plan; but the rashness of Varro, and his contempt for the operations of Fabius, occasioned the fatal battle of Cannæ. Tarentum was obliged to surrender to him after the battle of Cannæ; and on that occasion the Carthaginians observed, that Fabius was the Hannibal of Rome. When he had made an agreement with Hannibal for the ransom of the captives, which was totally disapproved by the Roman senate, he sold all his estates to pay the money, rather than forfeit his word to the enemy. The bold proposals of young Scipio to carry the war from Italy to Africa, was rejected by Fabius as chimerical and dangerous. He did not, however, live to see the success of the Roman arms under Scipio, and the conquest of Carthage by measures which he treated with contempt, and heard with indignation. He died in the 100th year of his age, after he had been five times consul, and twice honoured

with a triumph. The Romans were so sensible of his great merit and services, that the expences of his funeral were defrayed from the public treasury.

FABIUS MAXIMUS, QUINTUS, son of the preceding, shewed himself worthy of his father's virtues. During his consulship he received a visit from his father on horseback in the camp. The son ordered the father to dismount; and the old man cheerfully obeyed, embracing his son, and saying, "I wished to know whether you know what it is to be consul?" He died before his father, who with the moderation of a philosopher, delivered a funeral oration over his son's body.

FABIUS MAXIMUS RULLIANUS was the first of the Fabii who obtained the surname of Maximus, for lessening the power of the populace at elections. He was master of horse, and his victory over the Samnites in that capacity nearly cost him his life, because he engaged the enemy without the command of the dictator. He was five times consul, twice dictator, and once censor. He triumphed over seven different nations, and rendered himself illustrious by his patriotism.

FABIUS PICTOR, a Roman general and historian. He first introduced painting at Rome; and having caused the walls of the temple of Health to be painted, some authors have erroneously reckoned him a painter. He died about B. C. 216.

FABLE, [*fabula*, Lat.] a tale or feigned narration, designed either to instruct or divert, disguised under the allegory of an action, &c. Fables were the first pieces of wit that made their appearance in the world, and have been still highly valued, not only in times of the greatest simplicity, but among the most polite ages of the world. Jotham's fable of the trees is the oldest that is extant, and as beautiful as any that have been made since. Nathan's fable of the poor man is next in antiquity, and had so good an effect as to convey instruction to the ear of a king. We find Æsop, in the most distant ages of Greece; and in the early days of the Roman commonwealth, we read of a mutiny appeased by the fable of the belly and the members. As fables had their rise in the very infancy of learning, they never flourished more than when learning was at its greatest height; witness Horace, Boileau, and Fontaine.

FABLE is also used for the plot of an epic or dramatic poem, and is, according to Aristotle, the principal part, and, as it were, the soul of a poem. See **POETRY**.

FABRETTI, RAPHAEL, LL.D. a learned Italian author and antiquary, born at Urbino, in 1619. He studied at Cagli, and took his degree at Urbino, in his 18th year. Cardinal Imperiali sent him into Spain, where he continued thirteen years, and was for some time auditor general of the Nunciature. On his return to Rome, he was appointed judge of appeals, and afterwards inspector of reliques. Pope Alexander VIII. appointed him Secretary of memorials, and Innocent XII. made him keeper of the archives of St Angelo. In the midst of all this business he found time to cultivate his favourite study of antiquities, and upon which he wrote several tracts in Latin, particularly, 1. *De Aquæ & Aquæ Ductibus Veteris Romæ*: 2. *De Columna Trajana*: 3. *Inscriptionum Antiquarum Explicatio*, &c. He was admitted a member of the academy of Asorditi at Urbino, and of the Arcadi at Rome, and died Jan. 7, 1700.

FABRIANO, a town of Italy, in the marquisate of Ancona, at the foot of the Apennines, 16 miles N. of Nocera.

FABRIC-LANDS, those formerly given towards rebuilding or repairing cathedrals and other churches; for anciently almost every body gave more or less, by his will, to the fabric of the parish-church where he dwelt.

FABRICIA, in botany, a genus of the icosandria monogynia class and order. Calyx five-cleft, half superior; five petals, without claws; stigma capitate; capsule many-celled; seeds winged. It has two species: viz. the myrtifolia, and the levigata, natives of New Holland.

FABRICIUS, CAIUS, a celebrated Roman, who in his first consulship, A. U. C. 470, obtained several victories over the Sam-

nites and Lucanians, and was honoured with a triumph. The riches acquired in those battles were immense, the soldiers were liberally rewarded, and the treasury was enriched with 400 talents. Two years after, Fabricius went as ambassador to Pyrrhus, and refused with contempt presents and offers, which might have corrupted the fidelity of a less virtuous citizen. Pyrrhus admired the magnanimity of Fabricius, but his astonishment was excited to the highest pitch, when Fabricius discovered to him the villainy of his own physician, who had offered to the Roman general, for a sum of money, to poison his royal master. To this greatness of soul was added the most consummate knowledge of military affairs, and the greatest simplicity of manners. Fabricius never used rich plate at his table. A small salt-cellar, the feet of which were of horn, was the only silver vessel which appeared in his house. This contempt of luxury Fabricius wished to inspire among the people; and during his censorship he banished from the senate Cornelius Rufinus, who had been twice consul and dictator, because he kept in his house more than ten lib. weight of silver plate. Such were the manners of the conqueror of Pyrrhus, who observed that he wished rather to command those that had money than possess it himself. He lived and died in virtuous poverty; his body was buried at the public charge; and the Roman people gave a dowry to his two daughters when they had arrived to years of maturity.

FABRICIUS, GEORGE, a learned German, born at Chemnitz in Misnia, in 1516. After a liberal education, he visited Italy in quality of a tutor to a young nobleman; and examining all the remains of antiquity with great accuracy, compared them with their descriptions in Latin writers. The result of these observations was his work intitled "Roma," containing a description of that city. He afterwards settled at Misenum, where he conducted a great school till his death in 1571. He also wrote seven books of the "Annals of Misnia," three of the "Annals of Meissen," Travels, and many sacred poems in Latin.

FABROT, CHARLES HANNIBAL, one of the most celebrated civilians of his time, was born at Aix in 1681; and acquired an extraordinary skill in the civil and canon law, and in the belles lettres. He published the "Basilicæ, or Constitutions of the Emperors of the East," in Greek and Latin, with learned notes, in 7 vols. folio; and editions of "Cedrenus, Nicetas, Anastasius, Bibliothecarius, Constantine Manasses, and Cujas," with learned and curious notes.

FACADE, [Fr.] the face or front of a building.

FACALA, or FACALE, a sea-port of Japan, where the Jesuits formerly had a church and establishment.

FACE, [*facies*,] generally signifies the visage of any animal: it is more particularly applied to the human countenance; being the only conspicuous part of the body. The human face is called the image of the soul, because it is the seat of the principal organs of sense, and the place where the ideas and emotions of the mind are most obviously displayed. It has always been considered the most comely and expressive part of the frame, so that various lotions, powders, &c. have been invented for beautifying and restoring ugly or decayed countenances. Such practice, however, though sanctioned by the folly and caprice of fashion, cannot be too severely censured. The face also serves to indicate the sex, age, temperament, health, disease, &c. As the index of the passions, habits, &c. of the person, it makes the subject of physiognomy. See **PHYSIOGNOMY**.

FACE, among painters and artists, denotes a certain dimension of the human body, adapted for determining the proportion which the several parts should bear to one another. See **DRAWING**.

FACE, or FACADE, in architecture, the front of a building, or the side which contains the chief entrance. Sometimes, however, it is used for whatever side presents to the street, garden, court, &c. or is opposite to the eye.

FACE, in fortification, an appellation given to several parts of a fortress, as the face of a bastion, &c. See **FORTIFICATION**.

FACE, in the military art, a word of command, intimating to turn about: thus, "Face to the right," is to turn upon the left heel a quarter-round to the right; and "Face to the left," is to turn upon the right heel a quarter-round to the left.

FACET, or FACETTE, among jewellers, the name of the

little faces or planes to be found in brilliant and rose diamonds.

FACTION, in antiquity, a name given to the different companies of combatants in the circus. They were four; viz. the white, the red, the green, and the blue; to which Domitian added another of purple colour. They were so denominated from the colour of the liveries they were; and were dedicated, according to M. Aur. Cassiodorus, to the four seasons of the year; the green being consecrated to spring, the red to summer, the white to autumn, and the blue to winter. It appears from ancient inscriptions, that each faction had its procurators and physician; and from history, that party rage ran so high among them, that in a dissension between two factions, in the time of Justinian, almost 40,000 men lost their lives in the quarrel.

FACTITIOUS, any thing made by art, in opposition to what is the produce of nature. Thus, factitious cinnabar is opposed to native cinnabar.

FACTOR, in commerce, is an agent or correspondent residing beyond the seas, or in some remote part, commissioned by merchants to buy or sell goods on their account, or assist them in carrying on their trade.

FACTORS are employed by merchants residing at other places, to buy or sell goods, negotiate bills, &c. on their account; and are entitled to a certain allowance for their trouble. A supercargo differs from a factor in this: the business of the former is limited to the care of a particular cargo; he goes along with it, and generally returns when his business is completed: the latter has a fixed residence abroad, and executes business for different merchants. But their duties, and the circumstances for which they are accountable, are the same. The duty of a factor is to procure the best intelligence of the state of the trade at his place of residence; of the course of exchange; of the quantity and quality of goods at market, their current price, and the probability that it may rise or fall; to pay exact obedience to the orders of his employers; to consult their advantage in matters referred to his direction; to execute their business with all the dispatch that circumstances admit; to be early in his intelligence, distinct in his accounts, and punctual in his correspondence. A factor's power is either absolute or limited. Though entrusted with ample discretionary powers, he is not warranted to take unreasonable or unusual measures, or do any thing contrary to his employer's interest; but it is incumbent on the employer, if he challenge his proceedings, to prove that he could have done better, and was guilty of wilful mismanagement. When a factor's power is limited, he must adhere strictly to his orders. If he exceed his power, though with a view to his employer's interest, he is liable for the consequence. For example, if he give credit when not empowered, or longer credit if not empowered, for the sake of a better price, and the buyer prove insolvent, he is liable for the debt. A factor has no power to give credit unless authorised: but if the goods consigned be generally sold on credit at the place of consignment, the factor will be vindicated for selling at the usual credit, unless expressly restricted. Although opinion will never justify the factor for departing from orders, necessity sometimes will. If he be limited not to sell goods under a certain price, and the goods be perishable, and not in a situation for being kept, he may sell them, to prevent their destruction, even under the price limited. A factor is never warranted to deal on trust, except with persons in good credit at the time. If the employer challenge the debtors, it is incumbent on him to prove that their bad circumstances was known at the time of sale; and the factor will be vindicated, if he trusted them at the same time for goods of his own. If the factor sell his employer's goods on trust, and, after the day of payment is elapsed, receive payment from the purchaser for a debt of his own, he becomes liable in equity for the debt. In case of bankruptcy, the factor ought immediately to lay attachments, and advise his employers; and he cannot withdraw his attachments, nor compound debts without orders. If a factor sell goods belonging to different merchants to the same person, and the buyer prove insolvent, they shall bear the loss in equal proportions; and, if the buyer have paid part before his insolvency, without specifying for which, the payment ought to be distributed in equal proportions; but, if the days of payment be fixed, and part of the debts only due, the payment ought to be applied, in the first place, to such debts as were due. If he make a wrong entry

entry at the custom-house, and the goods be seized in consequence thereof, he must bear the loss, unless the error be occasioned by a mistake in the invoice, or letter of advice. The owner bears the loss of goods seized when attempted to be smuggled by his orders: but the factor complying with an unlawful order is liable in such penalties as the laws exact. If a factor save the duty of the goods due to a foreign prince, he shall have the benefit; for, if detected he bears the loss. If a factor sell goods bought by his employer's orders for his own advantage, the employer may recover the benefit, and the factor shall be amerced for the same. If a factor receive bad money in payment, he bears the loss; but if the value of the money be lessened by the government, the employer bears the loss. A factor is not liable for goods spoiled, robbed, or destroyed by fire. If a factor receive counterfeit jewels from his employer, and sell them, the employer is liable to indemnify him for any penalties he may incur. If a factor be ordered to make insurance, and neglect it, and the subject be lost, he is liable to make it good, providing he had effects in his hands. If a factor buy goods for his employer, his bargain shall be binding on the employer. In case of a factor's insolvency, the owner may reclaim his goods; and, if they be sold on trust, the owner (and not the factor's creditors) shall recover payment of the debts.

FACTOR, in multiplication, a name given to the multiplier and multiplicand, because they constitute the product. See **ARITHMETIC**.

FACTORAGE, called also commission, is the allowance given to factors by the merchants who employ them.

FACTORY is a place where a considerable number of factors reside, to negotiate for their masters and employers. The most considerable factories belonging to the British are those established in the East Indies. There were also factories in Portugal, Turkey, and at Hamburg, Petersburg, Dantzic, and Amsterdam, all endowed with certain privileges. The ascendancy of the French Emperor, for the present, at least, has put an end to these, or to most of them. However, we indulge a strong hope that the event will at length prove favourable to our interest.

FACTUM, [Lat.] in arithmetic, the product of two quantities multiplied by each other.

FACTURE, [French,] the act or manner of making any thing.

FACULÆ, [Lat. from *fax*, a torch,] in astronomy, a name given by Scheiner and others, to certain bright spots on the sun's disk, that appear more lucid than the rest of his body. Hevelius affirms, that on July 20, 1634, he observed a facula, whose breadth was equal to one-third of the sun's diameter. Kircher, Scheiner, and others, represent the sun's body, as full of these faculae; which they suppose to be volcanos; and others contend, that the maculae change into faculae before they disappear. But Huygens and others of the latest and best observers, finding that the best telescopes discover nothing of the matter, agree entirely to explode the phenomena of faculae; and attribute the cause of these appearances to the tremulous agitation of the vapours near our earth. Dr. Hutton concludes that "the faculae are not eruptions of fire and flame, but refractions of the sun's rays in the rarer exhalations, which, being condensed, seem to exhibit a light greater than that of the sun." Math. Dict. vol. i. p. 466.

FACULTY, a term used to denote the powers of the human mind, viz. understanding, will, memory, and imagination. See **UNDERSTANDING** and **METAPHYSICS**.

FACULTY, in law, a privilege granted to a person, by favour and indulgence, of doing what, by law, he ought not to do. For granting these privileges, there is a court under the archbishop of Canterbury, called the court of the faculties. The chief officer of this court is styled master of the faculties, and has a power of granting dispensations in divers cases; as, to marry without the bans being first published, to eat flesh on days prohibited, to ordain a deacon under age, for a son to succeed his father in his benefice, a clerk to hold two or more livings, &c.

FACULTY, in the schools, a term applied to the different members of an university, divided according to the arts and sciences taught there: thus in most universities there are four faculties, viz. 1. Of arts, which include humanity and philosophy. 2. Of theology. 3. Of physic. And, 4. Of civil law. The degrees in the several faculties in our universities are those of bachelor, master, and doctor.

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FACULTY OF ADVOCATES, a term applied to the college or society of advocates in Scotland, who plead in all actions before the court of session. They meet in the beginning of every year, and choose the annual officers of the society, viz. dean, treasurer, clerks, private and public examiners, and a curator of their library.

FACES, in chemistry, settlings after distillation and infusion. The faces of wine are commonly called lees.

FACES. See **FECES**.

FÆCULA, in chemistry, the substance obtained by bruising or grinding certain vegetables, or grain, in water; the fæcula is that part which after standing some time falls to the bottom; this, in plants, appears to be only a slight alteration of their mucilage, for it differs from mucilage in no other respect than in being insoluble in cold water. Most plants contain fæcula, but the seeds of gramineous and leguminous vegetables, and all tuberos roots, contain it in great abundance.

FAENSA, FAENZA, or FAYENCE, a fortified city of Italy, in Romagna, anciently called Faventia. It is 12 miles S. W. of Ravenna.

FAGARA, IRON-WOOD; a genus of the monogynia order and tetrandria class of plants; natural order, *Dumosa*. Calyx quadrifid; corolla tetrapetalous; capsule bivalved, monospermous. There are ten species, natives chiefly of the warm parts of America, rising with woody stems more than 20 feet high.

FAGG, in the sea language, a term given to the end of those stands which do not go through the tops, when a cable or rope is closed.

FAGONIA, in botany, a genus of the monogynia order, and decandria class of plants; natural order, *Gruinales*. Calyx five-leaved; petals five, cordate; capsula five-celled, ten-valved, with one seed in each cell. There are three species; natives of Spain, Crete, and Arabia.

FAGOT, in times of popery, was a badge worn on the sleeve of the upper garment of such persons as had abjured what was then termed heresy; being put on after the person had carried a fagot, by way of penance, to some appointed place of solemnity. The leaving off the wear of this badge was sometimes interpreted a sign of apostasy.

FAGOTS, among military men persons hired by officers, whose companies are not full, to muster and hide the deficiencies of the company; by which means they cheat the king of so much money.

FAGREA, a genus of the class and order pentandria monogynia. Calyx bell-shaped; corolla funnel-shaped; berry two-celled, fleshy; seeds globular; stigma peltate. One species, a shrub of Ceylon.

FAGUS, BEECH TREE: a genus of the polyandria order, and monœcia class of plants; natural order, *Amentacea*. Male, calyx five-cleft, bell-shaped; corolla none; stamina twelve; female, calyx four-toothed; corolla none; styles three; capsule muciculate, four-valved; seeds two. There are five species, viz. two chestnut trees, and three of the beech, one of which is a native of Cochinchina. The chestnut tree will thrive upon almost any soil which lies out of the water's way; but disaffects wet moorish land. It sometimes grows to an immense size. The largest in the known world are those which grow upon Mount Ætna in Sicily. At Tortworth in Gloucestershire, is a chestnut-tree 52 feet round. It is proved to have stood there ever since 1150, and was then so remarkable that it was called the great chestnut of Tortworth. It fixes the boundary of the manor, and is probably near 1000 years old. As an ornamental, the chestnut is well worthy the gardener's attention. Its uses have been highly extolled. As a substitute for the oak, it is preferable to the elm: for door-jambs, window-frames, and some other purposes, it is nearly equal to oak itself; but there is a deceitful brittleness in it which renders it unsafe to be used in beams, or in any other situation where an uncertain load is required to be born. It is excellent for liquor casks; not being liable to shrink, nor to change the colour of the liquor: it is also recommended as an underwood for hop-poles, stakes, &c. Its fruit too is valuable, not only for swine and deer, but as a human food: Bread is said to have been made of it.

FAHALFAHARA, a town of Persia, in the province of Meccran, 100 miles N. W. of Kidge.

FAHEU, one of the New Philippine islands.

FAHLUN, a town of Sweden, capital of Dalecarlia. It is 30 miles N. W. of Hedemora.

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FAHRAC,

FAHRAG, a town of Persia, in the province of Farsistan, 180 miles N. E. of Schiras.

FAILLIS, in heraldry, a French term denoting some failure or fraction in an ordinary, as if it were broken, or a splinter taken from it.

FAILURE, a species of bankruptcy, commonly called breaking, or stopping payments. See **BANKRUPTCY**.

FAILURE OF RECORD, in law, is where an action is brought against a person, who alleges, in his plea, matter of record in bar of the action, and avers to prove it by the record; to which the plaintiff replies, *Nul tiel record*, viz. There is no such record: whereupon the defendant has a day given him by the court to bring it in; and if he fail to do it, he is then said to fail of his record, and the plaintiff shall thereon have judgement.

FAINT ACTION, in law, a feigned action, or such as, although the words of the writ are true, yet, for certain causes, the plaintiff has no title to recover thereby.

FAINT PLEADER, in law, a covinous, false, or collusory manner of pleading, to the deceit of a third person.

FAINTS, in the distillery, the weak spirituous liquor that runs from the still in rectifying the low wines after the proof spirit is taken off. Faints are also the last runnings of all spirits distilled by the alembic. The clearing of the worm of these is so essential a point in order to the obtaining of a pure spirit by the subsequent distillation, that all others are fruitless without it.

FAIR, in sea language, is used for the disposition of the wind, when it is favourable to a ship's course, in opposition to that which is contrary or foul. The term fair is more comprehensive than large, and includes about 16 or 18 points in the compass; whereas large is confined to the beam quarter, that is, to a wind which crosses the keel at right angles, or obliquely from the stern, but never to one right a-stern.

FAIR CURVE, is a winding line used in delineating ships, whose shape is varied, according to the part of the ship which it is intended to describe.

FAIR WAY, in sea language, the path or channel of a narrow bay, river, or haven, in which ships usually advance in their passage up and down; so that if any vessels are anchored therein, they are said to lie in the fair way.

FAIR, a greater kind of market, granted to a town, by privilege, for the more speedy and commodious providing of such things as the place stands in need of. It is derived from the French word *foire*, which signifies the same thing; and *foire* is by some derived from the Latin *forum*, market; by others from the Latin *feria*, because anciently fairs were always held in the places where the *feria* were held. See **FERIE**. Fairs are granted to towns by privilege, for the more speedy supplying of whatever they need. It is one privilege of a fair, that persons shall be free from being arrested in it for any other debt or contract than what was contracted in the same, or at least promised to be paid there. Fairs are generally kept once or twice a-year; and, by statute, they shall not be held longer than they ought, by the lords thereof, on pain of their being seized into the king's own hands, &c. Also proclamation is to be made, how long they are to continue; and no person shall sell any goods after the time of the fair is ended, on forfeiture of double value, one-fourth to the prosecutor and the rest to the king. There is a toll usually paid in fairs on the sale of things, and for stallage, pittance, &c. Fairs abroad are either free, or charged with toll and impost. The privileges of free fairs consist chiefly, first, in that all traders, &c. whether natives or foreigners, are allowed to enter the kingdom, and are under the royal protection, exempt from duties, impositions, tolls, &c. Secondly, that merchants, in going or returning, cannot be molested or arrested, or their goods stopped. They are established by letters patent from the prince. Fairs, particularly free fairs, are of great importance in the commerce of Europe, especially in that of the Mediterranean, and inland parts of Germany, &c. The principal fairs of America are the fairs of Porto-bello, Vera Cruz, and the Havanna, all of which are of very considerable consequence. The two first last as long as the flota, and galleons continue in those parts; and the last is opened as soon as the flota or galleons arrive there upon their return for Spain; this being the place where the two fleets join. The chief British fairs are, 1. Sturbridge fair, near Cambridge, is by far the greatest in Britain, and perhaps in the world. 2. Bristol has two fairs, very near as great as that of Sturbridge. 3. Exeter. 4. West Chester. 5. Edinburgh. 6. Wheyhill; and 7. Burford

fair; both for sheep. 8. Pancras, in Staffordshire, for saddle horses. 9. Bartholomew fair, at London, for Welsh black cattle. 10. St. Faith's, in Norfolk, for Scotch runts. 11. Yarmouth fishing fair for herrings, the only fishing fair in Great Britain. 12. Ipswich butter fair. 13. Woodborough hill in Dorsetshire, for west country manufactures, as kerseys, druggets, &c. 14. Two cheese fairs at Chipping Norton. 15. There are eight fairs in Perth; and, 16. A great cattle fair at Falkirk; besides innumerable other fairs, throughout the island, for all sorts of goods. Among the principal free fairs in France were those of St. Germain, Lyons, Rheims, Chartres, Rouen, Bourdeaux, Troyes, Bayonne, Dieppe, &c. The most noted fairs in Germany are those of Frankfort, Leipsic, and Nuremberg; not only on account of the great trade, but the vast concourse of princes of the empire, nobility, and people, who come to them from all parts of Germany to partake of the diversions.

FAIR ISLE, or **FARO**, a small island lying between Orkney and Shetland, 30 miles E. N. E. from the former; and 24 S. W. from the latter. It is above three miles long, and nearly two broad.

FAIRFAX, a county of Virginia, on the W. banks of the Potomac, 25 miles long and 18 broad. The chief town is Alexandria.

FAIRFIELD, a populous maritime county of Connecticut, bordering on the State of New York.

FAIRFIELD, the capital of the above county, called Unquowa by the Indians, is seated on the Mill-run, a little above its influx into Long Island Sound.

FAIRFORD, a town in Gloucestershire, remarkable for its church, which has curious painted glass windows. They represent the most remarkable histories in the Old and New Testament. The painter was Albert Durer. It is 25 miles E. of Gloucester.

FAIR WEATHER CAPE, a cape on the E. coast of Patagonia. Lon. 68. 10. W. Lat. 51. 45. S.

FAIRY, [*ferkth*, Saxon; *fee* Fr. ab *ega*, terra, fit & *pegu* Macedonum dialecto; unde *εργος υπεργος*, & Romanis *inferi*, qui Scoto Saxonibus dicuntur *feries*, nostratij; vulgo corruptius *fairies*, *narax*, *feries* *dauphinois*, sive *dii manes*. Baxter's Glossary.] a kind of fabled beings supposed to appear in a diminutive human form, and to dance in the meadows, and reward cleanliness in houses; an elf; a fay. Fairies were most usually imagined to be women of an order superior to human nature, yet subject to wants, passions, accidents, and even death; sprightly and benevolent while young and handsome; morose, peevish, and malignant, if ugly, or in the decline of their beauty; fond of appearing in white, whence they are often called the white ladies. Jervaise of Tilleberry, marshal of the kingdom of Arles, who lived in the beginning of the 13th century, writes thus concerning them, in a work inscribed to the emperor Otho IV. "It has been asserted by persons of unexceptionable credit, that fairies used to choose themselves gallants from among men, and rewarded their attachment with an affluence of worldly goods; but if they married, or boasted of a fairy's favours, they as severely smarted for such indiscretion." This idea of fairies has a near affinity with that of the Greeks and Romans, concerning the nymphs of the woods, mountains, rivers, and springs; and an ancient scholiast on Theocritus says, "The nymphs are demons which appear on the mountains in the figure of women." The Arabs and other orientals have also their *ginn* and *peri*, of whom they entertain the like notions.

FAIRY CIRCLE, or **RING**, a phenomenon pretty frequent in the fields, &c. long supposed to be traced by the fairies in their dances. There are two kinds of it; one of about seven yards in diameter, containing a round bare path, a foot broad, with green grass in the middle of it. The other is of a different bigness, encompassed with a circumference of grass. Some suppose these circles to be made by ants, which are often found in great numbers in them. Messrs. Jessop and Walker, in the Philosophical Transactions, ascribe them to lightning; which is thought to be confirmed by their being most frequently produced after storms of that kind, as well as by the colour and brittleness of the grass roots when first observed. Lightning, like all other fires, moves round, and burns more in the extremity than in the middle: the second circle arises from the first, the grass burnt up growing very plentifully afterwards. Mr. Cavallo, however, in his valuable Treatise on Electricity, does not think that lightning is concerned in the formation of them: "They are not (says he) always of a circular figure; and, as I am informed, they seem to be rather beds of mushrooms than the effects of lightning." Dr. Wollaston has, in a late volume of

the "Transactions of the Royal Society," given a new and very ingenious theory. That which first attracted his notice was the position of certain fungi which are always found growing upon these circles, if examined in a proper season. He was induced from the position of these fungi to imagine that the progressive increase from a central point was the probable mode of formation of the ring: hence he conjectured that the soil, which had once contributed to the support of the fungi, might be so exhausted of some peculiar pabulum necessary for their production as to be rendered incapable of producing a second crop. Hence the second year's crop would appear in a small ring surrounding the original centre of vegetation, and at every succeeding year the defect of nutriment on one side would necessarily cause the new roots to extend themselves solely in the opposite direction, and would occasion the circle of fungi continually to proceed, by an annual enlargement, from the centre outwards. An appearance of luxuriance of the grass would follow as a natural consequence, as the soil of an interior circle would always be enriched by the decayed roots of fungi of the year's growth. This theory is supported by some observations of Dr. Withering; and Dr. Wollaston says, by way of confirmation, that whenever two adjacent circles are found to interfere, they not only do not cross each other, but both circles are invariably obliterated between the points of contact: the exhaustion occasioned by each obstructs the progress of the other, and both are starved. Phil. Trans. 1807, Part II.

FAITH, [*foi*, French; *fede*, Italian; *fides*, Latin,] in philosophy, is that assent which we give to a proposition advanced by another, the truth of which we do not immediately perceive from our own reason or experience; or it is that judgement or assent of the mind, the motive whereof is not any intrinsic evidence but the authority and testimony of some other who reveals or relates it. Hence, as there are two kinds of authorities and testimonies, the one of God, and the other of man, faith becomes distinguished into divine and human:

1. **FAITH, DIVINE**, is that founded on the authority of God; or that assent we give to what is revealed by God. The objects of this faith, therefore, are matters of revelation. See **REVELATION** and **RELIGION**.

2. **FAITH, HUMAN**, is that whereby we believe what is told us by men. The object hereof is matter of human testimony and evidence. See **METAPHYSICS**.

FAITH, in practical theology and Christianity, is the first of theological virtues or graces. Faith in God, in this sense, denotes such a conviction of his being, perfections, character, and government, as produces love, trust, worship, obedience, and resignation. Faith by divines is generally distinguished into four sorts viz. historical, temporary, the faith of miracles, and justifying or saving faith. 1. Historical, whereby we assent to the truths of revelation, as a kind of certain and infallible record: this, when without works, is dead *Jam. 2. 17*; of this kind is the faith of devils *Jam. 2. 19*. 2. A temporary faith, whereby, with some degree of affection we receive divine truths as both certain and good; but soon after lose the whole impression, since they were never rooted in the heart: such is the faith of the gospel-hearers, who are compared to stony ground, *Matth. 11. 24*. 3. The faith of miracles whereby, from a divine impression, one is persuaded that God will work such a particular miracle by his means, or upon his person; a faith to remove mountains is of the first kind, and faith to be healed is of the last, *1 Cor. 13. 2. Acts 14. 9*. 4. Saving or justifying faith is a saving grace wrought in the soul by the Spirit of God, whereby we cordially receive Christ, as he is offered in the gospel, to be our prophet, priest, and king. By this we, on the testimony of God's word, and through the operation of his Spirit, believe, that is, are fully persuaded, and conscious to ourselves, that we are utterly sinful, lost, and undone, without Jesus Christ. Hence this exercise of faith renders sin, or the transgression of the law of God, exceedingly odious, makes us feel the burden of our past offences to be intolerable, and instigates us earnestly to seek relief. It is to those, who are thus affected, that the Redeemer of men gives the kind invitation, "Come unto me all ye that labour, and are heavy laden, and I will give you rest," *Mat. 11. 28*. He is a partaker of saving faith, or is a true believer, who on the testimony of Christ, and on other similar testimony, found in the word of God, and through the influence of the divine Spirit, ventures on the atonement of Christ, that is, receives Christ in his priestly office, and having

intirely renounced every idea of merit in himself, he depends altogether on the merits of Jesus Christ, whom he now acknowledges as his lord and master. It is this degree of faith which is properly called saving or justifying faith, for, to come to Christ, as expressed in the above passage, plainly means to depend and rely fully on him, and he that does this assuredly finds, because God is true, the rest promised, or deliverance from this load of sin; that is, his sins are remitted, or he is justified before God. Since the subject of this article is one of the most important in the whole compass of science, we conceive it will not be improper to present a few additional observations. 1. Since he that has faith receives Christ as his prophet or teacher, he, as a disciple or scholar, attends to the heavenly instruction of his divine master; he hearkens to his precepts, follows his example, seeks to attain his temper and disposition, and sets himself to do the will of God, and to observe all his directions. And the more cordially he does this the stronger is his faith. 2. Since he that has faith, receives Christ as his priest, he, as a sinful, polluted creature, having no merit, nothing to recommend him to God's favour, relies wholly on the merits of Christ, and this being in acquiescence with the will, direction, and purpose of God, he obtains, as a free gift, the pardon of his sins, and the approbation of the Divine Being, who accepts of the merits of Christ on his account. The more cordially a man relies on Christ, the stronger is his faith, and the larger measure does he obtain of God's favour, for it is done unto him according to his faith. And here it may be observed that it is not for his faith, but by his faith, that the believer obtains this most valuable of all blessings. Faith is not the meritorious cause, but the instrument by which we receive the heavenly treasure into earthen vessels. 3. Since he who has faith receives Christ as his king, he, as a willing subject, pays ready obedience to all his laws and ordinances, confides in him for the supply of all his wants, and for protection from all his enemies, employs himself in supporting the cause of Christ, and opposes under the standard of his king, the powers of the world, the flesh, and the devil, and it is in consequence of his faith in Christ that he gains the conquest, *1 John 5. 4*. "and this is the victory that overcometh the world even our faith." But though, by faith we are made to understand divine things, are rendered acceptable to God, are made to bear the fruits of righteousness, and empowered to conquer our spiritual enemies, yet we have nothing to boast of, for boasting is excluded by the law of faith, *Rom. 3. 27*. The reason is that faith is not the meritorious but the instrumental cause of the blessings which the believer obtains. If a prince beholding a rebel reduced to a state of the utmost misery, and totally unable to extricate himself, should offer him pardon, protection, and every thing calculated to make him happy, on condition he would come to him in the way he had directed, and accept of his favour. If this man do not lend his ear to the voice of the prince he cannot obtain the only thing which could make him happy; but if he do lend his ear does he therefore merit the pardon, &c.? If he do not come to the prince in the way directed he cannot receive the bounty; but if he do use his feet to come, does he by that merit the kindness bestowed upon him? In like manner if he stretch out his hand to receive any particular gift, does he by that act, merit the gift? Thus faith is the ear by which we attend to the voice of Christ, and hear the offers of grace, and lessons of heavenly wisdom directing the way in which we should proceed. But it is plain, that faith does not merit any part of the boundless mercy which that celestial voice proclaims. Again faith is the feet by which we come to Christ, and move in the path of duty; but this faith or exercise of faith, does not merit the blessing, which by this means we enjoy. Also faith is the hand which takes of the things of Christ and shews them to us, or makes them our own, but it does not on this account merit them. And all the good works, that a man does acceptably to God, being properly acts of faith, cannot have merit in them, but are only the instrumental means by which we come to God, and receive the free gift of his favour. Therefore boasting is excluded by the law of faith. Faith is said to be of the operation of the Spirit of God, because that Spirit is the author and finisher of it; it is said to work by love, because in receiving divine things it attaches the mind to the giver, and hence fixes in the soul the principle of love; it is said to purify the heart, because it receives the atonement which removes our sins, and is that exercise of our duty in which righteousness consists. The Apostle observes, that "faith is the substance of things hoped for,

for, the evidence of things not seen, *Heb.* 11. 1. And this it is because it realizes spiritual things to the mind. Faith is the gift of God, and St. James, denoting it by the very significant appellation *wisdom*, says, "if any of you lack wisdom, let him ask of God, that giveth to all men liberally, and upbraideth not; and it shall be given to him," *Jam.* 1. 5. We earnestly entreat our readers above all things to secure this wisdom; it is this which diffuses the soul of happiness throughout the whole compass of our pursuits and actions.

FAKENHAM, a town of Norfolk, 6 miles from the sea-coast, and 20 N. W. of Norwich.

FAKIRS, Indian monks or friars. They outdo the severity and mortification of the ancient Anchorets. Some of them make a vow of continuing all their lifetime in one posture, and keep it effectually. Others never lie down; but continue in a standing posture all their lives, supported only by a stick, or rope under their arm-pits. Some mangle their bodies with scourges and knives. They pretend to have conquered every passion, and triumphed over the world; and accordingly scruple not, as if in a state of innocence, to appear entirely naked in public. The people of East India are persuaded of the virtue of the fakirs; notwithstanding which, they are accused of committing the most enormous crimes in private. There is also another kind of fakirs, who do not practise such severities; these flock together, and go from village to village, prophesying, and telling fortunes. They are wicked villains, and it is dangerous to meet them in a solitary place; nevertheless the Indian idolaters have them in the utmost veneration.

FALAISE, a town of France, in the department of Calvados, and late province of Normandy, with a castle, one of the finest towers in France; famous for being the birth-place of William the Conqueror. It is 20 miles S. E. of Caen.

FALASHA, a people of Abyssinia, of Jewish origin, described by Mr. Bruce, who was at great pains to acquaint himself with their history, by cultivating the friendship of the most learned persons among them. They say, that the first book of Scripture they ever received was that of Enoch; and they place that of Job immediately after it, supposing that patriarch to have lived soon after the flood. They have no copy of the Old Testament in the Falasha language, what they make use of being in that of Geez. This is sold to them by the Abyssinian Christians, who are the only scribes in that country. No difference takes place about corruptions of the text; nor do the Falasha know any thing of the Jewish Talmud, Targum, or Cabala.

FALCADE, in the manege, the motion of a horse when he throws himself upon his haunches two or three times, as in very quick carvets; which is done in forming a stop and half stop.

FALCATED, something in the form of a sickle: thus, the moon is said to be falcated when she appears horned.

FALCO, in ornithology, a genus of birds, of the order Accipitres. The characters are these: bill hooked at the end, covered at its base with a cere, or naked membranous skin; head covered with feathers, which lie close on each other: tongue often cleft. This is a rapacious carnivorous race of animals, feeding almost entirely on animal food; they are very quick-sighted, generally fly high, and build their nests in lofty places. They are not gregarious; and the females are generally larger than the males. The legs and feet are scaly; the claws large, strong, very sharp, and much hooked. There are about 100 species, with several varieties. Dr. Gmelin divides this genus into four sub-genera, or lesser divisions; which Mr. Kerr has reduced to three, by including the *Gypatus Serpentarius*, in his 2d subgenus, because it has some relation to the vultures. These three subgenera are, 1. *Gypati*, Bastard Eagles; 2. *Aquilæ*, Eagles; and 3. *Falcones*, Falcons and Hawks.

F. AQUILA CHRYSÆTOS, the **GOLDEN EAGLE**, weighs about 12lb. and is about three feet long, the wings when extended measuring seven feet 4 inches. The sight and sense of smelling are very acute: the head and neck are clothed with narrow, sharp-pointed feathers, of a deep brown colour bordered with tawney; the hind part of the head is of a bright rust colour. These birds are very destructive to fawns, lambs, kids, and all kinds of game; particularly in the breeding season, when they bring a vast quantity of prey to their young. Smith, in his History of Kerry, relates, that a poor man in that country got a comfortable subsistence,

for his family, during a summer of famine, out of an eagle's nest, by robbing the eaglets of the food the old ones brought; whose attendance protracted beyond the natural time, by clipping the wings and retarding the flight of the former. It is very unsafe to leave infants in places where eagles frequent; there being instances in Scotland of two being carried off by them; but, fortunately, the thefts were discovered in time, and the children were restored unhurt out of the eagles nests. In order to extirpate these pernicious birds, there is a law in the Orkney isles, which entitles every person that kills an eagle to a hen out of every house in the parish where it was killed. Eagles seem to give the preference to the carcasses of dogs and cats. People who make it their business to kill those birds, lay one of these carcasses by way of bait; and then conceal themselves within gun-shot. They fire the instant the eagle alights; for she, that moment, looks about before she begins to prey. Yet, quick as her sight may be, her sense of hearing seems still more exquisite. If hooded crows or ravens happen to be nearer the carrion, and resort to it first, and give a single croak, the eagle instantly repairs to the spot. These eagles are remarkable for their longevity, and for sustaining a long abstinence from food. Mr. Keyster relates, that an eagle died at Vienna after a confinement of 104 years. This pre-eminent length of days is alluded to by the Psalmist, "Thy youth is renewed like the eagle's." One of this species, which was nine years in the possession of Owen Holland, Esq. of Conway, lived 32 years with the gentleman who made him a present of it; but what its age was, when the latter received it from Ireland, is unknown. The same bird also furnishes us with a proof of the truth of the other remark; having once, through the neglect of servants, endured hunger for 21 days without any sustenance whatever. See Plate LVIII.

F. HALIÆTUS, or the **OSPREY**, is to be found in almost all parts of Europe, on the borders of lakes and rivers, which it frequents for the sake of the fish contained in them, which constitute its principal subsistence, and on which it darts with unerring accuracy; it builds on the ground among reeds, and is the most numerous of the larger birds of prey.

F. BUTEO, or the **COMMON BUZZARD**, is abundantly provided with means of defence, as well as attack; but is sluggish and cowardly with all its strength, and will suffer itself to be brought to the ground by a sparrow-hawk, without at all employing those means, which, if fully exerted, would uniformly and inevitably prove fatal to the assailant. The length of the common buzzard is about 20 inches; its food consists of birds, vermin, reptiles, and insects.

F. AQUILA MILVUS, the **KITE**, is a native of Europe, Asia, and Africa. This species generally breeds in large forests or woody mountainous countries. Its nest is composed of sticks, lined with several odd materials, such as rags, bits of flannel, ropes, and paper. They are white, spotted with dirty yellow. Its motion in the air distinguishes it from all other birds, being so smooth and even that it is scarce perceptible. Sometimes it will remain quite motionless for a considerable space; at others glide through the sky without the least apparent action of its wings; from thence deriving the old name of Glade, from the Saxon glida. They inhabit the N. of Europe, as high as Jarlsberg, in the S. of Norway; but do not extend farther. They are observed in vast numbers about Cairo, where they are extremely tame, and feed even on dates, probably for want of other food. They appear in Greece in the spring. In Britain they are found the whole year. Lord Bacon observes, that when kites fly high, it portends fair and dry weather. Mr. Kerr enumerates three varieties of this species, viz. the Siberian, Russian, and Jaic Kites.

F. OSSIFRAGUS, the **OSPREY**, or **SEA-EAGLE**, frequents the sea-shore, and subsists principally upon fish; it is nearly of the size of the golden eagle, and is found in many countries both of Europe and America; its sight is stated to be equally clear by night and by day. Mr. Barlow relates, that he saw a bird of this species engaged once in a violent conflict in the air with a cat which he had lifted in his talons, whose efforts, however, were finally too powerful for him, and brought him again to the ground. Martin, speaking of the great eagles of the Western Isles, says, that they fasten their talons in the back of the fish, commonly salmon, which are often above the water, or very near the surface. Those of Greenland will even take a young seal out of the water. It also

preys on water fowl. This species is frequent in North America, and was met with in Botany Island by Captain Cook. See Plate LVIII.

FALCONARA, an island in the Grecian Archipelago. See **FALCONRY**.

FALCONRY, the exercise of taking wild-fowl by means of hawks. The primeval Britons, with a fondness for the exercise of hunting, had also a taste for that of hawking; and every chief among them maintained a considerable number of birds for that sport. To the Romans this diversion was scarcely known in the days of Vespasian; yet it was introduced immediately afterwards. Most probably they adopted it from the Britons; but we certainly know that they greatly improved it by the introduction of spaniels into the island. In this state it appears among the Roman Britons in the sixth century. In after-times, hawking was the principal amusement of the English: a person of rank scarcely stirred out without his hawk on his hand; which, in old paintings, is almost the criterion of nobility. Harold, afterwards king of England, when he went on a most important embassy into Normandy, is painted embarking with a bird on his finger, and a dog under his arm: and in an ancient picture of the nuptials of Henry VI. a nobleman is represented in much the same manner; for in those days, "it was thought sufficient for noblemen to wind their horn, and to carry their hawk fair, and leave study and learning to the children of mean people." The expence was great that sometimes attended this sport. In the reign of James I. Sir Thomas Monson is said to have given 1000*l.* for a cast of hawks: we are not then to wonder at the rigour of the laws that tended to preserve a pleasure which was carried to such an extravagant pitch. In the 34th of Edward III. it was made felony to steal a hawk; to take its eggs, even in a person's own ground, was punishable with imprisonment for a year and a day, besides a fine at the king's pleasure: in queen Elizabeth's reign, the imprisonment was reduced to three months; but the offender was to find security for his good behaviour for seven years, or lie in prison till he did. The falcons or hawks that were in use in these kingdoms are now found to breed in Wales, and in North Britain and its isles. The peregrine-falcon inhabits the rocks of Caernarvonshire. The same species, with the gyr-falcon, the gentil, and the gos-hawk, are found in Scotland, and the lanner in Ireland. We may here take notice, that the Norwegian breed was, in old times, in high esteem in England: they were thought bribes worthy a king. Jeoffrey Fitz-pierre gave two good Norway hawks to king John, to obtain for his friend the liberty of exporting 100 cwt. of cheese; and Nicholas the Dane was to give the king a hawk every time he came into England, for the liberty to traffic throughout the king's dominions. Falconry, though an exercise now much disused among us, yet furnishes a great variety of significant terms, which still obtain in our language. Thus, the parts of a hawk have their proper names. The legs from the thigh to the foot, are called arms; the toes the petty singles; the claws the pounces. The wings are called the sails; the long feathers the beams; the two longest, the principal feathers; those next, the flags. The tail is called the train; the breast-feathers the mails; those behind the thigh the pendant feathers. When the feathers are not yet full-grown she is said to be unsummed; when they are complete, she is summed: the craw, or crop, is called the gorge; the pipe next the fundament, where the faeces are drawn down, is called the pannel: the slimy substance lying in the pannel is called the glut: the upper and crooked part of the bill is called the beak; the nether part, the clap; the yellow part between the beak and the eyes, the sear or sere; the two small holes therein, the nares. As to her furniture: the leathers with bells buttoned on her legs, are called bewits. The leathern thong, whereby the falconer holds the hawk, is called the lease or lash; the little straps, by which the lease is fastened to the legs, jesses; and a line or packthread fastened to the lease, in disciplining her, a creance. A cover for her head, to keep her in the dark, is called a hood; a large wide hood, open behind, to be worn at first, is called a ruffer-hood: to draw the strings, that the hood may be in readiness to be pulled off, is called unstriking the hood. The blinding of a hawk just taken, by running a thread through her eye-lids, and thus drawing them over the eyes, to prepare her for being hooded, is called seeling. A figure or resemblance of a fowl, made of leather and feathers, is called a lure. Her resting place, when off the falconer's hand, is called the

perch. The place where her meat is laid, is called the hack; and that wherein she is set while her feathers fall and come again, the mew. Something given a hawk to cleanse and purge her gorge, is called casting. Small feathers given her to make her cast, are called plumage. Gravel given her to help to bring down her stomach is called rangle. Her throwing up filth from the gorge after casting is called gleaming. The purging of her grease, &c. en-seaming. Her being stuffed is called gurgiting. The inserting a feather in her wing in lieu of a broken one is called imping. The giving her a leg, wing, or pinion, of a fowl to pull at, is called tiring. The neck of a bird the hawk preys on is called the inke. What the hawk leaves of her prey is called the pill, or pelf. There are also proper terms used for several actions. When she flutters with her wings, as if striving to get away, either from the perch or fist, she is said to bate. When, standing too near, they fight with each other, it is called crabbing. When the young ones quiver, and shake their wings in obedience to the elder, it is called cowering. When she wipes her beak after feeding, she is said to feak. When she sleeps, she is said to jouk. From the time of exchanging her coat till she turn white again, is called her inter-mewing. Treading is called cawking. When she stretches one of her wings after her legs, and then the other, it is called mantling. Her dung is called muting; when she mutes a good way from her, she is said to slice; when she does it directly down, instead of jerking backwards, she is said to slime; and if it be in drops, it is called dropping. When she sneezes, it is called snit-ing. When she raises and shakes herself, she is said to rouze. When, after mantling, she crosses her wings together over her back, she is said to warble. When a hawk seizes she is said to bind. When, after seizing, she pulls off the feathers she is said to plume. When she raises a fowl aloft, and at length descends with it to the ground, it is called trussing. When being aloft, she descends to strike her, then it is called stooping. When she flies or keeps far from game, she is said to rake. When, forsaking her proper game, she flies at pyes, crows, &c. that chance to cross her, it is called the check. When, missing her prey, she betakes herself to the next check, she is said to fly on head. The fowl or game she flies at is called the quarry. The dead body of a fowl killed by the hawk, is called a pelt. When she flies away with the quarry, she is said to carry. When in stooping she turns two or three times on the wing, to recover herself ere she seizes, it is called canceliering. When she hits the prey, yet does not truss it, it is called ruff. The making of a hawk tame and gentle is called reclaiming. The bringing of her to endure company, manning her. An old staunch hawk, used to fly and set example to a young one, is called a make hawk. The reclaiming, manning, and bringing up of a hawk to the sport, is not easy to be brought to any precise set of rules. It consists in a number of little practices and observances, calculated to familiarize the falconer to his bird, to procure the love of it, &c. When your hawk comes readily to the lure, a large pair of luring bells are to be put upon her; and the more giddy-headed and apt to rake out your hawk is, the larger must the bells be. Having done this, and she being sharp-set, ride out in a fair morning, into some large field unencumbered with trees or wood, with your hawk on your hand; then having loosened her hood, whistle softly to provoke her to fly; unhood her, and let her fly with her head into the wind; for by that means she will be the better able to get upon the wing, and will naturally climb upwards, flying a circle. After she has flown three or four turns, then lure her with your voice, casting the lure about your head, having first tied a pullet to it; and if your falcon come in and approach near you, cast out the lure into the wind, and if she stoop to it reward her. You will often find, that when she flies from the fist, she will take stand on the ground: this is a fault which is very common with soar-falcons. To remedy this, fright her up with your wand; and when you have forced her to take a turn or two, take her down to the lure and feed her. But if this does not do, then you must have in readiness a duck sealed, so that she may see no way but backwards, and that will make her mount the higher. Hold this duck in your hand, by one of the wings near the body; then lure with the voice, to make the falcon turn her head; and when she is at a reasonable pitch, cast your duck up just under her; when, if she strike, stoop, or truss the duck, permit her to kill it, and reward her by giving her a reasonable gorge. After you have practised this two or three times,

your hawk will leave the stand, and, delighted to be on the wing, will be very obedient. It is not convenient, for the first or second time, to shew your hawk a large fowl; for it frequently happens, that they escape from the hawk, and she, not recovering them, rakes after them: this gives the falconer trouble, and frequently occasions the loss of the hawk. But if she happen to pursue a fowl, and being unable to recover it, give it over, and come in again directly, then cast out a sealed duck: and if she stoop and truss it, across the wings, permit her to take her pleasure, rewarding her also with the heart, brains, tongue, and liver. But if you have not a quick duck, take her down with a dry lure, and let her plume, a pullet and feed upon it. By this means a hawk will learn to give over a fowl that rakes out, and, on hearing the falconer's lure, will make back again, and know the better how to hold in the head.

FALERII, in ancient geography, a town and territory of Etruria, on the W. or right side of the Tiber. The territory was famous for its rich pasture; hence the *gramen Faliscum* in authors.

FALERNUS AGER, a district at the foot of mount *Massicus* in Campania; famous for its generous wines; now called *Monte Massico*.

FALEZIN, a town of European Turkey, in Walachia, on the Pruth. Lon. 26. 49. E. Lat. 45. 15. N.

FALIN, a river of Chinese Tartary, which runs into the sea of Japan.

FALISCI, the people of *Falerii*, called *Æqui*, by Virgil, because they afforded supplemental laws to the XII Tables.

FALKENAU, a town of Bohemia, in the circle of Saatz, on the Eger; 66 miles W. of Prague.

FALKENBERG, a sea-port town of Sweden, in the province of Halland, on the Scaggerac, 52 miles N. of Helsingborg.

FALKENBURG, a town of Germany, in Brandenburg, six miles E. of Dramburg.

FALKENHAM, or **FALKINGHAM**, a town of Lincolnshire, 18 miles W. by S. of Boston.

FALKENSTEIN, a town of Germany, in the department of Mont Tonnerre; 24 miles W. of Worms.

FALKIA, a genus of the trigynia order, and hexandria class of plants. Calyx bell-shaped, five-cleft; corolla bell-shaped; stigmas orbicular, peltate; seeds four-angled. There is but one species, viz. *F. repens*, creeping *Falkia*.

FALKIRK, a town of Scotland, in Stirlingshire, chiefly supported by great fairs for black cattle from the Highlands; 24,000 head being annually sold there. It is 8 miles S. E. of Stirling, and 24 W. of Edinburgh.

FALKLAND, a town of Scotland, in Fifeshire, 15 miles N. of Edinburgh.

FALKLAND ISLANDS, a range of islands, at the utmost extremity of South America, not far from the Straits of Magellan. They were discovered by Sir Richard Hawkins in 1594. The soil is bad, and the shores are beaten by perpetual storms. Lon. between 50° and 56° W. Lat. from 51° to 53° S.

FALKLAND SOUND, a strait which separates the two largest of the Falkland islands.

FALKOPING, a town of Sweden in W. Gothland; 56 miles E. of Uddervalla.

FALL, in the sea-language, that part of the rope of a tackle, which is hauled upon. Also when a ship is under sail, and keeps not so near the wind as she should do, they say she falls off; or when a ship is not flush, but hath risings of some parts of her decks more than others, it is called falls.

FALL, the name of a measure of length used in Scotland, containing six ells.

FALL OF MAN, in sacred history, that awful event by which sin and death were introduced into the world. See *THEOLOGY*.

FALLACY, in philosophy, false appearance. The Epicureans deny that there is any such thing as a fallacy of the senses. According to them, all our sensations and perceptions, both of sense and phantasy, are true; whence they make sense the primary criterion of truth. The Cartesians, on the other hand, maintain, that we should suspect as false, or at most as dubious, every thing that presents itself to us by means only of the external senses, because they frequently deceive us; and that our senses, as being fallacious, were never given us by nature for the discovery of truth, or the contemplation of the principles of things; but only

for pointing out to us what things are convenient or hurtful to our bodies. The Peripatetics keep a middle course. They say, that if a sensible object be taken in its common or general view, the sense cannot be deceived about it; but that if the object be taken under its specific view, the sense may be mistaken about it, from the want of the dispositions necessary to a just sensation, as a disorder in the organ, or any thing uncommon in the medium: thus, in some disorders of the eye, all objects appear yellow; a stick in water appears broken or crooked, &c.

FALLAFAJEEA, one of the Friendly islands.

FALLING SICKNESS, the same with epilepsy. See *ME-DICINE*.

FALLING-STAR, in meteorology, a phenomenon that is frequently seen, and which has been usually supposed to depend on the electric fluid. Others conceive that they are rather to be attributed to falling stones. It is observable that when their appearance is frequent they have all the same direction; and it has been remarked that they are the forerunners of a westerly wind in our country. See *METEOR*.

FALLOPIAN TUBES, two canals of a tortuous figure, but approaching to a conic form, joined to the fundus of the uterus, one on each side. See *ANATOMY*.

FALLOPIUS, GABRIEL, a celebrated physician and anatomist, born at Modena, in 1523, and descended of a noble family. He made several discoveries in anatomy, one of which was that of the tubes, called from him the Fallopiian tubes. He travelled through the greatest part of Europe; was made professor of anatomy at Pisa, in 1548, and at Padua in 1551, where he died in 1562, aged 39. His writings, which are numerous, were first printed separately, and afterwards collected under the title of "*Opera genuina omnia, tam practica quam theoretica, in tres Tomos distributa.*" They were printed at Venice in 1585, and in 1606; at Frankfort in 1600, cum operum appendice; and in 1606, in folio.

FALLOWING, in agriculture, is the mode of preparing land, by ploughing it a considerable time before it is ploughed for seed. Lands are laid fallow either during the summer, or during the winter, according to the nature of the soil, and the judgement of the cultivator. Very able arguments have been alleged as well for, as against summer fallows, by skilful agriculturists. Both summer and winter fallows, however, are occasionally useful on different soils. The advantages to be derived from fallowing are: 1. By repeatedly turning soils over, much carbonic acid, or fixed air, is produced in a fluid state, which remains united with the vegetable rements, or with volatile alkali, or calcareous earth. 2. The parts of the soil become better incorporated, and thus reciprocally meliorated; so that they may afford more uniform nourishment to the roots of plants. 3. The pulverized soil is more easily penetrable, and thus exposes a greater surface of its cavities to the vegetable absorbents. 4. All unprofitable plants, or weeds, being thus eradicated, or continually ploughed under the soil, while yet young, a considerable proportion of vegetable nutriment will be reserved, and farther increased, by the saccharine and mucilaginous matter of the young vegetables buried by the plough. Lastly, some plants, during their herbaceous state, do not exhaust the ground on which they grow, before the seed-stems arise; as turnips, for instance, when pulled up, and carried away for the purpose of feeding cattle, or sheep, on other grounds. This benefit appears to arise from the soil being shaded by the thick foliage of those vegetables, and consequently meliorated; for its nutritious properties cannot have suffered by evaporation so much, as if the land had been exposed to the scorching influence of the sun. Dr. Darwin, when treating on this subject, justly observes, that, though a summer fallow may be of advantage to a poor soil, which has nothing to lose, yet it must be injurious to a rich one, which has nothing to gain. A fallow-cleansing machine was invented by a Mr. Aaron Ogden, a smith, at Ashton-under-Line, near Manchester. It consists of two large rollers, armed with iron spikes, to which the inventor prefixed a harrow so constructed, that it may be set to go to any depth in a furrow, without weighting; and will pulverize the soil, raise the roots, or weeds, to the surface, and at the same time not be obstructed by their accumulation, though it should raise as many weeds as would load a cart within the short space of five yards. There are several other pieces of machinery belonging to this implement; but as they are intricate, we refer the reader to the 3d vol. of the work, entitled "*Museum Rusti-*"

cum et Commerciale," where its parts are minutely described, and illustrated with a plate.

FALMOUTH, a port town of Cornwall, on a fine bay of the English channel, 10 miles S. of Truro. Lon. 4. 57. W. Lat. 50. 8. N. High water on the day of the change and full of the moon at thirty minutes past five in the afternoon.

FALMOUTH, a township of Antigua, on the S. shore.

FALMOUTH, a town of Jamaica, called also the Point, on the S. side of Martha Brae harbour.

FALMOUTH, a town of the United States, in the district of Maine, Cumberland county, seated on Casco Bay, 120 miles N. N. E. of Boston.

FALMOUTH, a town of Pennsylvania, in Lancaster county, 20 miles W. of Lancaster.

FALSE ACTION, if brought against one, whereby he is cast into prison, and dies pending the suit, the law gives no remedy in this case, because the truth or falsehood of the matter cannot appear before it is tried: and if the plaintiff is barred, or non-suited at common law, regularly all the punishment is amercement.

FALSE BAY, a bay lying E. of the Cape of Good Hope; frequented by vessels during the prevalence of the N. W. winds, which begin to blow in May, and render it dangerous to remain in Table Bay. Lon. 18. 33. E. Lat. 34. 10. S.

FALSE CAPE HORN, the S. W. point of Terra del Fuego.

FALSE IMPRISONMENT, is a trespass committed against a person, by arresting and imprisoning him without just cause, contrary to law; or where a man is unlawfully detained without legal process: and it is also used for a writ which is brought for this trespass. If a person be in any way unlawfully detained, it is false imprisonment; and considerable damages are recoverable in those actions.

FALSE NEWS, SPREADING OF, in order to make discord between the king and nobility, or concerning any great man of the realm, is punishable by common law with fine and imprisonment; which is confirmed by statutes Westm. 1. 3 Edw. 1. c. 34. 2 Rich. II. stat. 1. cap. 5. and 12 Rich. II. cap. 11.

FALSI CRIMEN, in the civil law, is fraudulent subornation or concealment, with design to darken or hide the truth, and make things appear otherwise than they are. The crimen falsi is committed, 1. By words, as when a witness swears falsely. 2. By writing, as when a man antedates a contract, or the like. 3. By deed, as when he sells by false weights and measures.

FALSIFYING A RECORD, signifies shewing it to be erroneous. Thus lawyers teach, that a person purchasing land of another, who is afterwards outlawed of felony, &c. may falsify the record, not only as to the time wherein the felony is supposed to have been committed, but also as to the point of the offence. But where a man is found guilty by verdict, a purchaser cannot falsify as to the offence; though he may for the time where the party is found guilty generally in the indictment, because the time is not material upon evidence.

FALSTER, a fertile island of Denmark, at the entrance of the Baltic, S. of Zealand, 60 miles in circumference. Nyekioping, and Stubbekioping, are the chief towns.

FALSTERBO, a sea-port town of Sweden, in the province of Schönon, 22 miles S. S. W. of Lund.

FALUGA, a town of Asiatic Turkey, in the Arabian Irak, 25 miles S. E. of Bagdad.

FALUGA, a small island near the W. coast of Sardinia, 12 miles S. of Cape Argentera.

FALX, in anatomy, a process of the dura mater placed between the two hemispheres of the brain, and resembling a reaper's sickle.

FAMA CLAMOSA, in the judicial procedure of the church of Scotland, a ground of action before a presbytery against one of its members, independent of any regular complaint by a particular accuser. Any person of a good character may give to the presbytery a complaint against one of their members; but the presbytery is not to proceed to the citation of the person accused, until the accuser under his hand gives in the complaint, with some account of its probability, and undertakes to make out the libel, under the pain of being considered as a slanderer. When such an accusation is brought before them, they are obliged candidly to examine the affair.

FAMACUSTA, or **FAMAGOSTA**, a city of Asiatic Turkey, on the E. coast of Cyprus, anciently called Fama Augusta. It is 28 miles W. of Tripoli in Syria.

FAME, in the heathen mythology, a goddess, celebrated

chiefly by the poets. She is feigned to have been the last of the race of Titans produced by the Earth, to have her palace in the air, and to have a vast number of eyes, ears, and tongues. She is mentioned by Hesiod, and particularly described by Ovid and Virgil.

FAMES CANINA, an excessive appetite. See **BULIMY**.

FAMIA, or **AFAMIA**, the modern name of one of the ancient Apameas.

FAMILIARS, in the Inquisition, persons who assist in apprehending such as are accused, and carrying them to prison. They are assistants to the inquisitor, and called familiars, because they belong to his family. In some provinces of Italy they are called cross-bearers, and in others the scholars of St. Peter the martyr; and they wear a cross before them on the outside garment. They are properly bailiffs of the inquisition; and the vile office is esteemed so honourable, that noblemen in Portugal have been ambitious of it. Nor is this surprising, when it is considered that Innocent III. granted very large indulgences and privileges to these familiars; and that the same plenary indulgence is granted by the pope to every single exercise of this office, as was granted by the Lateran council to those who succoured the Holy Land. When several persons are to be taken up at the same time, these familiars are commanded to order matters so, that they may know nothing of one another's being apprehended; and it is related, that a father, with his three sons, and three daughters, who lived together in the same house, were carried prisoners to the inquisition, without knowing any thing of one another's being there till seven years afterwards, when they that were alive were released by an act of faith.

FAMILY, [*familia*, Lat.] denotes the persons that live together in one house, under the direction of one head or chief manager. It also signifies the kindred or lineage of a person, and is used by old writers for a hide or portion of land sufficient to maintain one family.

FAMILY, in natural history, a term used by authors to express any order of animals, or other natural productions of the same class.

FAMILY LAKE, a lake of N. America. Lon. 93. 20. W. Lat. 52. 35. N.

FAMINE, or **FAMENE**, in geography, a territory in the W. part of the late duchy of Luxemburg; now included in the department of Forets. Marche and Roche are the chief towns.

FAMINE, PORT, a bay of South America, in the Straits of Magellan. Lon. 71. 26. W. Lat. 53. 43. S.

FAMINE, PORT, a fortress on the N. E. coast of Patagonia, where a Spanish garrison perished for want: whence the name of the fort and bay. Lon. 70. 20. W. Lat. 55. 44. S.

FAN, a well known contrivance employed chiefly by females to raise wind, cool the air by agitating it, and defend their complexion. This kind of toy was introduced into Britain from the East, where it is very generally used for shading the face from the sun, and guarding it against troublesome insects. Although the practice of fanning be sanctioned by fashion, it does not appear to be conducive to health, nor consistent with the operations of nature, because the evaporations of perspirable matter on the human skin has a greater tendency to cool the body, than the incessant fanning, wiping, and rubbing, of the face. Nevertheless fans may be useful for affording protection against the rays of the sun, for which purpose, however, parasols will be more convenient.

FAN is also an implement of husbandry employed in winnowing corn.

FANANO, a town of Modena, in Italy, 25 miles S. of Modena.

FANATICS, wild, enthusiastic visionary persons, who pretend to extraordinary revelation and inspiration, above what is written in the sacred scripture. The ancients called those *fanatici*, who passed their time in fana, temples, and being or pretending to be, often seized with a kind of enthusiasm, as if inspired by the divinity, shewed wild and antic gestures. Prudentius represents them as cutting and slashing their arms with knives. Shaking the head was also common among the *fanatici*; for Lampridius informs us, that the emperor Heliogabalus was arrived to that pitch of madness, as to shake his head with the gashed fanatics. Hence those who wish to throw an opprobrium on religion, have, with equal injustice and impropriety, applied the epithet to anabaptists, quakers, methodists, &c. The conduct of these people fully evince that

that they are not carried away by madmen's dreams, but soberly attend to the revelation of God, as delivered in the books of the Old and New Testament, and received by all Christians.

FANCY, [*φαντασία*], imagination, or the power by which the mind forms and represents to itself the images of objects. See **METAPHYSICS**.

FANGEAUX, a town of France, in the department of Aude, 8 miles S. E. of Castelnau-d'Aud.

FANIONS, in the military art, small flags carried along with the baggage.

FANO, a sea-port town of Italy, in the duchy of Urbino, anciently called Fanum Fortuna. It is seated on the Adriatic, 8 miles S. E. of Pesaro. Lat. 12° 59' 38" E. Lon. 43. 51. N.

FANOE, two small islands of Denmark; 1. in the Little Belt, 2 miles S. of Middelfart, in Funen; 2. in the German Ocean, on the coast of Sleswick, inhabited by fishermen. Lon. 8. 25. E. Lat. 55. 23. N.

FANSHAW, Sir RICHARD, famous for his embassies, was the tenth son of Sir Henry Fanshaw of Ware Park in Hertfordshire, and was born about 1607. In 1635, he was employed by King Charles I. sent resident to the court of Spain; whence being recalled in 1641, he adhered to the royal interest, and was employed in several important matters of state. At the restoration he was made master of the requests; a station in those times of considerable profit. Afterwards, on account of his skill in the Latin language, he was made secretary for that tongue. In 1661, he was sent envoy to Portugal; and in 1662, with the title of ambassador; when he negotiated the marriage of Charles II. with the infanta Catherina. Upon his return he was made a privy counsellor. In 1664, he was sent ambassador to both Spain and Portugal; at which time the foundation of peace betwixt those crowns and England was laid by him. His conduct during his former employments in those courts gained him such esteem, that his reception was magnificent, exceeding all that were before, which those kings declared was not to be a precedent to succeeding ambassadors. He died at Madrid in 1666, on the very day he had fixed for his return to England. Besides some original poems, he published a translation of Bathista Guarini's "Pastor Fido," and another of the "Lusiad of Camoens." Among his posthumous publications are, "Letters during his embassies in Spain and Portugal, with his life prefixed."

FANTASIA, in the Italian music, signifies fancy; and is used for a composition, wherein the composer ties himself to no particular time, but ranges according as his fancy leads, amidst various movements, different airs, &c. This is otherwise called the capricious style: before sonatas were used, there were many of this kind, some of which still remain.

FANTIN, a fertile country of Africa, on the Gold Coast, extending about 30 miles along the shore of the Atlantic.

FANTIN, the capital of the above territory, lies about 12 miles from the coast.

FANU, a small island of the Mediterranean, 10 miles N. W. of Corfu.

FANUM, among the Romans, a temple or place consecrated to some deity. The deified men and women among the heathens had likewise their fana; even the great philosopher Cicero erected one to his daughter Tullia.

FAOE, a small isle of Denmark, N. of Laland.

FAOUA, or **FOUA**, a town of Egypt, on the W. branch of the Nile, 16 miles S. E. of Rosetta, and 70 miles N. N. E. of Cairo.

FAQUIER, a county of Virginia, 55 miles long, and 20 broad.

FAR BAY, a bay on the N. coast of Sutherlandshire.

FARA, two of the smaller Orkney isles.

PARADEESE, a town of Africa in Tunis, 32 miles S. of Tunis.

FARAND-MAN, a traveller, or merchant stranger, to whom, by the laws of Scotland, justice ought to be done with all expedition, that his business or journey be not hindered.

FARCE was originally a droll, petty show, exhibited by charletans, and their buffoons, in the open street to gather the crowd together. The word is French, and signifies literally, stuffing; from the Latin *farcio*, to stuff. It was applied to this species of entertainment on account of the variety of jests, gibes, tricks, &c.

wherewith it was interlarded. At present, instead of being performed by merry-andrews on the street, it is acted by comedians on the theatre, and becomes the entertainment of the fashionable world!

FARCIN, or **FARCY**, in fariery, a creeping ulcer, a loathsome disease with which horses are sometimes affected. See **FARRIERY**.

FAREHAM, a town of England in Hampshire, on the N. W. of Portsmouth harbour.

FAREMOUTIER, a town of France, in the department of Seine and Marne, 27 miles E. of Paris.

FAREWELL, CAPE, the S. point of W. Greenland on the N. side of the entrance of Davis's Straits. Lon. 42. 42. W. Lat. 59. 37. N.

FARGANI, **ALFRAGAN**, or **ALFERGANI**, a celebrated Arabian astronomer, who flourished about A. D. 800; so named from his birth-place, Fergan, in Samarcand. He is also named Ahmed Ben Cothair, or Katir. He wrote "Elements of Astronomy," in thirty chapters, wherein he chiefly adopts Ptolemy's hypothesis, using his terms, and often quoting him. Of this work there are three Latin translations; the last and best by professor Golius of Leyden, published in 1669, after his death. It is accompanied with the Arabic original, and with many learned notes on the first nine chapters, which Golius's death prevented him from continuing to the end of the work. Encyc. Brit. Sup. vol. i. p. 5.

FARGEAU, ST. a town of France, in the department of Yonne, with a strong fort; 10 miles S. of Briare, and 82 of Paris.

FARIM, a town and territory of Africa, S. of the Gambia. Lon. 13. 50. W. Lat. 12. 10. N.

FARIMA, or **BANSJU**, a province of Japan, noted for its manufactures of silk, cloth, paper, &c.

FARINA, [*Lat.*] flour of corn, &c.

FARINA FÆCUNDANS, among botanists, the impregnating dust on the apices or antheræ of flowers. See **POLLEN**. The manner of gathering the farina of plants for microscopical observations is this: gather the flowers in a dry sunny day at mid-day, when the dew is perfectly off; then gently shake off the farina, or lightly brush it off with a soft hair pencil, upon a piece of white paper; then take a single talc of isinglass between the nippers, and, breathing on it, apply it instantly to the farina, and the moisture of the breath will make that light powder stick to it. If too great a quantity adhere to the talc, blow a little of it off; and, if too little, breathe upon it again, and take up more. Then, put the talc into the hole of a slider, and, applying to it the microscope, see whether the little grains are properly laid; lastly, cover them up with another talc, and fix the ring; but be careful that the tales do not press upon the farina so as to alter its form.

FARLEU, money paid by the tenants in the W. of England, in lieu of a heriot. In Devonshire, farleu is distinguished to be the best goods, as heriot is the best beast, payable at the death of a tenant.

FARM, **FARIN**, or **FERM**, [*Firma*, *Lat.*] in law, signifies a little country messuage or district; containing house and land, with other conveniences; hired, or taken by lease, either in writing, or parole, under a certain yearly rent. See **LEASE**. This in divers parts is differently termed: in Scotland, it is a tack; in Lancashire, a fermeholt; in Essex, a wike, &c. In the corrupted Latin, firma signified a place inclosed or shut in; whence, in some provinces, Menage observes, they call closerie, or closure, what in others they call a farm. We find locare ad firmam signifies to let a farm; probably on account of the sure hold the tenant here has in comparison of tenants at will. Spelman and Skinner, however, derive the word farm from the Saxon *fearme*, or *jeorne*, provision; because the country people and tenants anciently paid their rents in victuals and other necessities, which were afterwards converted into the payment of a sum of money. Whence a farm was originally a place that furnished its landlord with provisions. For the management, culture, &c. of a farm, see **HUSBANDRY**.

FARMER, in mining, is the lord of the fields, or one that farms the lot and cope of the king.

FARMINGTON, a rich town of Connecticut, in Hartford county, 10 miles S. W. of Hartford.

FARN

FARN ISLANDS, two groups of little islands and rocks, seventeen in number, opposite to Bamborough castle in Northumberland.

FARNHAM, or **FERNHAM**, a town of Surrey, and capital of a district of its own name, 41 miles from London on the Winchester road.

FARNOVIANS, in ecclesiastical history, a sect of Unitarians, which arose in the 16th century, so named from Farnovius; whose principles they adopted, and soon after whose death they were dispersed.

FARO, a sea-port of Portugal, in the province of Algarva, on the Gulf of Cadiz, 20 miles S. W. of Tavira.

FARO, a populous and fertile island of Sweden, 30 miles in circumference, separated from Gothland by a narrow channel.

FARO, the capital of the above island, seated on the S. E. coast. Lon. 19. 7. E. Lat. 57. 50. N.

FARO, CAPE, a promontory of Sicily, near Messina, on which is a light-house.

FARO ISLANDS. See **FERRO**.

FARO OF MESSINA, a strait of the Mediterranean, between Sicily and Calabria, about 7 miles across; so named from Cape Faro; remarkable for its tide's ebbing and flowing with great rapidity every six hours.

FARRIERY.

FARRIERY, [from *ferriere*, Fr. a bag of instruments used in the shoeing, &c. of horses, so named from the Latin *ferrum*, iron, of which the instruments were made,] the art of preventing, curing, or alleviating, the disorders of horses. The practice of this useful profession has, till within the last fifteen or twenty years, been almost entirely confined to a class of men, who were utterly ignorant of the anatomy of the horse, and the general principles of the art of healing. Their prescriptions were as absurd as the reasons they assigned for administering their draughts, bolusses, drenches, &c. An institution has at length been established, where the diseases of that noble animal, the horse, are the subject of peculiar attention; we mean the Veterinary College, which, we are happy to state, is patronized by the most respectable of the nobility and gentry. From the manifest great consequence of the services of the domestic animals to man, in a state of civilization, they have, from a very remote period of antiquity, been the objects of his study and attention, both as to their ordinary management, and that which was requisite for them in a state of disease: for the latter a peculiar system was formed, including a materia medica and general mode of treatment considerably distinct from those in use with human patients. Of the authors of this system, whether Greek or Roman, nothing worth notice has been handed down beyond an occasional citation of names, to be found in Columella the Roman writer, who lived in the reign of Tiberius, and treated at large on the general management of cattle; and in Vegetius Renatus, who lived two centuries afterwards, and wrote more professedly on animal diseases. Both these authors have treated their subject in elegant and classical Latin; and the latter most particularly has urged, in very eloquent and forcible language, the necessity of a liberal cultivation of the veterinary art, as well on the score of profit as of humanity. It ought to be remembered, however, that neither of these authors had the benefit of any professional acquaintance with medicine or surgery, so obscure and imperfect were those sciences in their days; and that no ancient treatise on the diseases of animals, written by a professional man, has descended to posterity. Nor is this in the smallest degree to be regretted, since we not only find in the authors above-mentioned a sufficient field for the satisfaction of our curiosity, but also the most ample proofs of the irrationality of ancient principles and practice, and their total inapplicability to modern occasions. On veterinary anatomy and physiology no attempts at discovery or improvement are to be traced in those writers, a singular defect, considering the progress which had been made in Egypt and Greece in both the human and comparative anatomy. Celsus is the only physician of eminence among the ancients who is reported to have written on veterinary medicine; this part of his works has not survived, nor is probably the loss we have thereby suffered very considerable. Xenophon is the oldest veterinary writer on record; but his treatise is confined to the training and management of the horse for war and the chase. With respect to the fragments of ancient Greek and Latin veterinary writers, collected and published by Ruellius, chief marshal, or farrier to Francis I. king of France, they appear to have been generally the works of military men, or other lovers of the horse; perhaps none of them were of medical education. We learn from

the works of one of them, (Theomnestus,) which is confirmed also by others, that the ancients had a knowledge of the disease called the glanders in horses and other cattle, which was denominated in those days the moist malady. The chief merit of the ancient veterinary writers consists in their dietetic rules and domestic management; they were in the habit of purging their animals, but in other respects their medical prescriptions appear to us an inconsistent and often discordant jumble of numerous articles, devoid either of rational aim, or probable efficacy. In the operations of surgery, particularly in phlebotomy, and indeed in the various methods of manual treatment and controul of their animals, the ancients were far more skilful; and what they have left on the symptoms of diseases, if of no consequence in the present advanced state of science, still serves to demonstrate that they had not been inattentive observers of animal diseases, however inferior they might be in their methods of cure. These ancient writers are yet to be esteemed superior, not only in learning and eloquence, but in professional utility, to the majority of their pupils of the fifteenth, sixteenth, and seventeenth centuries. On the revival of learning in Europe, at the above periods, the works of the ancient veterinary writers were early sought and translated in Italy and France. At the same dawn of opening light and enthusiasm for the resuscitation and enlargement of the bounds of useful science, the anatomy and physiology of the human body became the grand objects of pursuits in the Italian schools. Veterinary anatomy followed in course; and the destructive labours of Ruini and others on the body of the horse, have not only served for a ground-work and model to all the schools of Europe since; but succeeding discoveries and improvements, notwithstanding the vast advantage of a general diffusion of light have not been hitherto sufficiently considerable to detract in any eminent degree from the well-earned fame of those early and original anatomists. Veterinary medicine was now generally cultivated, and in some instances, under regular medical professors. We find the following names in a list of those who had written on the res veterinaria in Italy during that period:—Laurentius Russius, Camerarius, Apollonius, Horatio, Albeterio, Grill, Casar Fiaschi, Evangelista; and afterwards in Germany and France, Gresson, Libal, Wickerus, La Brove, Vinet. Every branch of the Equine œconomy, whether relative to harness and trappings, equitation and military menage, or riding the great horse, the methodical treatment of the hoof, with the invention of various forms of iron shoes, and their scientific adaptation, were pursued with general assiduity and success. In this latter department Casar Fiaschi distinguished himself; and either invented or recommended the welshed shoe, proposing a substitute for calkens and frost-nails, which it appears were then in use, as well as the lunette, or short half-moon shoe. Evangelista, of Milan, distinguished himself in the breaking or education of the horse, and to him is attributed the invention of the martingale. The new veterinary science having diffused itself over a great part of the continent, could scarcely fail of occasional communication with this country, where the care of the diseased animals had been committed immemorially to leeches and farriers, persons generally belonging to the most illiterate class of society. It is probable that such communi-

cations became frequent during the reign of the first Tudors; for we learn from Blundeville, who wrote in the time of Elizabeth, that French and German farriers and riding-masters were not only employed by the queen, but in general by the nobility and gentry of the country. Yet our improvements in this country, in consequence of foreign aid, with regard to the medical and surgical branches at least, were by no means great, extending our view from the period of which we now speak, to the early part of the eighteenth century. No medical name appears during that long interval upon our veterinary list, nor any one of the smallest scientific pretension, we mean as far as respects the medical, anatomical, or surgical branches, that of Snape excepted, who was farrier to Charles II. and whose family, it appears by his book, had served the crown in that capacity upwards of two hundred years. Snape's anatomy of the horse proves him to have been a well-informed farrier. His anatomical system, arrangements, and nomenclature, were in course drawn from the Italian school; but he dissected, and his descriptions were confirmed by his own observation. His numerous plates are bold, accurate, and handsomely executed. Whether or not he published the book of cures which he promised, we are uninformed, but he was doubtless far better qualified for that task than those of his profession upon whom that branch of veterinary art unfortunately devolved. Stevens, Martin, Clifford, and Morgan, were very early writers among the leeches and farriers. The book of Maschal, farrier to James I. is most laughably illiterate, and we cannot help wondering with a late author, how such a book could possibly pass through numerous editions in a learned age, and which even possessed learned and rational books on the same subject. The above list may be concluded with De Grey and the celebrated Gervase Markham, a contemporary of Blundeville, who continued to publish perhaps until after the Restoration, and whose works were stuffed with every absurd, barbarous, and abominable juggling trick, as well as with every useful invention which had issued from the brains of either ancients or moderns. As a specimen of the medical part of the horse-leech craft of Markham, he prescribes human ordure in certain cases for the horse, both externally and internally. Yet this man's works had a most rapid and universal sale, and continued in repute until the days of Gibson, and even long afterwards among the country leeches and farriers. It must be allowed that Markham's book contained the fullest detail of the practice of the farrier, with a delineation of his instruments, not materially different from those in present use. Blundeville wrote sensibly and respectably on the general subject of the horse, according to the continental, the then fashionable practice. Baretti, in the succeeding reign, that of James I. wrote a learned treatise, entitled an *Hipponomie*, or the *Vineyard of Horsemanship*, in which he ably, and from obvious great experience, discusses all the relative branches, including the principle and practice of the race-course, and of that system of equitation peculiar to, and so generally prevalent in, this country. The huge folio of the duke of Newcastle gives us the regular manege of the horse from the continental schools, with an account of the different races of the animal, in which his grace was a connoisseur of high celebrity. In the early part of the eighteenth century William Gibson turned his attention to horse medicine and surgery. He had acted in queen Anne's wars as army-surgeon, and appears by his writings to have been a man of much practical knowledge and sound judgement. He was the first regular professional man who attempted to improve veterinary science, which he effected in a plain and popular way, grounded on the analogy between human and brute physiology, in course between human and animal medicine. The appearance of Gibson's book on farriery forms an era in veterinary annals; and his system in fundamentals has ever been, and is at this moment, the basis of our superior veterinary practice. He lived to publish a new edition of his chief work, about the middle of the eighteenth century. Dr. Bracken, a physician of Lancaster, a vulgar, desultory, captious, and petulant writer, yet a profound and enlightened reasoner, and of great ability in his profession, in a few years followed the laudable example of Gibson, and turned his attention to veterinary medicine. He was an exquisite practical judge of the animal of which he treated; and his work on farriery is a standard with respect to the jockey or peculiar English system, a branch which had been left untouched by Gibson. Bartlet, a surgeon in Bow-street, Covent-garden, was a most respectable, intelligent, and useful compiler

from Gibson and Bracken, whose labours he circumscribed and improved. William Osmer, a surgeon, turned his attention to veterinary and surgery, and published an excellent and practical, although whimsically written, book on horse-shoeing. His book has not probably been hitherto excelled in point of utility; and being written in a plain and popular way, is adapted to the capacity of the shoeing-smiths. The earl of Pembroke also wrote a short and excellent treatise on the same subject, practical horse-shoeing and case of the feet, and on the education of the military horse. Berenger about the same time, published a respectable work on the grand manege. Mr. Clarke, the king's farrier for Scotland, has published two valuable treatises on shoeing, and on prevention of the diseases of horses. The eighteenth century was abundantly fruitful in veterinary pursuits and publications. France took the lead; but a zeal for this science also pervaded Germany and the northern states, and colleges were established in various countries, where in the science has been since regularly cultivated. Baron Haller collated the various continental writers on black cattle and sheep; another catalogue of them may also be found in the *Giornale di Letterati di Italy*. Since these collections, the number of veterinary writers has been immense on the continent. Few or none of them have been translated into our language, excepting detached parts of the works of the eminent French writers, La Fosse and Bourgelat. The French have improved the anatomical and surgical branches of the veterinary art, rather than the medical; the English have made the greatest improvements in the latter: it is not improbably a parallel case with respect to human medicine. In 1792 the veterinary college was instituted at St. Pancras, near London. Towards the support of this institution, a sum is allowed annually by Parliament; it also derives some aid from the fees of students, and from subscription. The donation of twenty guineas makes a subscriber for life, and the payment of two guineas yearly gives the same title for that term. In either case the privilege of sending two horses to the veterinary hospital, free of all charges, except for keep, is thus acquired. His majesty has given considerable importance to the institution, by requiring that all veterinary surgeons, employed in the army, should have passed examination at the college, and he has eminently served the whole of the cavalry corps by conferring on those surgeons the rank of commissioned officers. And a great number of veterinary surgeons, receiving their diploma from thence, have been dispersed in the army and throughout the country, to our great national advantage, in the surgical and medical treatment of horses. A number of farriers also annually take the advantage of improving themselves at this seminary; but it is to be lamented that the light of veterinary science has hitherto shined but dimly and imperfectly on the other domestic animals. Mr. Coleman, the present professor, is well qualified for the important office he holds, and his exertions have been of very great advantage to the public, and of no less credit to himself. A great number of veterinary publications have issued from the press within this last period; and the two professors St. Bel and Coleman, with Messrs. White, Boardman, Blane, and many others, have laudably and usefully distinguished themselves in this way. Mr. Blane appears to have taken great pains in a new branch of veterinary science, as it relates to that useful domestic the dog. He has also published the anatomy of the horse. But the anatomical drawings and engravings of the bones, muscles, and many of the blood-vessels of the horse, of our justly celebrated horse-painter Stubbs, are held superior to any thing we possess of this kind. The objects of farriery we have shewn, are the anatomy, physiology, pathology, medical and surgical care, and shoeing, of the horse. Snape says, that "in some regards anatomy is more necessary to farriers than to physicians, in order to find out disorders; for besides the pulse and the urine, and the pathognomonic signs of each distemper, they (the latter) are assisted in their enquiries, moreover not to say chiefly, by the complaints and relations of the patients themselves; whereas a farrier, having to do with a dumb creature, must be very curious in his knowledge of the parts, with their offices, and of the sympathy or consent that one part hath with another; or else, seeing all his information must be of his own hammering out, he is like to make but a short discovery of the distemper."

OF THE ANATOMY OF THE HORSE.

The anatomy of the horse, in many respects, bears so close an analogy to that of the human subject, that the general description of

of the one will apply pretty accurately to the other. Thus, the horse is an animal composed like the human subject, of solids and fluids; of bones, cartilages, ligaments, fibres, membranes, arteries, veins, nerves, absorbents, muscles, glands, &c. It is therefore unnecessary here to repeat the definitions and descriptions of these parts already inserted under anatomy, which, with little variation, will apply to those of the horse; and for this reason, we refer the reader to ANATOMY, ZOOLOGY, and the above-mentioned works, and shall on this part of the subject only consider the external denominations, the skeleton, the contents of the chest and belly, with the principal parts of the feet.

OF THE EXTERNAL PARTS OF A HORSE.

"The first thing," says Mr. Reeves, "that offers itself to our view, is the coat, or hair. This has different denominations in several parts of the body. The fore-top is called the topping, or tuke: the hairs on the under lip are the beard: those along the upper part of the neck are called the mane: the part that is most arched, the crest; and when that sinks, a horse is said to be crest-fallen: the tuft of hair on the lower part of the leg behind, above the heel, is termed the fetlock, or feet lock: the hair, that grows round over the top of the hoof, is named the crown, crownet, or crowt: the hair on the eye-lids is the brills. The usual term for the body of a horse, is the carcass. The fore-head is often called the brow. The two hollows above the eyes, which are most remarkable in old horses, are termed the eye-pits. The mark, which often runs down the face, is the rache: and the white spot on the forehead, the star. The back part of the head, where it joins the neck is the poll: and the juncture of the head and neck, the onset, or setting on, of the head. The lips with the tip of the nose form the muzzle. The place on the inside of the mouth, where the tongue lies is the charnet. The fleshy rows that run across the upper part of the mouth, and are very remarkable in young horses, are called the bars. The top of the shoulder blades, and the highest part of the spine at the setting on of the neck are the withers; and from the top of these a horse is measured to know his size. From the withers to the hind part of the back are the reins. Next the reins are the loins, though some call the whole extent, from the withers to the croup, the reins. The extremity of the reins, above the hips, is called the croup. The part where the crupper lies is the channel; and the tail is the dock, or runt. The sinking of the back, if any, is named the sway. The hinder part of the belly, next the genitals, is called the flank, which reaches from the small ribs to the haunches. The loose skin which covers the yard is the sheath. The belly reaches from the brisket to the sheath. The point from the withers to the top of the thigh, inclosing the whole breast on both sides, is called the shoulder. The fore-legs, or arms, begin from the shoulder; and the hind part, pointing towards the brisket, is the elbow. The middle joint is the knee, to which the fore-leg reaches. The extent from the knee to the pastern is called the shank; and the strong tendon behind the shank, which is inserted into the heel, is termed the back sinew. The place where the shank joins the pastern, is distinguished by the pastern, or fetlock joint. The pastern reaches from the lower part of this joint to the foot, has a joint in the middle, to facilitate the motion of the foot, which distinguishes it into two parts; the greater pastern, next the shank, and the less, next the foot. The joining of this last with the foot is called the coffin-joint. The hoof is by some called the horn, but most commonly the coffin, because it incloses the bone of the foot. The tender part of the hoof, next the heel, is named the frush; and the ball of the foot the frog: though some give the same denomination to both, and thus the frush or frog rises from the middle of the foot, and reaches to the heel. The sole is the horny part, which covers the rest of the bottom of the foot, and adheres to the verge of the hoof, where nails are driven when a horse is shod. The sides meeting on the heel are the quarters. The haunches begin at the two bones of the back part of a horse, which inclose the ham, hock, or hough. The stifle is the kneepan of a horse seated in the middle joint of the thigh; and is outwardly that part, which sets out from the thigh towards the belly. The thigh or gascoin, begins at the stifle and reaches to the bending of the ham. The ham, or hock, is the bending of the hind-leg; and the round knob behind is called the heel of the hock, in which the great master sinew is inserted. The small of the hind-

leg is named the instep. The pasterns and feet are distinguished as in the fore-legs. That side of a horse, which we approach to mount him, is called the near side, and the other the off side. Hence come the terms near foot and off foot, the near eye and the off eye, and so of the rest."

OF THE SKELETON.

The skeleton of the horse may be divided into the head, trunk, and extremities. In Plate LXVIII. fig. 1. the letters *aaaa*, shew the os frontis, or forehead bone: *bb*, the parietal, or vertical bone: *ccc*, the occipital, by some called the knoll bone: *dd*, the temporal bone, made up of two parts, the squamous and petrous: *ee*, maxilla superior, or anterior: *f*, jugal, or cheek bone; *gg*, nasal, or bones of the nose: *h*, os unguis: *iii*, posterior jaw, or maxilla inferior: these are all the bones forming the head that appear on a side view. The following figures refer to particular parts of the bones, viz. 1. The petrous portion of the temporal bone, a hollow process, which forms. 2. The meatus auditorius, or opening to the ear. 3. The maxillary process of the temporal bone. 4. The cuneiform process of the occipital. 5. The zygomatic process of the temporal, joined to the jugal process, and forming the zygoma, or arch of this part. 6. The occipital protuberance. 7. The orbit, or cavity of the eye. 8. The coronoid process of the posterior or lower jaw. 9. The condyloid process that articulates the posterior jaw with the head. 10. A hole, called the superciliary foramen, through which the frontal nerve and artery pass. 11. A process of the frontal bone joining with the zygomatic process of the temporal. 12. A hole transmitting a nerve and artery to the face. 13. A third foramen, from which proceeds a branch of the 5th pair of nerves, and an artery. 14. The grinders. 15. The tushes. 16. The nippers.

The CERVICAL VERTEBRÆ, or NECK BONES. *AAAAAAA*, the 7 cervical vertebræ, the first of which, *b*, is called the atlas; the 2d dentate; *c* marks the transverse process of the first; as *ddddd*, do the same processes of the other six: *eee*, &c. the superior or antique oblique processes of the six last; in the first it is wanting: *fff*, &c. their inferior or posterior oblique processes; *ggg*, &c. the spinous processes of the same.

The remainder of the bones of the SPINE, *aaaaaa*, &c. the 18 dorsal vertebræ; *b*, their spinous processes; *c*, their transverse processes; *d*, their upper or anterior oblique processes; *e*, their lower or posterior oblique processes; *f*, the cartilage interposed between each dorsal and lumbar vertebræ; one only is marked, but will serve as a guide for the rest. *BCDE*, *FG*, the lumbar vertebræ, or those of the loins. The same description answers to these as to the dorsal, the great length of their transverse processes only being noticed. The numerals I, II, III, IV, V, mark the five pieces, of which the os sacrum is composed in the young subject, but which by age become entire bone. The figures, from 1 to 18, denote the 18 bones of the tail.

BONES OF THE THORAX, AND SHOULDER BLADES. *AA*, the sternum: 1, 2, 3, 4, 5, 6, 7, 8, the eight true ribs, so called as their cartilages are immediately attached to the sternum; 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, the false ribs, so called from their cartilages not being inserted into the sternum, but into each other; *a*, the head that articulates with the transverse process of the first vertebra of the back; *b*, the anterior part of the head that is connected to the body of the seventh vertebra of the neck; the same description answers for each of the other ribs. *A. A.* The scapula or shoulder blade; *a*, the superior, or more properly anterior spinatus fossa; *b*, the inferior spinatus fossa; *c*, the spine which divides these two fossa, and from which they take their name; *d*, the upper costa; *e*, the lower costa; *f*, the neck; *g*, coracoid apophysis: at the upper part is seen a line, shewing the extent of the cartilage of the scapula.

BONES OF THE FORE-LEGS. *B*. The humerus, or bone of the arm; *i*, its head that articulates with the shoulder blade; *k*, its external condyle; *l*, the fossa, or cavity receiving the radius; *m*, that which receives the cubitus. *c*, the cubitus or ulna: this in the young subject is a distinct bone, but in the grown horse is fastened to the radius; *n*, the process called olecranon, forming the elbow. *D*. the radius; *o*, its upper end; *p*, its lower extremity, forming a part of the knee. *E*. the carpus, which in the horse is formed of 7 bones; the tarpesium, which in the human subject forms the 8th, is wanting in the horse; this part forming the wrist.

of a man, is by long custom called the knee of the animal. F. the metacarpus or shank bones, to each of which are joined two imperfect metacarpal bones marked g, called by the French epineux; r, r, the sesamoid bones. G. the pastern bones. H. the coracæ, or little pastern bones. I. the coffin bone. There is another sesamoid or small bone within the curve of the coffin bone; which will be described afterwards.

THE PELVIS AND BONES OF THE HINDER EXTREMITIES. K. the pelvis, composed of three bones in the young subject, which are *aaaaa*, the ilium; *bb*, the ischium; *cc*, the pubis; *d*, foramen magnum. L. the femur: *e*, its head, articulating with the acetabulum, or cavity in the pelvis; *ff*, the great trochanter: *g*, the linea aspera; *kk*, the patella, or stifle, but more properly the knee bone. M. the tibia. N. the fibula; this, as in the cubitus or ulna, is firmly attached to the tibia, and is an inconsiderable bone, compared with that of the human subject. O. the tarsus, consisting of six bones, the great cuneiform bone being wanting which in the human body forms the 7th; *ll*, the calcaneum. PP, *pp*, the metatarsus, which follows the same description as the anterior extremities.

OF THE CONTENTS OF THE THORAX.

The chest being opened by raising the sternum, there appears a smooth polished membrane, the pleura, attached to its upper surface. This membrane is there double, but unites about an inch above the sternum; and the space between the double reflection is filled by cellular substance posteriorly, and by the thymus gland anteriorly. See ANATOMY, and Plate LXVIII, fig. 2. This space is called the inferior mediastinum: the two laminae then separating pass over the pericardium, and over the vessels, to be reflected on the lungs. After having passed over the lungs; one portion goes over the spine on one side, the other portion over the spine on the other side; leaving in this division a tubular opening, filled by the aorta, vena cava, azygos, thoracic duct, and œsophagus. This forms the superior mediastinum. There are therefore two reflections of the pleura on each side; one close under the ribs, the other in contact with the lungs. A bag is formed by this reflection; but the lung is not contained within it, as it is usually described, but a small quantity of water, the liquor pleurae. If this bag be cut into, the lung on that side is rendered for a time useless, by the air being admitted and preventing its expansion; but the distinct separation, formed by the reflections of the pleura, preserves the functions and powers of the other lung entire; without which wise provision, accidents and diseases of these parts would be more injurious, and more frequently fatal.

The PLEURA has few arteries and veins; and but little sensibility, if any, when uninfamed; but under inflammation, as is seen in pleurisy, peripneumony, &c. it has a great degree of it. The mediastinum is simply the junction of the two laminae of the pleura, dividing by distinct partitions the cavity of the chest. At the anterior and inferior division of the pleura, is situated the thymus gland. See ANATOMY.

The LUNGS, when inflated, are said to resemble the figure of the cloven foot of the ox. They are spongy in their texture, being every where full of little cavities, which are the minute ramification, or distribution of vessels termed bronchial, arising from one common trunk called the trachea. By means of these vessels, air is received throughout the substance of the lungs; depositing its vital part, it is returned from thence, and fresh air admitted.

Between the lungs is placed the HEART, supported in its situation by various attachments. It is covered by a membrane called pericardium, and is of an elliptical form: its anterior and superior part is called its basis; its posterior and inferior part its apex. The basis is confined by vessels; the apex is loose, and strikes against the intercostal muscles, giving the pulse from the heart. See ANATOMY. Fig. 2, of Plate LXVIII, represents such of the abdominal viscera, as appear immediately on the integuments being removed; and such of the thoracic viscera, or contents of the chest, as become evident on raising the sternum. *aaaaa*, the skin. *bbbb*, the integuments thrown back, consisting of muscles, tendons, and peritoneum. *cccc*, the most extensive of the large intestines, called the colon. *ddd*, the ligamentous bands of the colon, drawing it into folds. *e*, one of the small intestines. *ff*, the diaphragm, a large muscle, dividing the chest from the abdomen. *ggg*, the lungs. *h*, the heart. *iii*, the pericardium, a

bag surrounding the heart, containing a quantity of fluid; it is here opened to shew the heart, *kk*, the ribs. *l*, the sternum. *m*, the ensiform cartilage.

OF THE CONTENTS OF THE ABDOMEN.

The abdomen is divided into 4 regions. The epigastric, umbilical, and hypogastric inferiorly; and the lumbar superiorly. The epigastric region begins at the ensiform cartilage, or end of the breast-bone, and extends to within about six-inches of the umbilicus or navel: within its limits are situated the liver, the stomach, the pancreas, parts of the colon, of the spleen, of the duodenum, of the aorta, and vena cava. The umbilical region begins where the epigastric ends, at about six inches before the navel, to the same distance behind it; so that its extent is about 12 inches. It contains great part of the small intestines, the cœcum, parts of the colon, of the aorta, and vena cava, with a portion of the mesentery, and omentum. From the extent of the umbilical region, that is six inches behind the navel, to the bottom of the pelvis, and whole posterior part of the belly, is the hypogastric region; containing the rectum, bladder, part of the colon, the iliac vessels, and parts of generation. The lumbar region is that which is situated as it were upon these; and is formed from the hollows left on each side of the spine, from the beginning of the abdomen nearly to the end. It includes the kidneys and their appendages, the emulgent vessels, parts of the ureters, and greater part of the spleen. The whole of the abdominal cavity is lined by a membrane called peritoneum; it not only lines the cavity, but invests the whole of its contents, by being reflected over them. It has few vessels or nerves; when wounded therefore it bleeds little, and has not much pain, except under inflammation, when it becomes very sensible. It secretes a fluid of a serous nature, for the lubrication of the viscera, and for the prevention of adhesions; this may become so much increased in quantity as to cause dropsy. By its attachments it preserves the parts it invests in their proper and true situation; which seems to be its principal use. Fig. 3. Plate LXVIII, represents the two cavities of the chest and belly; with such of their contents as are immediately seen, when the parts represented in the former figure (the heart, lungs, and intestines,) are removed. A, the stomach nearly in its natural situation; upon its surface are seen its vessels. BB, the lobes of the liver. C, the omentum or caul, attached to the stomach throughout its whole length, covering the pancreas entirely, and in part the spleen. At one part it is held back by a pin, forced into the substance of the spleen, to shew the renal gland. D, the spleen. E E, the kidneys. F, part of the rectum. GG, the ovaria. H, the uterus or womb. I, the bladder distended with urine. KK, the diaphragm, or midriff. *aaa*, the aorta descendens, seen in both cavities. *b*, vena cava descendens; it is not seen plainly in this view in the chest, therefore is not distinguished. *cc*, the emulgent veins, emptying their blood into the vena cava. *dd*, the emulgent arteries, arising from the aorta. *ee*, the spermatic arteries and veins, united by a cellular substance soon after their origin, distributed to the ovaria. *ff*, the ureters, arising from the kidneys, and inserted into the sides of the bladder rather superiorly. *gg*, the iliac vessels, being the bifurcations of the aorta and vena cava. *hh*, the cavity of the pelvis. *i*, part of the duodenum, or first intestine, with which the expellent orifice of the stomach is united. *k*, the gall duct, seen arising from the liver, and inserting itself obliquely into the duodenum. *l*, ligamentum suspensorium, one of the ligaments attaching the liver to the diaphragm. *mm*, capsula renales, or renal glands, receiving vessels from the emulgent artery and vein. *nn*, the œsophagus, or canal for the passage of the food into the stomach. *o*, the ascending aorta. *p*, the ascending vena cava. *q*, the division of these vessels into branches, the principal of which are, *rr*, the subcostal arteries cut off furnishing with blood the fore-legs. *ss*, subcostal veins cut off, returning the blood from the fore-legs. *tttt*, jugular veins, returning the blood from the head. *uuuu*, carotid arteries, carrying blood to the head. *v*, a pipe, supporting these last vessels to render them more distinct. *ww*, the trachea or windpipe; the portion entering into the chest is removed. *x*, the œsophagus or gullet, brought from its situation behind the trachea, and supported with a knife. *yyyy*, the integuments of the abdomen thrown back. The principal parts of the foot are shewn in Plate LXVIII, fig. 4, 5, 6, 7. Fig. 4, shews the horny sole *d*, raised

raised from the fleshy sole *eee*, round which is the enchanneled flesh *f*, placed in the fulcus of the inner surface of the hoof *g*, the horny part of which is soft and white. Fig. 5, shews the under part of the fleshy sole *h*, raised from the foot bone, called the coffin bone *iii*; *k*, the covering of the tendo achillis; *n*, the cartilage; *m*, the edge of the fleshy sole confined in the furrow of the channeled horny substance. Fig 6 and 7, represent the bottom or base of the foot: *aaa*, the horny sole; *b*, the frog; *c*, the roof towards its lower edge, called the crust, or wall, of the foot.

OF THE TEETH AND AGE OF THE HORSE.

The horse has forty teeth: twenty-four double teeth, or grinders; four tushes, or single teeth; and twelve front teeth, or gatherrers. Mares in general have no tushes. The black marks, or cavities, which denote the age, are to be found in the corner front teeth, adjoining the tushes. Horned cattle have similar marks in the teeth. At four years and a half old, the mark-teeth are just visible above the gum, and the cavity is very conspicuous. At five, the horse sheds his remaining colt's teeth, and his tushes appear. At six, his tushes are up, and appear white, small, and sharp; near which is observable a small circle of young, growing, flesh: the horse's mouth is then complete, and the corner teeth filled up. At seven years old, the two middle teeth fill up. At eight, the black marks vanish, and the horse's mouth is said to be full, and himself aged. The French farriers aver that the marks remain in the teeth of the upper jaw until the horse is twelve years of age; but we believe this to be fortuitous.

OF THE MANAGEMENT OF HORSES, WITH REGARD TO FOOD AND MEDICINE.

GENERAL DIRECTIONS RELATIVE TO FOOD, DIET, EXERCISE, &c.

1. It ought to be laid down as a general rule, to give horses as few medicines as possible; and by no means to comply with the ridiculous practice of those who frequently bleed, purge, and give balls, though their horses be in perfect health, and have no indication that requires such treatment. 2. Proper management in their feeding, exercise, and dressing, will alone cure many disorders, and prevent most; for the simplicity of a horse's diet, which chiefly consists of grain and herbage, when good in kind, and dispensed with judgement, secures him from those complicated disorders, which are the general effects of intemperance in the human body. 3. In France, Germany, and Denmark, horses are seldom purged; there they depend much on alteratives; the use of the liver of antimony we have from the French, which is in general a good medicine for that purpose, and may, in many cases, be substituted for purging. 4. As hay is a material article in a horse's diet, great care should be taken to procure the best: when it is not extraordinary, the dust should be well shaken out before it is put in the rack; for such hay is apt to breed vermin. 5. Beans afford the strongest nourishment of all grain; but are fittest for laborious horses, except on particular occasions. In some seasons they breed a kind of vermin called the red bugs, which is thought to be dangerous; the best method in such cases is to procure them well dried and split. 6. Bran scalded is a kind of panada to a sick horse; but a too frequent use of it, either dry or scalded, is hurtful, as it relaxes and weakens the bowels. The botts in young horses may be owing to too much musty bran and chaff, given with other foul food to make them up for sale; particular care should therefore be taken that the bran be always sweet and new. 7. Oats, well ripened, make a more hearty and durable diet than barley, and are much better suited to the constitutions of British horses. A proper quantity of cut straw and hay mixed with them, is sometimes very useful to horses troubled with botts, indigestion, &c. 8. Horses, that eat their litter, should particularly have cut straw and powdered chalk given them with their feed; as it is a sign of a depraved stomach. 9. The salt marshes are good pasture for horses who have been surfeited, as well as for those under many other disorders: they purge more by dung and urine than any other pasture, and make afterwards a finer flesh; their water is for the most part brackish, and of course, as well as the grass, saturated with salts from the sea-water. 10. A summer's grass is often necessary; more particularly to horses glutted with food, and which use little exercise: but running for a month or two is proper for most; those especially who have been worked hard, and have stiff

limbs, swelled legs, or wind galls. Horses whose feet have been impaired by quitters, bad shoeing, or many other accidents, are also best repaired at grass. Those lamenesses particularly require turning out to grass, where the muscles or tendons are contracted or shrunk; for by the continual gentle exercise in the field, with the assistance of a patten shoe on the opposite foot, the shortened limb is kept on the stretch, the wasted parts are restored to their ordinary dimensions, and the limb again recovers its usual tone and strength. 11. The fields which lie near great towns, and are much dunged, are not proper pasture for horses; but are found to be very injurious to them, when fed thereon all the summer. 12. Horses may be kept abroad all the year, where they have a proper stable or shed to shelter them from the weather, and hay at all times. Thus treated, they are seldom sick; their limbs are always clean and dry; and, with the allowance of corn, they will hunt, and do more business than horses kept constantly within doors. 13. If horses, when taken from grass, should grow hot and costive, mix bran and chopt hay with their corn; and give them sometimes a feed of scalded bran for a fortnight, or longer: let their exercise and diet be moderate for some time, and increase both by degrees. 14. When horses are soiled in the stable, care should be taken that the herbage be young, tender, and full of sap; whether it be green barley, tares, clover, or any thing else the season produces; and that it be cut fresh once every day at least, if not oftener. 15. When horses lose their flesh much in soiling, they should in time be taken to a more solid diet: for it is not in soiling as in grazing; where, though a horse loses his flesh at first, yet after the grass has purged him, he soon grows fat. 16. Young horses, not fully grown, should be indulged more in their feeding than those come to their maturity; but if their exercise is so little as to make it necessary to abridge their allowance of hay, a little fresh straw should constantly be put in their racks to prevent their nibbling the manger, and turning crib-biters; they should also be sometimes strapped back in order to cure them of this habit. 17. It is obvious that great care should be taken of a horse after violent exercise; that he cool not too fast, and drink no cold water. 18. Most horses fed for sale have the interstices of their muscles so filled with fat, that their true shapes are hardly known. For which reason a horse just come out of the dealer's hands should at first be gently used. He ought to lose blood, and have his diet lowered, though not too much: walking exercise is most proper at first, two hours in the day; in a week or fortnight two hours at a time, twice a-day; after this usage for a month, bleed him again, and give him two or three times a-week scalded bran, which will prepare him for purging physic, that may now be given safely, and repeated at the usual intervals. 19. When a horse comes out of a dealer's hands, his cloathing must be abated by degrees, and care taken to put him in a moderately warm stable; otherwise the sudden transition would be attended with the worst consequences.

OF BLOOD-LETTING.

Horses, that stand much in the stable, and are full fed, require bleeding now and then: especially when their eyes look heavy, dull, red, and inflamed; as also, when they feel hotter than usual, and mangle their hay. Young horses should be bled when they are shedding their teeth, as it takes off those feverish heats they are then subject to. But the cases that chiefly require bleeding, are colds, fevers of most kinds, falls, bruises, hurts of the eyes, strains, and all inflammatory disorders, &c. A horse should be bled when he begins to grow fleshy at grass; and it is generally proper to bleed before purging. Horses should always be bled by measure, that the quantity taken away may be known exactly: two or three quarts are always enough at one time. The disorder and the horse's constitution should be considered before repeating it. The fleam and blood-stick have been long in use for bleeding horses, but many practitioners prefer the spring fleam as being much safer, others use the lancet. The frequent accidents consequent on striking with the blood-stick, and perhaps dividing the vein, and causing a dangerous tumour in the neck, are notorious. But in opposition to the use of the lancet, it is said to require more skill; and that the horse, on first feeling the point, unless the desired effect be instantaneous, shifts the position of his neck, and prevents success in the operation. Thus adroitness in the use of the lancet and instant execution, seem the only desiderata, by which to obtain a most beneficial improvement in practice. By some this advantage

is obtained, and they prefer the common lancet used in human phlebotomy. The horse, from past experience of perhaps repeated strokes, is ever shy of the farrier and the blood-stick. Surely even the prick of the lancet must occasion less alarm; and were the horse moderately twitched, or even his head made fast, he might be held sufficiently steady. Mr. Clark (see his book,) shews the danger in making the ligature round the horse's neck, previously to sticking and cutting the orifice; but in the use of the lancet, this is not so material, and the ligature may be slackened, upon the completion of the orifice. Should it be necessary to pin the wound as usual, care should be taken not to raise the skin from the vein, whence the blood may flow into the cellular substance between the vein and the skin, and form a lump or tumour, commonly called a swelled neck. Animals should never be bled at random, as is too often the case at this day, but by measure; nor is the practice lately introduced of drawing such large quantities, amounting to upwards of a gallon of blood, from a horse at one time, either rational or ultimately beneficial, in any case.—The most proper place for making the opening in the jugular veins, is where the teguments are thinnest, which is about a hand-breadth from the head, and about one inch below the branching, or joining of the vein which comes from the lower jaw, and which may be distinctly seen when any pressure is made on the main branch of the vein. In general, blood-letting should be reserved for inflammatory and critical cases, and nothing can be more absurd than the custom of regular periodical bleeding, whether in man or horse; neither bleeding nor diuretics can be the sufficient substitute for purgatives, when the plain intent is to remove obstruction and inflammation by unlading the bowels.

OF PURGING.

In gross full horses purging is often necessary, in some disorders of the stomach, liver, &c. but should be directed with caution. Before a purge is given to any horse, it is necessary some preparation should be made for it, to render the operation more safe and efficacious: thus a horse that is full of flesh should first be bled, and at the same time have his diet lowered for a week, especially those that have been pampered for sale; several mashes of scalded bran should also previously be given, to open the bowels, and unload them of any indurated excrements, which sometimes prove an obstacle to the working of the physic, by creating great sickness and griping. It should be remembered, that a horse is purged with difficulty; that the physic generally lies 24 hours in the guts before it works; and that the track of bowels it has to pass through is above 30 yards, all lying horizontally: consequently resinous and other improper drugs may, and often do, by their violent irritation, occasion extensive gripings and cold sweats, shave off the very mucus or lining of the guts, and bring on inflammations, which often terminate in mortification and death. The stomach and guts of a horse are but thin, compared to those of some other animals of the same bulk, and therefore must be more liable to inflammation and irritation. The first purge given to a horse should be mild, to know his constitution. It is a mistaken notion, that if a proper prepared purge does not work to expectation, the horse will be injured by it; for though it does not pass by stool, its operation may be more efficacious as an alternative to purify the blood, and it may pass by urine or other secretions. Purgative medicines are very successfully given in small quantities, mixed with others; and act then as alteratives. If mercurial physic be given, care should be taken that it be well prepared; and warmer clothing and greater circumspection are then required. A purge should be given early in the morning upon an empty stomach: about three or four hours after the horse has taken it, he should have a feed of scalded bran; and a lock or two of hay may then be put into his rack. The same day give him two more mashes; but should he refuse warm meat, he may be allowed raw bran. All his water should be milk-warm, and have a handful of bran squeezed in it; but if he refuse to drink white water, give it him without bran. Early the next morning give him another mash; but if he refuse to eat it, give him as much warm water as he will drink: let him be properly clothed, and rode gently about. This should be done two or three times a-day, unless he purge violently; once or twice will then be sufficient: at night give him a feed of oats mixed with bran. During the working, a horse should drink plentifully; but if he will not drink warm water he must be indulged with cold, rather than not drink

at all. It is a very pernicious custom to purge horses often; for it weakens their constitutions, depraves the blood and humours, and hinders digestion. Every purge abrades in some degree the mucus of the intestines, and procures an extraordinary secretion of the bile and pancreatic juice. The constitution therefore languishes under this loss, when the drains of these salutary fluids are too frequent; for unless they exist in a sufficient quantity to mix with aliments, the digestion must be weakened, as they are absolutely necessary for the elaboration of the chyle.

OF CLYSTERS.

Mr. Clark observes, that clysters are of greater importance in relieving horses from many acute complaints than it is generally imagined; and it were to be wished, that, in place of the more extensive cordial drenches, &c. which are but too frequently given in most of these cases, a simple clyster of warm water, or thin water-gruel, were substituted; the latter proving of great benefit, whilst the former too frequently prove hurtful. They not only serve to evacuate the contents of the intestines, but also to convey very powerful medicines into the system, when it is not practicable to do it by the mouth: for although they are only conveyed into the larger intestines, and perhaps hardly penetrate into the smaller; still they are extremely useful, by fomenting the latter, and softening the hardened excrement accumulated in the former, and rendering it so soft as to be expelled out of the body, by which wind and all offending matters pent up in them are likewise expelled. Besides, by their warmth and relaxing power they act as a fomentation to the bowels: hence they may be of considerable service in removing spasmodic constrictions in the bowels, carrying off flatulencies, and preventing inflammation in the intestines, &c. or, by conveying opiates to the parts affected, give speedy relief in colics, &c. &c. The use of emollient clysters in fevers is considerable. They act by revulsion, and relieve the head when much affected. Besides, by throwing in a quantity of diluting liquor into the intestines, it not only relaxes and cleanses them, but cools the body in general; at the same time, a considerable portion of the liquid is absorbed and conveyed into the mass of blood, by which means it is diluted; and, in particular complaints in the bowels, clysters give almost immediate relief, as the remedies, when judiciously prescribed, pass immediately to the parts affected, with little or no alteration from the powers of the body. In administering clysters, it ought always to be observed, that the contents of the clyster be neither too hot nor too cold, as either of these extremes will surprise the horse, and cause him to eject it, before it has had any effect. The composition of clysters should be extremely simple: on that account they will be easily prepared, and as easily administered, provided the operator is furnished with suitable instruments for the purpose. The generality of clyster-pipes that are used, are by far too small, and too short. It may appear a kind of paradox, yet it is a fact, that a clyster-pipe which is of a larger size than the ordinary ones, and of a proper thickness, is much easier introduced into the anus, than one considerably smaller. It is likewise obvious, that when the pipe is too short, it renders clysters of no use, because it cannot convey the clysters so far up into the intestines as is necessary for them to be retained; a small short pipe of six or eight inches long, is not capable of conveying the injection to the end of the rectum, which, in a horse of a middling size, is about 16 or 18 inches long. The smallness of the bag, which is generally proportioned to that of the pipe, is another very material objection to these instruments, as it seldom contains one quart of liquid; from which circumstance, very little benefit can be derived from the use of them in such large intestines as those of a horse. Dr. Bracken very judiciously observes, that "the colon of a horse seems to be three guts, by reason of the two necks of about half a yard each; is drawn up into many cells or purses by means of two ligaments, one of which runs along the upper, and the other on the under side of it, which, with the assistance of a valve or flap at its beginning, hinder the excrements either from returning back into the small guts, or falling too soon downwards, before the chyle or milky substance prepared from the food be sent into its proper vessels. And, indeed, the cæcum seems to be so contrived in the manner of a valve, to hinder the aliment and chyle from passing too soon into the colon; for, it is evident, that if the aliment and chyle were not in some measure hindered in their passage through these

these large guts, the body could not be sufficiently supplied with nourishment. The first of these colons is about a yard and a half in length, the second about a yard, and the third, or that part which joins the rectum, near six yards in length; so that the colon of a horse 14 hands high, may be said to be nearly $8\frac{1}{2}$ yards long; and, from it, along the rectum to the anus, where the excrements are discharged, is not above half a yard; so that it is plain, clysters operate mostly in the colon; though I must say they are given in too small quantities; for what signifies two quarts of liquor in a gut nine yards long, and four or five inches diameter, in a natural state; but in the colic, it is so distended with flatulencies, that its diameter exceeds seven or eight inches, as I have frequently observed in those dying of that distemper." The most proper instrument for giving clysters, is a simple ox's bladder, which will hold two or three quarts, tied to the end of a wooden pipe about 14 or 15 inches long, one inch and a half diameter where the bag is tied, and of a gradual taper to the extremity, where the thickness should suddenly increase, and be rounded off at the point, and made as smooth as possible; the perforation or hole through the pipe may be made sufficiently large, so as to admit the end of a common funnel, for pouring in the liquor into the bag. By the flexibility of the bladder at the end of this instrument, no danger can happen to the horse; the clyster is conveyed so far up into the intestines that it will be retained; it causes no surprise (providing the liquor be neither too hot nor too cold, but milk warm,) as no other force is required to throw it up than the holding the bag a little higher than the level of the pipe; by which means the liquor flows gently into the gut, without any surprise to the horse. After using the bag, it may be blown full of wind, a cork put into the pipe, and hung up in some dry place to prevent it from rotting; by which means it will last a considerable time.

OF ROWELS AND SETONS.

Rowelling is an artificial vent made between the skin and the flesh, designed to carry off the humours, which are the cause of various diseases, by revulsion and derivation; and serves the same purposes as setons and issues in men. The method of introducing them is by making an incision through the skin, about three-eighths of an inch long, and then separating the skin from the flesh with the finger, or with a blunt horn, all round the orifice, as far as the finger will easily reach; then introducing a piece of leather, very thin, shaped round, about the size of a crown-piece, having a large round hole in the middle of it. Previous to introducing the leather, it should be covered with lint or tow, and dipped into some digestive ointment; a pledget of tow, dipped in the same ointments, should likewise be put into the orifice, to keep out the cold air: the parts around it soon swell, which is followed with a plentiful discharge, from the orifice, of yellow serum or lymph; and in two or three days at most, the discharge turns into thick gross white matter: the rowel is then said to suppurate. Rowels should be placed (especially in some particular cases) as near the affected part as possible; and, at all times, they ought to have a depending orifice, in order to admit a free discharge of matter. The parts where they are inserted to the greatest advantage, are the belly, inside of the thighs, the breast, and outside of the shoulders and hips. Rowels are of great use in many cases, as they empty the surrounding vessels by a regular slow discharge of their contents, and are even of great service when there is a redundancy or fulness of humours in general, which may require a gradual discharge, in preference to greater evacuations by purging medicines, &c. But though they are frequently beneficial, yet, like a number of other operations common to horses, they sometimes, by the improper use of them, become hurtful to the constitution; and, in some diseases, they often, instead of suppurating, turn gangrenous. Thus, in violent fevers, where they are frequently very injudiciously applied, they never suppurate properly: whether this proceeds from the quickness of the pulse, together with the violent rapidity with which the fluids in general are then carried through the vessels, or from the violent agitation into which the whole system is thrown, it is difficult to determine; but experience confirms the observation. In such cases, the surrounding parts, where the rowel is placed, seldom or never swell (as in the ordinary course, when they suppurate properly,) but appear dry, or much in the same state as when they were first put in; there is little or no discharge from the orifice; and the little that does come is thin, ichorous, and bloody. In such cases, they

ought to be taken out immediately, and the parts well fomented with a strong infusion of camomile, or an emollient poultice applied. Setons are cords, introduced by long, thin, sharp-pointed, instruments, or needles, shaped like a dart at the point, and having at the other extremity an eye to receive the end of the cord, which is to be left in the tumor. The size of the instrument may be determined by that of the tumor, and the thickness of the cord which is to follow it, and which ought always to be smaller than the perforation made by the point of the needle. Every practitioner in farriery should always have a number of these needles by him, of different sizes, that is, from 6 to 14 or 15 inches long, a little bent on the flat, or under side. The following is the method of applying setons in cases of tumours, &c. When the matter fluctuates in the tumor, the needle, armed with a cord at the other end, is to be introduced at the upper part of it, and the sharp point of the instrument directed to, and brought out at the under or lowermost part of the tumour, including the whole length of it; or, if needful, through the sound muscular flesh on the under part, in order to make a depending orifice for the matter to run freely off: the cord should be dipped in some digestive ointment, and then tied together at both ends with a thread, to prevent its slipping out. But if, from the length of the perforation, the cord should not admit of being tied together at the ends, a small button of wood, or some such substance, may be fixed at each end: only, from this circumstance, the cord will require, when shifted, occasionally to be drawn upwards and downwards; whereas, when the ends of it are tied together, it forms a circle, and may always be shifted downwards to the lower orifice. When the needle for introducing the seton is to pass near any large blood-vessels or nerves, to prevent their being wounded, it may be concealed in a case, open at both ends; and after an opening is made at the upper part of the tumour sufficient to admit the needle with its case, it may be directed with safety to pass the blood-vessels, &c. it may then be pushed forward through the canula and the opposite side of the tumour, and, having only the common teguments to perforate, all danger will be avoided. When the matter in the tumour appears to be wholly discharged or dried up, and no thickness appears but where the cord is, it may then be cut out, and the orifices suffered to heal up. Setons are of great use in carrying off matter from deep seated tumours or abscesses in different parts of the body. They ought always to be preferred to making deep incisions into the muscular parts, which not only disfigure horses, but are very difficult to heal up.

OF ALTERATIVE MEDICINES.

By alteratives are to be understood such medicines as, having no immediate sensible operation, gradually gain upon the constitution, by changing the humours or juices from a state of distemperature to health. Many have but an indifferent opinion of a medicine that does not operate externally; and gratify their senses with a quantity of imagined humours ejected from the body: but though the different secretions may be more or less increased, according to the nature and quantity of the stimulus applied to the secreting vessels, and the evacuations by sweat, urine, dung, &c. in some measure regulated thereby, yet no evacuating medicine has a power of selecting or separating the bad from the good; and consequently they are thrown out only in a proportionate quantity. Where a continued use of evacuates is necessary, none are so proper as alteratives, and what we have said respecting a too frequent repetition of purges, may be sufficient to convince the judicious reader, of the great advantages arising from this class of medicines; and the preference due to them in most cases over purgatives. We shall therefore recommend some alterative medicines which are of general use, and which possess peculiar advantages, as is found by a proper experience of their good effects in repeated trials. The first is nitre, or purified salt-petre, which has long been in great esteem, and perhaps is more to be depended on in all inflammatory fevers than any other medicine whatever: but besides this extensive power of allaying inflammatory disorders, it is now offered as an alterative remedy, taken in proper quantities for surfeits, molten-grease, hide-boundness, grease-heels, &c. And as it has been known to succeed even in the cure of the farcy, what other distempers in horses, arising from vitiated fluids, may it not be tried on, with a strong probability of success? This great advantage will arise from the use of this medicine over most others, that, as its operation is chiefly by urine, it requires no confinement or clothing;

cloathing; but the horse may be worked moderately throughout the whole course. This medicine has been found equally efficacious (by many trials made in one of our hospitals) in correcting the acrimony of the juices, and disposing the most obstinate and inveterate sores to heal up; and hence probably it came recommended as an alternative to our horses. The quantity of nitre, when given as an alternative, should not exceed two ounces in the day; one ounce morning and evening, being sufficient for a dose. Dissolved in a pail of water it will be very little perceptible to the taste; and being thus largely diluted will occasion no uneasiness in the stomach; but if he refuse it in his water, it may be given in a ball. Antimony is another capital article in this class of medicines. An ounce may be given every morning to a horse, along with his feed of oats. Crude antimony finely levigated, the crocus, precipitated sulphur, and the wine, for internal use; and the butter of antimony for external use, are the only preparations of this mineral necessary to be retained for the purposes of farriery.

OF THE METHODS USED TO PRESERVE THE FEET.

The custom of keeping horses constantly standing upon dry litter and hot dung in the stable, is exceedingly hurtful to the feet and legs, particularly the former, which are always found to agree best with coolness and moisture. Hence the hoofs of the horses that run in the fields are always in better condition than those that are kept hot and dry in the stable; which, besides being liable to many diseases, are hard, brittle, shattered, and often broken. With respect to greasy and oily applications, so often prescribed for the hoofs of horses to preserve them sound, tough, &c. Mr. Clark, in his *Observations on the Shoeing of Horses*, and on the *Diseases of their Feet*, very justly condemns them as rather pernicious than salutary. When young horses, he observes, are first taken from the fields, their hoofs are cool, sound, and tough. These are found from experience to be good qualities. But horses are no sooner introduced into the stable than their hoofs are greased or oiled two or three times a week; and if they are kept much in the house standing upon hot dry litter, without being frequently led abroad, and without having an opportunity of getting their hoofs cooled and moistened in wet ground, their hoofs grow so brittle, dry, and hard, that pieces frequently break off, like chips from a hard stone; and, when driving the nails in shoeing, pieces will split off, even although the nails are made very fine and thin. But if these same horses with brittle shattered hoofs are turned out to graze in the fields, their hoofs in time will become as sound, tough, and good, as they were at first. This change must undoubtedly be ascribed to the wet and moisture which the hoofs are exposed to in the fields, of which water is the principal ingredient; and it is a certain fact, of which we have daily proofs, that when all other means fail, horses turned out to grass will recover their decayed brittle hoofs. The dealers in horses about London, when they get a bad-footed horse, moisten his hoofs frequently in water; for which purpose, they keep a puddle of water and dung at the watering place, that, when the horse comes to water, his fore-feet may sink in the puddle, by which means they are cooled and moistened twice or thrice a day; so that, whilst they are making up his carcass for the market, his hoofs are likewise repaired, and sufficient to stand the test of a trial upon sale. But no sooner do horses with hoofs of this kind come into other hands, their hoofs at the same time being kept dry and greased, &c. than they degenerate into their former state. Hence the cause of so many complaints that horses turn soon lame after they come from dealers, when, in fact, it proceeds from greasy applications, and neglecting to cool or moisten the hoofs in water; for the careful groom, when airing his master's horses, rather than lead them into a puddle, will go about in order to keep their legs clean and dry. To preserve the feet of horses, the method which nature suggests is, to cool and moisten the hoofs with water morning and evening: and to those who are fond of stuffing, we would prescribe bran and water, or clay, &c. made into the consistency of a poultice; and in particular cases, where horses stand much in the stable, and the hoofs are disposed to be very hard, dry, and brittle, a poultice of this kind, or any other emollient composition in which water is a principal ingredient, may be applied all round the hoof; or, in imitation of some dealers, to keep a puddle of water at the watering place, which will answer equally well, if not better. From this manner of treatment, the hoofs will be preserved in their natural state, and a

free and equal perspiration kept up, by which the nourishment natural to the hoof will have free access to its surface; as it is this only which causes that cohesion of the parts, which constitutes a firm, sound, and tough hoof.

OF SHOEING HORSES.

The shoes cannot possibly be made too light, provided care be taken that they be of a thickness so as not to bend; for bending would force out the nails and ruin the hoof. That part of the shoe which is next the horse's heel, must be narrower than any other, that the stones may be thereby prevented from getting under it, and sticking there; which otherwise would be the case; because the iron, when it advances inwardly beyond the bearing of the foot, forms a cavity, wherein the stones being lodged would remain, and, by pressing against the foot, lame the horse. The part of the shoe which the horse walks upon should be quite flat, and likewise the inside of it; only just space enough being left next the foot to put in a picker, (which ought to be used every time the horse comes into the stable,) and also to prevent the shoe's pressing upon the sole. Four nails on each side hold better than a greater number, and keep the hoof in a far better state. Several modern authors, particularly Osmer, instead of attempting to improve the horse-shoe, propose to lay aside the use of it altogether, for which they are severely censured by Mr. Taplin. They "seem," says he, "extravagantly fond of an idea borrowed from antiquity, upon the practicability of horses travelling the road, and doing their constant work, without any shoeing at all." Osmer insists "that horses are adequate to their different services in a state of nature, without the officious obtrusions of art;" venturing to affirm "that they will travel even upon the turnpike roads about London, without injury to their feet." Mr. Taplin, however, observes, that "such economical plan may be admirably calculated for the theoretical journey of some literary speculatist, but affirms that no such excursion can take place of any duration, without material injury to the hoof, unless to the high-bred horses of authors, who enjoy their journeys only in imagination." Mr. Coleman, the present ingenious professor at the Veterinary College has made a material improvement on the horse-shoe. In his public lectures he observes, that, for a good natural foot, all that is required of a shoe, is to guard the crust by a small and narrow piece of iron, which should be attached principally towards the toe, and should not be extended so far back as the heel. The sole itself should not be covered by the shoe; for dirt and stones will get between, and will form a permanent and partial pressure on the sole, which will produce disease. According to the present mode of shoeing, those diseases which affect the horse's foot constantly take place on that portion of it which is covered by the extended breadth of the shoe, while the exposed parts remain uninjured. The reason is, that the covered parts, besides being exposed to permanent pressure from the cause already related, become tender by being covered. If these parts, therefore, are exposed, they get hardened and thick; and if the horse happens to tread on a hard and rough body, the inconvenience is but momentary, and the pain will make him remove his foot, so as to prevent mischief. Common shoeing is very liable to produce corns by the hoofs spreading out, and leaving the shoe in close contact with the sole, where it acts as a fixed point, and will not allow the elasticity of the insensible sole to act. The nails of the shoe should not be placed near the heels, for it disposes the heel to contract, especially when the bars are cut away. Mr. Coleman has the shoes made three times as thick at the toe as at the heels, because they wear more forward than behind. By this means the heels are less oppressed with weight, and the frog is allowed to come down to the ground: a matter of extreme importance. The nails are all placed forward, four on each side, but not approaching too near the heels, that they may not obstruct the elastic powers of those parts. The old method of fullering, *i. e.* making a groove in the shoe, being found injurious, by often breaking away the heads of the nails, they are now counter-sunk in conical or wedge-shaped holes, so that they may be driven up close to their thickest parts, and be out of the way of accident. By this means the nails and shoes appear as one body, and always wear together. For horses which go in shafts, or are used in hunting, it is usual to make shoes with only one heel, which should be outward. The horse's heel must be rather lowered on that side, and the inner heel of the shoe somewhat thickened so as to balance and bear equally. By this

easy precaution a good footing is obtained, and cutting is effectually prevented. The best breadth for the shoe of a medium sized horse is said to be one inch at the toe, and three quarters at the heel; the weight about eighteen or twenty ounces. Light saddle horses should not have shoes exceeding sixteen ounces; and, unless local circumstances prevail, twelve ounces will be generally found preferable. In order to fit the shoe without causing the horse to stand too much on his heels, the under part of the crust, or wall of the hoof, is pared away to receive the excess of thickness in front; for the bottom of the shoe ought to be perfectly flat, without any stubs or calkings in front. Paring away the heels is a most destructive practice, except in case of absolute excrecence in those parts; nor should the bars (or diagonal ridges) that extend from the heels to the frog, or central projection, ever be cut more than is absolutely proper for the purpose of keeping them in a clean and healthy state. Fig. 8 and 9, in Plate LXVIII. represent the form of modern shoes. When the roads are covered with ice, it is necessary to have the heels of a horse's shoes turned up, and frequently sharpened, to prevent him from slipping and falling; but this cannot be done without the frequent moving of the shoes, which breaks and destroys the crust of the hoof where the nails enter. To prevent this, it is recommended to those who are willing to be at the expence, to have steel points screwed into the heels or quarters of each shoe, which might be taken out and put in occasionally. To do this properly, Mr. Clark advises, first to have the shoes fitted to the shape of the hoof; then to make a small round hole in the extremity of each heel, or in the quarters, about three-eighths of an inch in diameter, or more, in proportion to the breadth and size of the shoe; in each of these holes a screw is to be made; the steel points are likewise to have a screw on them, exactly fitted to that in the shoes. Care must be taken that the screw in the points is no longer, when they are screwed into the shoe, than the thickness of the latter. The steel points are to be made sharp; they may either be made square, triangular, or chissel-pointed, as may be most agreeable; the height of the point above the shoe should not exceed half an inch for a saddle-horse; they may be made higher for a draught horse. A key for screwing them in and out occasionally is necessary, it must have a cavity properly adapted to the shape of the steel point, and sufficiently large to receive the part above the shoe. To prevent the screw from breaking at the neck, it is necessary to make it of a gradual taper; the same is likewise to be observed of the female screw that receives it, that is, the hole must be wider on the upper part of the shoe than the under part; the sharp points may be tempered, or hardened, in order to prevent them from growing too soon blunt; but where they become blunt, they may be sharpened as at first. These points should be unscrewed when the horse is put into the stable, as the stones will do them more injury in a few minutes than a day's riding on ice. A draught horse should have one on the point of each shoe, as that gives him a firmer footing in drawing on ice; but for a saddle horse, when points are put there, they are apt to make him trip and stumble. When the shoes are provided with these points, a horse will travel on ice with the greatest security and steadiness, much more so than on causeway or turnpike roads, as the weight of the horse presses them into the ice at every step he takes.

OF FIRING, CROPPING, NICKING, AND DOCKING.

The cautery is also an instrument of prime consequence in veterinary practice; but the firing the legs of horses is yet performed by the generality of common farriers in a heavy-handed, rough, and barbarous way; the old method of drawing cross lines ought to be abolished. Indeed the general rude and unfeeling modes of treating this animal, by whose services mankind are so much benefited, form a proper subject of instant inquiry, and attempts at gradual improvement. Common farriers and grooms, from inveterate habit and total absence of reflection, look upon the animal, placed by stratagem and force within their power, as a mere piece of machinery, the feelings of which never disturb the straight-forward aim of the operator, for indeed they never come within his contemplation: on the contrary, he generally views his victim, bound down to the most infernal and exquisite tortures, with a kind of triumph, or even strongly-marked features of revenge, if the wretched beast has given him much trouble. The heavy and bungling methods of common operators increase tenfold the necessary sufferings of the horse. Thus an author, whom

we have repeatedly quoted, relates that he saw a mare's lip twitched with such violent force, that it burst asunder; and the agony of the twitch being so exalted, its intent was frustrated, and the mare threw herself upon the ground. The burning off with a lighted candle the hair of the horse's lip, beneath the jaw, and within his ears, is generally a most terrifying process, and renders many horses dangerously shy about the head; besides, the robbing that delicate organ, the ear, of the natural protection of its inner part, is most improper, unnecessary, and cruel. Such practice should never be permitted for a moment; the scissors will do every thing in the case which neatness and symmetry require. The cruel operations of nicking the tails of horses it is almost useless to declaim against, from its present general adoption; but we really can discover no reason why an erected tail should be deemed essential to beauty of figure on the road or field, more than on the turf, for which purpose horses are never nicked. Yet it seems necessary to dock or abridge the tail of the horse destined for the saddle at least; but as it is always a severe, and often a dangerous, operation to a full-grown horse, we recommend Mr. Lawrence's practice of taking off a hand's-breadth of the colt's tail while it sucks, at a month or two old. He says he has repeatedly performed this trifling operation with a sharp knife; the patients being so little disturbed by it as to continue feeding on the same spot: nor was it always necessary to bind up the wound. Although no friend to cropping, he has been tempted to crop a large, heavy, lopping, ear in a yearling; judging it best to crop early, if at all. As Mr. Lawrence's treatise contains hints of peculiar utility, we will quote certain of them in this place: he strongly recommends that all cart-colts may be taught to back when they are first taken in hand; as a preventative of much future misery and barbarity. That the keepers of post-horses would, as far as lies in their power, be careful to select postilions of light weight; and that they would attach a convenient seat to the splinter-bar of their post-chaises, for the use of the postilion, whenever he can obtain leave of humane passengers to ease his horse, by seating himself on the bar. Mr. Lawrence also recommends a covering for the knees, to preserve them in case of an accidental fall, or in case of a recent wound by a fall: this is of particular use to race-horses and hunters, or sale horses on travel. He farther counsels, that saddle colts, in their breaking, be taught and accustomed to a steady canter, a thing generally unthought of.

OF THE INTERNAL DISEASES OF HORSES.

OF FEVERS IN GENERAL.

A fever is a general disease, which affects the whole nervous system, and disturbs all the functions of the body; nor are the solids free from its dire effects. The motions of the heart and arteries cease to be regular and equal; the circulation of the blood to be free and natural; and the secretions and excretions are no longer rightly performed. Horses may be attacked by this distemper at all ages, whether running at large in the fields, or kept close in the stable. Sometimes it is epidemical, seizing great numbers at the same time; sometimes symptomatical, being a consequence of other diseases, and rendering them more dangerous and difficult to be cured. A fever, properly speaking, does not consist merely in an accelerated pulse, or a more frequent beating of the heart, as this may happen from hard riding, or any thing else that puts the blood and spirits into a commotion. That only can be called a fever, which proceeds from internal causes, and is attended with coldness of the external parts. In men there is generally a shivering, and probably also in horses, though it is seldom or never taken notice of, because it can hardly be discovered till the disease is confirmed.

I. SIMPLE FEVER. In a simple fever, all the internal parts continue sound, and there is no inflammation, or inflammatory tumour, that may occasion it. This is the mildest and least dangerous of all fevers, and is generally owing to a suppressed perspiration, which increases the quantity of humours, and thereby requires an increased effort of nature to throw them off, and to remove the obstructions; whence a feverish habit will follow, which, if taken in time, by assisting the endeavours of nature, may go off without any bad consequences. There is nothing so likely to cause this fever, as a sudden refrigeration of the body, after it has been violently heated. The symptoms of a simple fever are, a

loss of appetite, in such a manner, that the horse only nibbles his hay, as if he did not like it; and he is so restless as to be continually ranging from one end of the rack to the other: he has a beating of his flanks, a redness of his eyes, and dryness of his tongue, which is somewhat parched; and his ears and feet are not cold, as in complicated fevers, but are almost as warm as the rest of his body. He is not costive, but his dung by internal heat is dried into small balls, and is seldom or never greasy: his urine is of a high colour, and is sometimes voided with difficulty. He seems to be fond of water, yet drinks but little at a time, and often. His pulse beats full and hard, to 50 strokes and upwards in a minute. The indications of cure are, to free the vital parts from the congested blood; to abate the heat of the blood and humours; to allay the inordinate motion of the solids; to discuss the stagnant and corrupted humours; and procure a free circulation, by recalling the blood to the external parts. Therefore we must begin the cure by taking away a sufficient quantity of blood. The longer this is neglected, the more viscid and acrimonious is the blood rendered, by dissipating its more thin part, condensing the globules, and heating the serum to such a degree, as to turn it into a kind of jelly. The acrimony of the oleous and saline parts of the blood will be increased more and more, insomuch that the blood will be at length highly contaminated, and so far depraved as to be unfit for the purposes of life. The quantity of blood to be taken away must be in proportion to the strength of the horse, the intensity of the fever, the heat, and the violence of the symptoms. In general, three pints or two quarts may be sufficient; and if the symptoms are not abated by the first bleeding, it shews a necessity of repeating the operation, especially if he refuse to feed. However it is safer to take away too little than too much. When the horse is disposed to drink, it will be always proper to let him have a sufficient quantity to keep his blood well diluted; otherwise, as the preternatural heat dissipates the thinner part, without a sufficient quantity of fluid, the serum of the blood will be concreted into a jelly. This should be made with warm milk and water, mixed with a little oatmeal. He may likewise have the drink, No. 16. His diet should be scalded bran to keep his body open, and he may be allowed half a quartern three or four times a-day, if he will eat it. But if he refuse it, let him have raw bran sprinkled with water. He should never get much hay at a time, but a small quantity of good hay may be given to him frequently. His water needs not be much warmed, but should be given often and in small quantities: his cloathing should be moderate; too much heat and weight on a horse being improper in a fever, which scarce ever goes off in critical sweats (as those in the human body terminate,) but by strong perspiration. Besides bleeding and the nitrous cooling drink, it will be proper to inject cooling, emollient, and laxative clysters, even at the very beginning, to bring away the hardened faeces that are pent up in the intestines, and to discharge any bilious acrid matter, which might enter into the blood through the lacteals. Saline purges are also proper, being cooling and gentle in their operation and preferable to aloetic purges in fevers. The drink, No. 14, is as good a general formula as can be contrived, in almost all cases where such medicines are indicated. The signs of recovery are, the horse eating scalded bran, and picking a little hay, which, when he does, he needs only to be taken care of and well nursed, without troubling him with any more medicines. For though a horse continue to heave at the flanks, this is no bad sign, especially if he be cool all over, and has a return of appetite. He should now be taken out in the air every day, and led about by the hand. He should also have plenty of clean straw to lie down on.

II. Low, putrid, and malignant fever. This is of a more complicated and irregular nature than the former, and if not properly treated often proves fatal. It seldom rises to that degree of heat, that attends inflammatory fevers, but creeps on gradually, while nature endeavours to get rid of her enemy, sometimes by one outlet, and sometimes by another; insomuch that we are not able to determine which of the secretions to promote, and this renders the method of cure very precarious and uncertain. These sorts of fevers have been often mistaken for severe colds, which has produced fatal errors. And indeed it requires the highest skill in farriery, to treat these diseases in a proper manner, and prevent them from ending in a consumption. All kinds of irregularities, whether in diet, rest, exercise, or labour, when long continued,

may produce these fevers; as they all tend to generate bad humours, deprave the blood, and depress the spirits. The only way, therefore, to prevent them, is to keep the horse from excesses of all kinds: for what tends to preserve his due temperament, is the best means to preserve him from diseases in general, and this kind of fever in particular. When this fever begins to appear, the horse feeds but little, eating a mouthful or two, and then leaving off; he has a constant moisture in his mouth, moves his jaws in a feeble manner, and has a disagreeable grating of his teeth. The fever is attended with a depression of spirits, which is at some times more remarkable than at others. His heat is variable; sometimes none appears outwardly, but rather a remarkable coldness: at other times he is hot all over, but not to a great degree. His eyes are generally moist and languid; his body is open; his dung soft and moist, but seldom greasy. His staling is irregular; sometimes very profuse, and at other times very little. His urine is generally pale, without a sediment, and very seldom high coloured. With regard to prognostics, if the fever sensibly abate, and his mouth grow more dry, the grating of his teeth ceasing at the same time; if his appetite mend by degrees; if he begin to lie down, (which at first he seldom does,) for a week, or a fortnight, or longer, these are promising signs. A horse in these fevers always runs at the nose, but not the kindly white discharge, as in the breaking of a cold, but of a reddish or greenish dusky colour, and of a consistence like glue, that sticks like turpentine to the hair on the inside of the nostrils: if this turn to a gleet of clear thin water, the horse's hide keep open, and he mend in his appetite, there is no doubt of his recovery, unless through bad management. While the disease is in a moderate state, he will feed, though but poorly; his urine will be pale and thin without any sediment; his dung will be sometimes loose, and sometimes hard; his mouth will continue moist, with a redness and sponginess about the roots of his teeth; his skin will sometimes feel dry, and sometimes moist and damp, with a roughness of his coat. While the horse remains in this state, proper medicines will in all probability work a cure. But if his appetite be constantly upon the decline, and go off gradually, till at last he forsakes every kind of food, while his fever continues or increases: if the horse be old, with poor rapid blood, or have lately met with any severe accident, little good is to be expected, unless by the consummate skill of the person who takes care of him. The various and irregular symptoms, that attend this slow fever, require great skill to direct the cure, and more knowledge of the symptoms of the diseases of horses, than the generality of gentlemen are acquainted with. The experienced farrier should therefore be consulted and attended to, in regard to the symptoms; but very seldom as to the application of the remedy, which is generally above his comprehension; though it may be readily selected, by duly attending to the observations here inculcated. The cure of this disease may be begun by bleeding; but the quantity of blood to be taken away must be regulated according to the symptoms. When the horse is plethoric, and there is a redundancy of blood and humours, two quarts at least may be taken, and that as soon as possible; if the horse be in a moderate condition, a quart or three pints will be sufficient; but if he be old, poor and low, it will be dangerous to take away any at all. In general, when there is any symptom of inflammation, it is necessary that the horse should lose blood, let his condition be what it may. The greatest danger in this distemper arises from supposing the horse to have little or no ailment, till he is too far gone for a cure, because he will keep picking and eating his hay, during the first stage of his disease. Afterwards, if he be allowed oats, he will eat nothing else, till his appetite quite forsakes him. Therefore, if his disease be discovered in due time, instead of oats he should have scalded bran; and if he refuse this, he should get a little raw bran sprinkled with clean water, and some good hay put into his rack by handfuls. But if he be neither willing nor able to lift his head to the rack, it may be given by the hand, to tempt him to eat. As drinking is absolutely necessary to dilute the blood, if the horse refuse to drink freely of warm water or gruel, he must be indulged with having the chill only taken off by standing in the stable: nor will any inconvenience ensue, but oftener an advantage; for the nauseous warmth of water, forced into horses for a time, palsies their stomachs, and takes away their appetites, which the cold water generally restores. Should the fever

fever after this treatment increase, the horse feed little, stale often, his urine being thin and pale; and his dung sometimes loose, and at other times hard; should the moisture in his mouth continue, his skin being sometimes dry and at others moist, with his coat looking staring and surfeited: upon these irregular symptoms, which denote great danger, the balls, No. 6, or the drink, No. 17, should be given, without delay, for in these cases there is no time to be lost. When the horse has so far recovered his strength, that he is fit to be taken out of the stable, lead him into the open air, which will contribute much to his speedy recovery. Costiveness is bad in all diseases, but particularly in those of the head and in fevers. When therefore the horse is in this condition, recourse must be had to emollient clysters or saline purges. If, on the contrary, the looseness should happen, it is often critical, and therefore should not be immediately stopped, if moderate; but if, by continuance the horse grow feeble, mild astringents and tonics must be administered. Particular regard should be had to his staling; which if in too great quantities, so as manifestly to depress his spirits, should be controlled by proper restraints, or by preparing his drinks with lime-water. If, on the contrary, it happen that he is too remiss this way, and stale so little as to occasion a fulness and swelling of the body and legs, mild diuretics such as No. 5, will be the most proper remedies. The signs of a horse's recovery are known by his hide keeping open, and his skin feeling kindly; his ears and feet will be of a moderate warmth, and his eyes brisk and lively; his nose grows clean and dry; his appetite mends, he lies down well, and both stales and dungs regularly. If he happen to have eruptions on his skin at this time, it is no bad symptom, but on the contrary, may prove very beneficial. Medicines will now be no longer necessary, as the completion of the cure depends more on proper attention to supply him with suitable diet and convenient exercise. As all tedious distempers weaken the digestive faculties, we may easily suppose a horse is not able immediately upon his recovery, to concoct the same quantity of food as before he was ill. It is therefore, obviously improper to give him as large feeds in his weak, though convalescent state, as formerly, when he was in perfect health and strength. This, it is alleged, will bring him to his flesh and strength the sooner; but it is a great mistake, and is in danger of causing a relapse; for though the horse's stomach be craving, and he appear greedy of food, yet as he will not be able to digest it, so as to enlarge the quantity of good chyle, he must necessarily generate crudities, which may occasion a relapse, or at least throw him into a surfeit, which may prove as bad. Hence the necessity appears of feeding sparingly at first, and of giving him provender by little and little, in proportion to his strength. He should also be aired every day; for fresh air is as necessary to restore all the functions as a proper diet; as is evident from the speedy effect a change of air has on the health and recovery of the human species. And then gentle exercise, increased by degrees, will bring him to his wind and flesh, by promoting a due distribution of the chyle, and a regular circulation of the fluids.

OF COLDS AND COUGHS.

We class these disorders together, because the second is generally the attendant on and consequence of the first. A cold in a horse is the same sort of disease as in a man. It is occasioned by the same exposure, and to be avoided by the same sort of cautions we think necessary for ourselves. To enumerate the various causes of colds would be endless: the most usual are, riding horses till they are hot, and suffering them to stand in that condition where the air is cold and piercing; removing a horse from a hot stable to a cold one, and too suddenly changing his cloathing; whence it is that horses often catch such severe colds after they come out of the dealers hands, and by not being carefully rubbed down when they come in hot off journeys. Where there is a constant attention and care, the effects of cold are not only soon discovered, but an observation may be very early made to what part it more immediately directs its attack. For instance, if the nervous system be the most irritable, the affection is quickly perceived in the eyes; if the glandular, upon the neck, throat, under the ears, or in the head; or if more particularly the system of circulation has been affected, the consequences are soon apparent upon the lungs; and will be exerted more or less in a cough, or

difficulty of breathing, according to the severity of attack, from the repulsion of respirable matter, and its consequent absorption into the circulation. As soon as the horse is in this state, a symptomatic fever attends; which is to be understood as no more than a degree of febrile heat or irritability dependent on the original cause, which gradually ceases as the primary disease is found to decline. From an affection of the different parts above specified, various disorders ensue, which are treated of under their proper heads. Here we have only to consider that kind of cold fixed on the lungs, which produces cough; and which, if taken in its first stage, generally yields to very simple remedies. With regard to prognostics, when the cough is strong, and the horse does not refuse scalded bran or warm water, at the same time pricking up his ears and moving briskly in his stall, it is a good sign; as also when he dungs and stales freely without pain. It is likewise a good sign, when his skin feels as in health, and when his mouth is moist without being clammy. But when his coat stales, it is a bad omen: when his mouth is hot, dry, and parched, and his belly tucked up, there is danger of a fever: when a horse feels hotter than ordinary, with a working at his flanks; when he will not eat his meat or drink his water; when his eyes are very moist, his mouth slimy, his ears and feet cold, there is danger of a malignant fever. As soon as the attack has been observed, bleeding should be instantly performed, according to symptoms, size, state, and condition; and the blood preserved a few hours to ascertain its state: if livid or black, with a coat of size upon its surface, there is no doubt of its viscosity, and of the obstructed circulation of that fluid through the finer vessels of the lungs. In three or four hours after bleeding, give a mash prepared as follows:—On equal parts of bran and oats, pour a sufficient quantity of boiling water, in which two ounces of Spanish juice, and four ounces of honey has been dissolved, and then stir in two ounces aniseed and liquorice powders; honey four ounces. In two hours after the mash give a gallon or six quarts of soft water moderately warm, in which has been dissolved two ounces of nitre. These mashes Mr. Taplin directs to be “continued every night and morning, giving a moderate feed of dry oats in the middle of the day, good sweet hay in small quantities, and the same proportion of nitre to be repeated in the water after each mash. To these must be added the necessary regulations of good dressing and gentle exercise, which in general soon effect the cure of such colds as are counteracted upon the first attack.” When the disorder has been neglected, and made a rapid progress, should the cough be violent and constant, the horse very dull and refusing his food, and the symptomatic fever run high, the blood will consequently prove as before described. In this case the symptoms will not perhaps yield to the above plan so soon as may be wished. It will therefore be necessary to repeat the bleeding in two or three days at farthest, according to circumstances. Continue the mashes and nitre as before directed; and give about four ounces of the cordial pectoral ball, No. 8, every morning. Malt may be substituted for oats in the mash, if thought more agreeable.

OF ASTHMA, BROKEN WIND, AND CONSUMPTION.

The consequences of colds, neglected or injudiciously treated, are settled habitual coughs, asthmas, broken wind, and consumptions. The asthmatic cough, which is distinguished by being short and dry, preceded by a husky hollow kind of wheezing, as if the respiration were obstructed by fragments of hay or corn retained in the passage, is not incurable, unless it have continued long, and the horse be old. Bleeding must be first performed, and occasionally repeated in small quantities, till the glandular inflammation and irritability are allayed, and the blood so attenuated by the constant use of nitre, as to render the circulation free through the finer vessels of the lungs, from the obstructions in which all the difficulties proceed. Bleeding having taken place with the necessary circumspection as to quantity, let two ounces of nitre be given punctually every night in the water, as particularized under the article COLDS, continuing one of the balls, No. 9, every morning for a fortnight or three weeks, that a fair and decisive trial may be obtained. This treatment, with the assistance of open air and moderate exercise proportioned to the horse's strength and constitution will bid fair to effect a cure in every case in which the disease is not too deeply rooted to re-

sist such powerful means of relief. When this distemper is so far confirmed, as to become what is properly called a broken wind, the inspirations are always more slow than the expirations; for they draw in their breath slowly, and their flanks fill up and rise very gradually, but fall again suddenly, because their breath is forced out through their mouths and nostrils with great rapidity, which shews a convulsive disposition of the parts designed for respiration. Most writers attribute the cause of this disorder to injudicious or basty feeding of young horses for sale; by which means the growth of the lungs, and all the contents within the chest, are so preternaturally increased, and in a few years so enlarged, that the cavity of the chest is not capacious enough for the performance of the necessary functions. There is great reason to disbelieve this doctrine altogether: but at least those who consider a broken wind in this light must own, that it ranks among the incurable diseases of horses; and that all the boasted pretensions to cure are vain and frivolous, since the utmost skill can amount to no more than now and then palliating the symptoms, and mitigating their violence. A much more probable cause of broken wind has of late been assigned by the anatomical professor at the Veterinary College, and one which is supported by the appearances on dissection. This is the breaking of the air-vessels into each other, so that a number of cells form one common bag, sometimes nearly the size of a hazel nut. Hitherto, unfortunately, no remedy for this disease has been hit upon; we shall therefore only lay down such methods as may probably prevent this disorder when pursued in time. But if they should not succeed, we shall offer some remedies and rules for mitigating the complaint, and making a horse as useful as possible under this malady. As a broken wind seldom or never comes on suddenly, but by degrees, it will be best to prevent, if possible, its coming to any height. Therefore when a horse has only a dry obstinate cough, and feels greedily at the same time, eating his litter and drinking heartily, it will be proper to bleed him in the plate or neck vein; then the mercurial ball, No. 2, should be given him over night, and purged off next morning; or it may remain two days before it is purged off. If given in a morning, he must fast two hours before and three after it: and then get a purge the next morning, or the morning following that. The same method may be repeated again in a week or ten days, twice or thrice. On the intermediate days he should have the detergent deobstruent balls, No. 10. Careful feeding and moderate exercise has greatly relieved broken winded horses. Horses sent to grass to be cured of an obstinate cough, have often returned completely broken-winded, where the pasture has been rich and succulent, so that they have had their bellies constantly full. As the ill consequences therefore are obvious, where one has not the convenience of turning out a horse constantly, he may be soiled for a month or two with green barley, tares, or any other young herbage. To pursue thick-winded horses, Barbadoes and common tar have often been given with success, to the quantity of two spoonfuls, mixed with the yolk of an egg, dissolved in warm ale, and given fasting two or three times a-week; especially on days when he works or travels. Two or three cloves of garlic given at a time in a feed, or three ounces of garlic bruised, and boiled in a quart of milk and water, and given every other morning for a fortnight, have been found very serviceable; for by warming and stimulating the solids, and dissolving the tenacious juices which choke up the vessels of the lungs, these complaints are greatly relieved. But to render broken winded horses of any real service, the most material point is to have a particular regard to their diet, observing a just economy both in that and their exercise; giving a moderate quantity of hay, corn, or water, at a time, and moistening the former, to prevent their requiring too much of the latter, and never exercising them but with moderation. When a consumption proceeds from a defect in a horse's lungs or any of the principal bowels, the eyes look dull; the ears and feet are mostly hot; he coughs sharply by fits; sneezes much, and frequently groans with it; his flanks have a quick motion; he gleans often at the nose, and sometimes throws out a yellowish curdled matter; he has little appetite for hay, but will eat corn, after which he generally grows hot. These symptoms, or at least most of them, will attend the abscess or corruption of any of the rest of the bowels, in the same manner as the hectic fever in mankind. The causes of this disease are schirrous tubercles which beset the

lungs, and are hard to be removed on account of their constant motion. These tubercles are full of a viscid matter, and are generally the beginning of vomica or abscesses of the lungs, which are contained in a kind of bag. When these break, they fill the lungs with a purulent matter mixed with phlegm, and then it is a true consumption. But these tubercles or schirrous knots may sometimes lie dormant a long while, without any other symptoms but a dry cough. But if these ulcerate at length, they turn to fistulous and cancerous ulcers, which admit no cure. As there is always some degree of an inflammation attends this disease, it is generally best to begin the cure with bleeding, and this should be but a little at a time, *i. e.* a pint every eight or ten days, while there is any probability of giving relief. Then make rowels in the sides and breast, to draw off the purulent matter from the part affected. With regard to internals, pectorals, as in colds, may be given to palliate present symptoms; but as dissections have discovered both the glands of the lungs and mesentery to be swelled and often indurated, the whole stress lies on mercurial purges and alteratives, given intermediately. There is nothing that will contribute more to the cure than good air and gentle exercise in a morning; and therefore, the horse should be removed from low, boggy places, when he happens to be kept in such. If he is turned out to grass, it should never be where it is rank, but on some dry common or other place where the air is good. But the best pasture is the salt marshes, where a horse will recover without the use of medicines, if his case is not desperate.

OF PLEURISY AND INFLAMMATION OF THE LUNGS.

A PLEURISY and PERIPNEUMONY, are inflammatory fevers, which arise from the stagnation of the blood and the bronchia of the lungs, or in the branches of the vena sine pari in the pleura. They are attended with a sharp pain in the side, difficult breathing, immoderate heat, a strong quick beating at the heart, and a cough. The pleurisy generally seizes one side only; but the peripneumony or inflammation of the lungs, generally seizes both sides of the lungs at once. The symptoms of a pleurisy and peripneumony are much the same, only in the former, the horse is more restless and uneasy, and shifts about from place to place, often turning his head to the affected side. The fever rises suddenly to a very great height in the beginning of this disease, and he often strives to lie down, but starts up again immediately. His ears and feet are burning hot, and his mouth parched and dry. As the disease advances, he does not offer to lie down at all, but runs back as far as the collar will let him, and then stands immovable, panting, or endeavouring to cough, till he drops down dead. This disease, at its first onset, has been frequently mistaken for the gripes, but may be readily distinguished from them; for in the gripes, the horse lies down and rolls, with his eyes turned up, and his limbs stretched out, as if he were dying with convulsive twitches. His ears and feet are not constantly hot, but are sometimes almost as hot as fire, and at other times as cold as ice. He also sometimes falls into profuse warm sweats, and then into cold damps; he stales and dungs with great difficulty, and the same symptoms continue till he finds relief. In an inflammation of the lungs, the horse is more dull and heavy, and never attempts to lie down at all; when his mouth is opened, a great quantity of ropy slime will fall therefrom; and a reddish or yellow matter sticks to the inside of his nostrils, from a gleet that runs from thence. There is no extraordinary beating in his flanks, nor is his belly tucked up as in the pleurisy. His ears and feet are generally cold, and he often falls into damp sweats. The cause may be any thing that impedes the free circulation of the blood through these parts, either by plenty of thick humours, or by thin acrid humours, which irritate the vessels to a spasmodic constriction, and so hinder the free passage of the blood; especially when the antecedent causes conspire to produce the same effect. Therefore it may be owing to bad or high feeding, want of exercise, being over-heated, hard labour, sudden cold, drinking cold water when hot, want of bleeding when the body is full of blood and humours; riding a horse deep in cold water when he is hot, or letting him stand long in a cold damp air, or when there is a very cold wind blowing; for all these have a tendency to render the blood and humours of that consistence, generally termed pleuritic. The cure of both these diseases is much the same, the intention of which is, to remove the stagnation of the blood, and to promote its equal circulation.

tation. For this purpose, we must endeavour to prevent the farther congestion of the blood, and to render it more fluid. There is nothing more proper to prevent the farther inflammation, than letting of blood as soon as possible, taking away three quarts at once; and if there be no great alleviation of the symptoms, two quarts the next day, unless they continue violent, and then bleeding may be repeated sooner; for speedy, large, and quickly repeated bleedings are in these cases chiefly to be depended on. But if the horse were low before he fell ill, or were pretty old, then take away a quart at once, and repeat it in 12 hours, and then the next day if the case require it. This operation when used in time, has often removed the disease of itself. The next thing to be done is, to rub the blistering ointment, No. 47, all over his brisket, into the foremost ribs, and when it is a pleurisy, into the pained side more particularly. Rowels also will be of great service when they digest in time. Therefore he may have one in the belly on the affected side, and one on each side the breast; but if he have a great motion of the flanks, that on the side will not come to digestion, and then it will be best to make one on each thigh on the inside. The diet and medicines should be cooling, attenuating, relaxing, and diluting. After the operation of bleeding, therefore, Mr. Taplin directs "to have ready some bran and very sweet hay cut small, and scalded together; which place hot in the manger, that the fumes may be imbibed as an internal fomentation to relax the rigidity of the glands, and excite a discharge from the nostrils as soon as possible. The very nature of this case, and the danger to which the horse is exposed, sufficiently point out the propriety and consistency of exerting all possible alacrity to obtain relief, or counteract the disease in its first stage: therefore let the fumigation of scalded bran and hay be repeated every four or five hours, and the decoction No. 17, prepared without delay. If relief be not soon obtained, and the horse be costive, give the clyster, No. 21. Should the symptoms still continue violent, without discovering any signs of abatement; after waiting a proper time for the effect of previous administrations, let the bleeding be repeated, in quantity proportioned to the urgency of symptoms, continuing the decoction and nitre every three or four hours, and repeating the clyster if plentiful evacuations have not been obtained by the former injection.

OF THE GLANDERS.

The glanders are known by a running of matter from the nostrils, which is either yellow, or greenish, or tinged with blood. When the disease is of a long standing, the matter turns blackish, and becomes very stinking. It is always attended with a swelling of the glands, or kernels, under the jaws. When there is a swelling which shews that matter is forming under the ears, jaws, or about the root of the tongue, let every possible method be taken to produce a suppuration and discharge of matter; for, in most cases, an external evacuation becomes the crisis, and is greatly preferable to the chance of mischiefs that may be produced by the morbid matter being absorbed into the system. Should a cough, difficulty of breathing, or a great degree of inflammatory heat, attend, draw blood from a remote vein in moderate quantity, to mitigate either of those symptoms; and when the swellings about the parts have acquired an evident prominence, foment them twice a-day, for two or three days, with flannels wrung out of warm water. In two or three days a judgement may be formed whether a suppuration is likely to take place. If so, the tumours will increase in size, and feel soft and yielding in the middle when pressed; in which case apply the poultice, and proceed as directed for the STRANGLES. If, on the contrary, the swellings continue hard and immoveable, a running coming on at the nose; observe whether the matter is of a white colour and without smell, or is of different tinges, and streaked with blood. The former is a favourable sign; and in that case the treatment may be as directed for COLDS and COUGHS. But if the matter should prove of the latter description every precaution ought to be instantly used, to prevent in its infancy what would soon become a case of so much trouble. To soften the viscid matter in the passages, and relax the inflammatory stricture of the glands, prepare a vapour bath of rosemary, lavender flowers, southernwood and marjoram (each) a handful, boiled in two or three quarts of water. Put this into a pail, and let the horse's head be fixed over it as near as can be borne, and so long as the fumes passing up the nostrils can be supposed to take

effect as an internal fomentation. This operation should be repeated twice every day; and much of the treatment recommended under coughs and strangles with glandular discharges from the nostrils, will at the same time appear proper to be observed, as being applicable to many of the present symptoms. Let it be particularly remembered, that, during the whole course of management, the head of the horse is to be kept as warm as possible, and in proportion much more so than the body, either in a double kersey hood, or a single external, and a flannel one underneath; as nothing can contribute more to a solution of the humours and promotion of their discharge, than a critical relaxation of the pores, particularly upon the very seat of the disease. In case the discharge should continue to increase in quantity and virulence, becoming still more discoloured, and its smell very offensive; besides continuing the fumigation, let half a gill of the following injection (milk warm) be thrown up either nostril, or both if the matter should be so discharged with a strong forcible syringe, three or four times a day. Linseed, an ounce; camomile and elder flowers, each half an ounce; water, three pints. Boil for a few minutes; then strain off, and add to the liquor 4 oz. of mel *Ægyptiacum*, mixing well together at each time of using. If after every effort the matter still continue malignant, there will be little hopes of recovery, and as Mr. Talpin observes, the first loss will be ultimately best, in a resignation of his hide to the collar-maker, and his remains to the hounds.

OF THE STRANGLES AND VIVES.

The STRANGLES is a disease that attacks young horses, chiefly before six years of age; and is somewhat analogous to the quinsy. It is a swelling under the throat between the jaw-bones, and its principal seat appears to be the muscles of the tongue, wherein there is an inflammation, and therefore it seems to differ from a quinsy in the seat of the distemper only. The symptoms and progress of this disease are as follow: a heaviness and inactivity, loss of appetite, and a hollow husky cough, occasioned by the irritability of the inflamed glandular parts in the throat and about the root of the tongue. To excite a degree of moisture in the mouth that may allay this disagreeable sensation, the horse is often picking his hay, but eats little or none; a degree of symptomatic heat comes on, and a consequent clamminess and thirst is perceptible. As the distemper advances, he becomes proportionally languid and inattentive; a swelling (with sometimes two or three small tumours surrounding it) is now discovered to have formed itself between the jaw-bones, which is at first very hard, exceedingly painful, and visibly increasing; he now swallows with difficulty, heaves in the flanks, and his whole appearance gives signs of the greatest distress. With regard to the prognostics, when the swelling begins on the inside of the jaw-bone, it shews it will be a long time before it grows ripe or imposthumate. When it rises between the jaw-bones in the middle under the tongue, it is a sign the disease will be mild, and of no dangerous consequence; when the skin that lies over the tumour is stiff, distended and tight, feeling hot and dry, a large swelling is portended, which will yield a plentiful discharge when it breaks. When it rises to the glands, and is, as it were, divided into knots, it is a sign that the disease will be long and tedious, because the tumours will break in several places, and at different times. When it lies at the head of the gullet or windpipe, the horse will not be able to swallow for several days, till the swelling descends more to the outward parts; but when he has a purulent running at the nose, it portends great danger, and shews it is complicated with some other disease which lies lurking in the blood; but if it goes off as the tumour ripens, the horse may do well. If the evacuations be regular (as they generally are), and the feverish symptoms moderate, let the swelling be examined, and its suppuration promoted. For this purpose (first clipping away all the long or superfluous hairs that cover or surround the part), foment with small double flannels, dipt in hot water, or a strong decoction of camomile flowers and marsh-mallow leaves, or rosemary, for ten minutes, as hot as can be conveniently submitted to; and then apply the emollient poultice, No. 52, or the turnip poultice, No. 53. Both the fomentation and the poultice must be repeated every night and morning till an opening in the swelling is effected, which generally happens in the course of five or six days. Upon the appearance of discharge, the aperture may be a little enlarged with a bistory or the point of any sharp

sharp instrument adequate to the purpose, though this will be unnecessary if the discharge is made freely and easy of itself. The part should then be dressed with the digestive ointment, No. 45, I, spread on tow; still continuing the poultice over it to promote the digestion, and prevent any remaining hardness. Some who are never easy unless they are doing something, will often open the swelling before it is ripe; not considering that this practice prevents the due discharge of the matter, which is always most plentiful when it comes to a head of its own accord, and will always be cleansed, and heal the sooner and better. When the tumour breaks of itself, some think it necessary to make the orifice wider, by putting in a sponge tent; but this is altogether superfluous, because there is always room for running off the matter, without any operation of that kind. However when the horse has fallen into bad hands, and improper applications have been used, so as to drive any part of the humour back, then enlarging the orifice may not be amiss. Bleeding, when this disease is genuine, is always unnecessary, and commonly dangerous; because it may recal the peccant matter expelled out of it: but when the disorder appears with uncommon symptoms, such as a swelling of the neck about the onset, stiff jaws, and the nostrils turned outward, which are signs of a dangerous inflammation; then we may venture upon taking away blood to stop its progress. When the swelling breaks inwardly, the horse's mouth should be kept sweet by washing it with some antiseptic fluid. White wine vinegar sweetened with honey, with the addition of a little brandy, will be sufficient for this purpose. In this disease mashes must be the constant food, in small proportions, to prevent waste: in each of which Mr. Taplin directs to put of liquorice and aniseed powders half an ounce, and about two oz. of honey, or in lieu of this last a quart of malt: the drink, consisting of warm water impregnated with a portion of scalded bran or water-gruel, should be given in small quantities and often. The head must be kept well covered with flannel, as the warmth will greatly tend to assist in promoting the necessary discharge: though, unless circumstances and weather forbid, the horse needs not be confined, but should have the advantage of air and short gentle exercise. Upon the whole this distemper is seldom dangerous, unless from neglect, ignorant treatment, or cruel usage. It generally terminates with a running at the nose, in a greater or less degree; which should be frequently cleansed from the inside of the nostrils, by means of a sponge sufficiently moistened in warm water, to prevent its acquiring an adhesion to those parts, or a foulness and fetor that would shortly become acrimonious. If a hardness remain after the sores are healed up, they may be anointed with mercurial ointment. If a copious and offensive discharge from the nostrils should continue after the abscess is healed up, there will be reason to suspect the disease called glanders, treated of in the preceding section.

The *IVES* or *VIVES* differ from the strangles only in this; that the swellings of the kernels seldom gather or come to matter, but by degrees perspire off and disperse by means of warm cloathing, anointing with the marshmallow ointment, a moderate bleeding, and a dose or two of physic. But should the inflammation continue notwithstanding these means, a suppuration must be promoted by the methods recommended for the strangles. When these swellings appear in an old or full-aged horse, they are signs of great malignity, and often of an inward decay, as well as forerunners of the glanders.

OF THE COLIC, OR GRIPES; AND PAINS IN THE BOWELS, FROM SUDDEN ACCIDENTS.

There seems to be no distemper so little understood by the farrier as the colic or gripes in horses, one general remedy or method serving them in all cases: but as this disorder may be produced by very different causes, the method of cure must also vary; otherwise the intended remedy, injudiciously applied, will not only aggravate the complaint, but make it fatal. We shall divide this disorder into three different species; the flatulent or windy; the bilious or inflammatory, and the dry gripes; each of which we shall distinguish by their different symptoms, and then point out the proper remedies.

I. THE FLATULENT OR WINDY COLIC may in general be readily distinguished by the rumbling of the confined air through the intestines: the horse is often lying down, and as suddenly rising again with a spring; he strikes his belly with his hinder feet,

stamps with his fore-feet, and refuses his meat; when the gripes are violent, he will have convulsive twitches, turn up his eyes, and stretch out his limbs as if dying, his ears and feet being alternately very hot and cold; he falls into profuse sweats, and then into cold damps; strives often to stale, and turns his head frequently to his flanks; he then falls down, rolls about, and often turns on his back; this last symptom proceeds from a stoppage of urine, that almost always attends this sort of colic, which may be increased by a load of dung pressing on the neck of the bladder. These are the general symptoms of colic and gripes from wind, drinking cold water when hot, and when the perspirable matter is retained, or thrown on the bowels by catching cold; in all which cases they are violently distended. Cribbing horses are more particularly subject to this complaint, as they are constantly sucking in great quantities of air. The first intention is to empty the bowels by the turpentine clyster, No. 23, or the laxative drink, No. 12. The hardened faeces, and the confined wind being discharged, and the neck of the bladder being eased, the suppression of urine is taken off, and the horse stales and gets ease.

II. The next species of COLIC is the *BILIOUS* or *INFLAMMATORY*. This, besides most of the preceding symptoms, is attended with a fever, great heat, panting and dryness of the mouth: the horse also generally throws out a little loose dung, with a hot scalding water; which when it appears blackish, or of a reddish colour, and fetid smell, denotes an approaching mortification. In this case the horse should immediately be bled to the quantity of three quarts; and it should be repeated, if the symptoms do not abate in a few hours. The turpentine clyster, No. 23, I, should be thrown up every two hours, till several loose stools are procured. The purging ball, No. 11, may be given first, and the clysters in four hours after, if relief be not obtained. As much linseed tea may also be given as the horse will drink, which will soften the acrimony of the ball, and tend greatly to assist the efficacy of the other remedies. If this disease be not removed by these means, but the inflammation and fever increase attended with a discharge of the flesh-coloured water above described, the event will most probably be fatal; and the chief thing to be depended on now must be a strong decoction of Jesuit's bark, given to the quantity of a pint every three hours, with a gill of red port wine.

III. THE SPASMODIC COLIC, or DRY GRIPES, as some call it, is always attended with costiveness, and the dung that comes away is black and hard; the urine is high-coloured, and the horse has a quick motion with his tail; his looks are dull, and his motions are sluggish. But the disease that is most dangerous, and which is often mistaken for the colic, is some inward inflammation, particularly of the guts, which is seldom found out till it is too late. As for the inflammation of the lungs, it may be known by the breath; and the inflammation of the liver by the symptoms of the jaundice or yellows. But an inflammation of any part of the guts has nothing particular to distinguish it from the dry gripes. This, for want of a timely assistance, generally terminates in a mortification; and then if any dung come away, it is black, which is a sign that the horse is past recovery. The way to prevent these fatal accidents, is always to be upon the watch when the horse has any symptoms of the gripes, and if he be costive, which is always the case in this inflammation, his body should be opened as soon as possible; not by purgatives which exasperate the disease, but by such things as will correct and discuss the offending humour, and carry it downward. Gentle emollient clysters and mild laxatives, either in the form of balls or drinks will by prudent repetition, in general, have a good effect. In the flatulent and spasmodic colic, after procuring a free evacuation by stool and urine, the carminative balls, No. 6, may be given with considerable advantage. When a horse has the symptoms of the gripes, with a looseness, and the dung has its natural colour, there is never any danger; but when it is blackish and stinking, the bowels are already mortified, and then all remedies will be given to no manner of purpose.

OF THE LAX AND SCOURING; WITH OTHER DISORDERS OF THE STOMACH AND BOWELS.

When the body of a horse is uncommonly open, and he dungs like a cow, or when he has a purging for a few days only, he is said to have a lax. But when it continues, he is said to have a scouring. This may proceed from various causes, as from a sudden

den stoppage of perspiration, from ravenous feeding, from hard riding or violent exercise, and then there is a discharge of slime or greasy matter; or from worms. Sometimes it is the consequence of other diseases, and sometimes it is a critical discharge of noxious humours. With regard to the prognostics, when it proceeds from a sudden stoppage of perspiration, commonly called a cold, it is never dangerous; nor when it is the effect of voracious feeding. The same may be said of that which succeeds hard labour. When scouring is habitual, it may go off as the horse advances in years, that is when he arrives at 7 or 8. That which succeeds or attends other diseases, cannot be judged of, without enquiring into the nature of the disease itself. Besides it may sometimes be critical, and then it will carry off the disease it accompanies. When a looseness is spontaneous, and comes on without any previous evident cause, it is critical, and generally tends to preserve health and prevent diseases. And when it is from worms, the only way to cure it is to remove the cause. It is sometimes very difficult to form a proper judgement when to controul or encourage a looseness; but these rules may be a general direction: if a healthy full horse, on taking cold, or upon hard-riding, over-feeding, eating unwholesome food, or with a slight fever, should have a moderate purging, by no means stop it, but rather encourage it with an open diet, and plenty of warm gruel: but if it continue long, with gripings, the mucus of the bowels coming away, and the horse losing his appetite and flesh, recourse must be had to proper medicines. The drink, No. 12, may be given three or four times, so as to encourage the evacuation of the offending matter, before the use of astringents: or half an ounce of rhubarb and two drachms of snake root, both in powder, may be given him in a horn or two of warm ale, every 24 hours or oftener, for three or four times. If he void great quantities of slime and greasy matter then add one scruple or half a drachm of ipecacuanha, and the same quantity of calomel to each dose, and make the whole into a ball with a little opiate confection; to be given once in 48 hours; or else, give one ball, No. 11, once in 48 hours, till this state of the fæces be altered. When by these means the stools become less offensive, and are no longer attended with griping or pain, but, by their frequency and consistence would continue to weaken the horse if not checked, astringents may be proper to complete the cure. A quart of the drink, No. 15, or one of the balls, No. 4 II, may be given two, three, or four times a day, according to the urgency of the complaint. If the griping and purging continue notwithstanding this treatment, and the discharge is attended with an acrid mucus or slime, and an evacuation of the common lining of the bowels, the starch clyster, No. 24, should be frequently injected warm.

The **Bloody Flux** is a distemper horses are not very subject to; however, as it sometimes does occur, whenever blood is discharged, attended with gripings and great pain in the bowels, if the flux is not speedily restrained, the horse probably may be soon lost: we recommend therefore the astringent clyster, No. 25, to be injected whenever the looseness is observed to be severe.

COSTIVENESS in horses is most frequent in hot weather, from an increased perspiration, from being kept to hard dry meat, or from want of air and exercise. Sometimes it becomes habitual, and then the horse never enjoys full health, but grows lean with a feverish heat and a staring coat. When the heat of the weather occasions this disorder, an opening diet with scalded bran will effect a cure, as well as in the other two cases; at most he needs have nothing more than from two to four oz. of Epsom salt, dissolved in water. But when it is become constitutional it is not so easily removed. It may happen, though very rarely, that a slow belly may be no disease, but rather a sign of strength and a good digestion and then we have nothing to do but prevent its increase, with now and then an opening diet. But when it produces the symptoms above-mentioned, we must have recourse to a constant opening diet, together with emollients. The best opener is scalded barley; and he should have the water it was scalded with to drink. All strong purges are as bad as poison, and therefore must be carefully avoided. The horse must have such laxatives only as to produce their effect without raising any commotion in the blood. Among these there is nothing more safe or certain than Epsom salt. Four ounces may be dissolved in a pint of water and given him for a dose; but this may be either increased or diminished according to its operation, and according as it is intended to purge either

more or less. Fenugreek seeds and linseed, on account of their oily mucilaginous quality, are very proper to render the guts slippery, and by that means to make his dunging regular. He should have an ounce every day mixed with his feed.

OF WORMS.

Zoologists and veterinary authors have described three different sorts of worms that affect horses; viz. Botts, which young horses are often troubled with in spring; the Rotundi, or those resembling earth worms; and Ascarides, or those about the size of the largest sewing needle, with flat heads. The symptoms of worms are various. The botts that many horses are troubled with, in the beginning of summer, are always seen sticking in the strait gut, and are often thrust out with the dung, with a yellowish coloured matter like melted sulphur; they are no way dangerous there; but are apt to make a horse restless and uneasy, and rub his breech against the posts. The season of their coming is usually in May and June; after which they are seldom to be seen, and rarely continue in any horse above a fortnight or three weeks. Those that take their lodgment in the stomach, are extremely dangerous by causing convulsions; and are seldom discovered by any previous signs before they come to life, when they throw a horse into violent agonies. The other kinds are more troublesome than dangerous: but are known by the following signs: the horse looks lean and jaded, his hair stairs as if he were surfeited, and nothing he eats makes him thrive; he often strikes his hind feet against his belly; is sometimes griped, but without the violent symptoms that attend a colic and strangury; for he never rolls and tumbles, but only shews uneasiness, and generally lies down quietly on his belly for a little while, and then gets up and falls a feeding; but the surest sign is when he voids them with his dung. For the cure of botts in the stomach, calomel should be given in large doses; viz. to the extent of two drachms made up in a ball with one oz. of aniseed powder, and a sufficient quantity of treacle. This to be put in over night and wrought off with a purging ball, No. 1 or 7, suited to the horse's strength and constitution; with the addition of one drachm of oil of savin. This may be repeated every six or eight days; and in the interval, let one of the vermifuge powders, No. 18, be given in his corn night and morning. Botts in the rectum may be cured by injecting the vermifuge clyster, No. 26, every morning, and using the powders above-mentioned. But as the source of worms in general proceeds from a vitiated appetite and a weak digestion, recourse must first be had to mercurials, and afterwards to such things as are proper to strengthen the stomach, promote the digestion, and by destroying the supposed ova, prevent the regeneration of these animals. For this purpose the tonic drink, No. 16, will be of considerable service.

OF APOPLEXY OR STAGGERS, LETHARGY, EPILEPSY, AND PALSY.

Farriers generally include all distempers of the head under two denominations, viz. staggers and convulsions, wherein they always suppose the head primarily affected. But in treating of these disorders, we will distinguish between those that are peculiar to the head, as having their source originally thence; and those that are only concomitants of some other disease.

In an **APOPLEXY** a horse drops down suddenly, without any other sense or motion than a working at his flanks. There are various degrees of this disease; for when the voluntary motions and animal functions, together with all sensation and consciousness cease, the animal will fall down as if struck with a thunderbolt. But sometimes, though the senses remain unhurt, the voluntary motions and animal functions cease; or at least the sense of feeling is either languid or quite abolished. The first case is called an apoplexy, and the 2d a palsy. The apoplexy has three degrees; the first takes away all sense and motion; the 2d the use of the will and all voluntary motions; the 3d is a slight degree of the 2d, and sometimes ends in a palsy. This may be caused by any thing that compresses the vessels of the brain; by too great a quantity of blood when the horse is fed plentifully, with little exercise; by being very much over-heated so as to expand the blood and render all the vessels turgid; by any fluid shed outwardly on the membranes of the brain, from blows on the head or falls; by blood or serum poured into the brain itself, and by its pressure hurting the origin

origin of the nerves, which is the most common cause of the apoplexy, and may be either blood or serum. This last most frequently happens to horses that have poor watery blood. The previous symptoms are, drowsiness; watery eyes, somewhat full and inflamed; a disposition to reel; feebleness; a bad appetite; the head almost constantly hanging, or resting on the manger; sometimes with little or no fever, and scarce any alteration in the dung or urine; the horse is sometimes disposed to rear up, and apt to fall back when handled about the head; which is often the case with young horses, to which it does not suddenly prove mortal, but with proper help they may sometimes recover. If the apoplexy proceed from wounds or blows on the head, or matter on the brain: besides the above symptoms, the horse will be frantic by fits, especially after his feeds, so as to start and fly at every thing. These cases seldom admit of a perfect recovery; and when horses fall down suddenly, and work violently at their flanks, without any ability to rise after a plentiful bleeding, they seldom recover. All that can be done is to empty the vessels as speedily as possible, by striking the veins in several parts at once, bleeding to four or five quarts: and to raise up the horse's head and shoulders, supporting them with plenty of straw. If he survive the fit, cut several rowels: give him night and morning clysters prepared with a strong decoction of senna and salt, or the purging clyster, No. 22; blow once a-day up his nostrils a drachm of asarabacca, or either of the powders, No. 19, which will promote a great discharge; afterwards two or three aloetic purges should be given; and to secure him from a relapse, by attenuating and thinning his blood, give him an ounce of equal parts of antimony, nitre, and gum-guaiacum every night. With regard to the other disorders of the head, such as lethargy or sleeping evil, epilepsy or falling-sickness, vertigo, frenzy, and madness, convulsions, and paralytical disorders, it may be observed, that most of them are to be treated as the apoplexy and epilepsy, by bleeding and evacuations, with the alteratives these directed.

In LETHARGIC DISORDERS, the horse generally rests his head with his mouth in the manger, and his poll often reclined to one side; he will shew an inclination to eat, but generally falls asleep with his food in his mouth, and he frequently swallows it whole without chewing: emollient clysters are extremely necessary in this case, with the antispasmodic balls recommended for apoplexy; strong purges are not requisite, nor bleeding in too large quantities, unless the horse be young and lusty.

OF THE YELLOWS, OR JAUNDICE.

Horses are often affected with this distemper: which is known by a dusky yellowness of the eyes; the inside of the mouth and lips, the tongue and bars of the roof of the mouth, looking also yellow. The horse is dull, and refuses all kinds of food; the fever is slow, yet both that and the yellowness increase together. The dung is often hard and dry, of a pale yellow or pale green. His urine is commonly of a dark dirty brown colour: and when it has settled some time on the pavement, it looks red like blood. He stales with some pain and difficulty: and if the distemper be not checked soon, grows delirious: which is a sign of an inflammation of the liver. The jaundice is either idiopathic or symptomatic; the seat of the first is in the liver, and the 2d may supervene to some other disease; or it may be critical when a fever is declining, and then the horse soon recovers his appetite, begins to look lively, the fever ceases, and the yellowness soon wears off. With regard to prognostics, when the horse is young and full of blood, the consequence of high feeding, and want of sufficient exercise, the cure will not be difficult. But if the disease succeed hard labour, which has hurt the liver by an abscess or otherwise, the cure will be exceeding difficult. When the liver is schirrous, which may be concluded by the swelling of the off side of the belly, about the region of the liver; the horse may linger a great while before it kills him, but he will grow weaker and weaker till he entirely becomes unfit for business. But if he retain his strength and vigour, without sickness or loss of appetite, there will be no danger of recovery by proper means. In the cure, we ought first to examine whether he has a fever, and the degree of it, that we may judge whether the liver be inflamed or not. If it be, we must begin with bleeding, and repeat it occasionally as long as the symptoms render it necessary, and as soon as possible rub the blistering ointment into the side all about the

region of the liver. These means alone will remove the inflammation, when they are administered in time. If any thing more be wanting, it must be laxative clysters to bring away the faeces, for this disease is always attended with costiveness. When the fever is gone off, if the jaundice still remain from the obstruction of the bilious duct, equal parts of aloes, rhubarb, and soap, $\frac{1}{2}$ oz. of each should be made into a ball and given every 3d or 4th day, washing it down with a pint of the deobstruent decoction, No. 17, when the materials can be procured.

OF THE DISORDERS OF THE KIDNEYS AND BLADDER.

The kidneys of a horse may be overstrained several ways; as by drawing too great a weight, by heavy burdens on the loins, and by not permitting him to stale on journeys. This last indeed is not properly a strain, but it has the effects of one, because all the vessels being turgid and over-loaded, they must of necessity be too much stretched, and their tone debilitated, which is the case in all strains. The same may happen if a horse be hard worked, when he is full of blood and humours; or he may receive blows on the loins or other hurts, which turning to an inflammation, may draw the kidneys into consent. When the horse has undergone any such hurts or hardships, the affection of the kidneys, may be discovered by a weakness of the back and loins, by difficulty of staling, by thick foul urine, sometimes bloody. These symptoms are attended with faintness, deadness of the eyes, and loss of appetite. But there is one sign very particular, and that is, he can seldom or never be backed without discovering signs of pain. The same thing will happen, when a horse has been wrenched in the back, but then there is no great alteration in the urine, except its being a little higher coloured than ordinary, nor does he lose his appetite or flesh. When the disease has continued a considerable time, it is attended with all the signs of a surfeit. When a fever attends a difficulty of staling, it is a sign of an inflammation of the kidneys. With regard to prognostics, diseases of the kidneys are never without danger, especially when they continue long, and the horse breaks out into scabs and blotches. An inflammation of the kidneys is very dangerous, unless taken in time. When a horse's urine is turbid, and yet comes away without much pain or straining, while the appetite is good and his eyes are brisk and lively, there is no danger: as also when he stales, and the thick sediment abates by degrees, till the urine comes to be of a natural colour. But when the urine is thick and ropy, and full of ulcerous matter or blood, attended with weakness and want of appetite; the case is dangerous. The consequences of a disordered state of the urinary organs are principally two; strangury and diabetes.

I. STRANGURY, or an obstruction of urine, may arise from different causes. When it is not owing to wind, or hardened dung pressing upon the neck of the bladder, it may proceed from inflammation in the bladder or kidneys, ulcerations there, or spasms upon any particular part. When owing to inflammation or spasm, the general indications of cure are, to lessen the stricture upon the parts; to reduce the inflammation; and to promote the evacuation of urine: the first of which intentions may be answered by a moderate loss of blood; the second, by the use of internal emollients; and the third, by gentle stimulants and mild diuretics. In strangury from inflammation or spasms in the parts, the horse makes frequent motions to stale, stands wide and straddling, appears full in the flank, and somewhat dejected. The first measure is bleeding, more or less plentifully according to the urgency of the symptoms. In a convenient time after this operation, inject the turpentine clyster, No. 23, II; or the diuretic drink, No. 13, II, may be given twice in the interval of three or four hours. Should neither of these, nor both in conjunction, procure an evacuation by urine, give the mild diuretic ball, No. 5, II, repeating it every four hours after the exhibition of the second dose, till relief be obtained by a plentiful evacuation. When the parts designed for the secretion of urine are cold and benumbed, the stimulant cataplasm, No. 54, or the blistering ointment, No. 47, I, may be laid to his loins. The former is a very penetrating composition, and may reach the cause of the complaint. It must be spread upon flannel, and bound on with another piece over that. It may be renewed once in two days, till the horse stales freely.

II. A DIABETES is a greater discharge of urine than the quantity of water that has been drunk. This generally proceeds from a laxity

a laxity of the kidneys. Horses subject to this disease, if old, or of a weak constitution, are seldom cured; they soon lose their flesh and appetite, grow feeble, their coat staring, and they die rotten. Of a young horse there are more hopes; but he must not be indulged with too much water, or moist food. The best medicines in this disease are those which strengthen the kidneys, without binding the belly. An ounce and an half of Peruvian bark, and half an ounce of alum made into a ball, with a little treacle, may be given night and morning, with a pint or two of a strong decoction of sassafras after each dose.

OF MOLTEN GREASE.

Molten grease is the voiding of greasy matter with the dung; which sometimes happens to very fat horses that stand much in the stable. Horses of hot constitutions which are apt to be costive, will sometimes void great quantities of slimy matter like corruption, and the balls of the dung will be covered with a pellicle, or thin skin. This is a common symptom which attends the retention of the dung. But neither of these can be referred to the melting of the grease, properly so called. Both these symptoms, however, are called by farriers molten grease. A fat horse may have his grease melted by hard usage, but seldom any other; and this must be done by hard riding, or working in very hot weather. It is always attended with a fever, heat, restlessness, starting and tremblings, great inward sickness, shortness of breath, and sometimes with the symptoms of a pleurisy. The horse's dung will be extremely greasy, and he will fall into a scouring. The horse soon looses his flesh and fat, which probably is dissolved and absorbed into the blood; and those that survive this shock commonly grow hide-bound for a time, their legs swelling both before and behind, and continue in this state till the blood and juices are rectified; and if this is not done effectually, the farcy, or some obstinate surfeit, generally follows; very difficult to remove. In the first place bleed plentifully, and repeat it for two or three days successively in smaller quantities, till the buff-coloured pellicle goes off the blood. He may also have a rowel in the breast: and when the working of the flanks begins to abate he may have another in the belly, and one on the inside of each thigh. Emollient clysters will be of great service to cool the intestines, such as have been already prescribed in other cases; taking care that no irritating ingredient enters therein. By the mouth give plenty of warm water or gruel, with cream of tartar or nitre, to dilute and attenuate the blood, which in this case is greatly disposed to run into grumes, and endanger a total stagnation.

OF HIDEBOUNDNESS, SURFEIT, AND MANGE.

I. The signs of hideboundness are, "a want of flexibility in the skin, which is pervaded by a general stiffness that seems to form an entire adhesion to the flesh, without the least partial separation, or distinction. There is a kind of dusty scurf, plainly perceived underneath the hair, that raises it up in different parts; and, giving it another hue, the coat in many places forms an appearance of two or three colours; conveying, even in this trifling circumstance, a very forcible idea of poverty in both food and raiment. The horse is generally languid, dull, heavy, and weak; his excrement is dark, foul, and offensive; he sweats much upon very moderate exertions; then his coat states, the hair turns different ways, its effluvium is disagreeable, and affords evident proof of weakness and debilitation. Bad food and want of care are, in general, the only probable reasons that can be assigned for this complaint. Long lank grass in low swampy land in autumn, and musty hay or bad oats at any season, may in some degree allay the hunger, but without strengthening the body; for, being in itself destitute of the quality and effect of superior food, no nutritive contribution can be conveyed for generating blood, or forming flesh. As to the cure, very few directions are necessary, the case being only a temporary inconvenience, rather than a disease. Therefore, to afford some little change to the circulation, take a very small quantity of blood; and in three or four hours after, increase its impetus by a mash of malt, oats, and bran, equal parts. Continue this mash every night for a fortnight, stirring in two ounces of flour of brimstone every other night; and for his other feeds (morning and noon) give equal parts of oats and bran, with half a pint of old beans in each, to prevent relaxing the body too much by the mashes. At the same time, regular and substantial dressing, air,

exercise, sound oats, sweet hay, and good soft water, will greatly contribute to promote the cure.

II. Of SURFEITS, according to Mr. Taplin, there are two kinds, originating from different causes: one being no more than a very advanced stage of the case last described; which being long neglected, all its symptoms increase, till the entire mass of blood being at last affected, the virulence of the disorder displays itself upon the surface of the body. The other kind of surfeit, differing from the former in cause, but very little in effect, is that, where, from ignorance or inattention, a horse is suffered to drink immoderately of cold water, when in violent perspiration, and the blood consequently in the highest degree of circulation. The circulating fluid being thus instantaneously checked by the influence of the frigid element, and the sudden contraction of the solids, the crassamentum becomes immediately thickened and inflamed; while the serum, separating from the other, extravasates itself; and, by an effort of nature, is propelled to the skin for transpiration, where the pores (having been instantly collapsed at the time of the water's taking effect) are so closely obstructed that its passage to the surface is rendered impracticable. In this situation it becomes united with the perspirable matter already confined there; and is, in the course of time, compelled by the progress of internal inflammation to make its way through the skin; upon which it at last appears in a variety of forms and different symptoms, assuming distinct degrees of malignancy, according to the state, habit, and constitution, of the horse at the time of attack. Such, in substance, is Mr. Taplin's account of this disorder. The indications of cure are, to resolve the inflammatory crudities, remove cutaneous obstruction, correct the acrimony of the blood, and gently quicken the circulation. The better to effect these, he directs to take away a moderate quantity of blood; to open the body with a few warm mashes; and according to the mildness or inveteracy of its appearance, to give either two or three mercurial purges, (No. 2,) avoiding cold during their administration. In three days after the last dose, a course of alteratives must be entered upon, or they may be given in the intervals of the purges. With each dose, one ounce of nitre may be given dissolved in a pail of water.

III. MANGE is a distemper so universally known as to render a particular description unnecessary. It proceeds chiefly from poor feeding: hence it is very little seen amongst horses of any estimation; but is almost entirely confined to the lower class of stables and proprietors. In a mangy horse the skin is generally tawny, thick, and full of wrinkles, especially about the mane, the loins, and tail; and the little hair that remains in those parts stands almost always straight out or bristly; the ears are commonly naked and without hair, the eye and eye-brows the same; and when it affects the limbs, it gives them the same aspect: yet the skin is not raw, nor peels off, as in the surfeit. Where this distemper is caught by infection, if taken in time it is very easily cured; and a sulphur ointment is recommended as most effectual for that purpose, rubbed in every day. To purify and cleanse the blood, give antimony and sulphur for some weeks after. There is a great variety of external remedies for this purpose, such as train oil and gunpowder, tobacco steeped in chamber ley, &c. most of them evidently improper. Soleseyl recommends burnt alum and borax in fine powder, of each two ounces white vitriol and verdegris powdered, of each four ounces; put them into a clean pot, with two pounds of honey, stirring till they are incorporated; when cold, add two ounces of strong aquafortis. But when this disorder, as is generally the case, is contracted by low feeding, and poverty of blood, the diet must be mended, and the horse properly indulged with hay and corn. With this view, there must be a constant supply of warm mashes, prepared with half malt and half bran, or equal parts of oats and bran, with four ounces of honey dissolved in each: let these be given night and morning, with a feed of dry corn every day at noon. During this treatment (which must be continued a week, to sheathe the acrimony of the fluids, and soften the rigidity of the skin) give one ounce of sulphur in each mash, and one ounce of nitre in water every night and morning. In a week or ten days, when the frame becomes more invigorated, discontinue the mashes, and let the diet be changed to good oats and sweet hay; giving, in the morning and evening feeds, the sulphur and antimony as before. In an incipient stage of the mange, the lotion, No. 27, will put an effectual stop to it, and being cleaner in its application than a greasy ointment, will be preferable in many cases. When every thing

else fails, equal parts of calomel and precipitated sulphur of antimony may be given from one drachm to two every morning, made into a bolus, with a little conserve of roses. When the horse is freed from his distemper, the place where he stood should be carefully cleaned, and washed with soap suds, as well as his clothing.

OF THE FARCY.

The **FARCY**, or **FARCIN**, has been mistaken by many for some one of the distempers already treated of; but is properly a distemper of the veins, and when inveterate thickens their coats so as to make them appear like so many cords. Their size always bears a proportion to the greatness or smallness of the vessels they affect. At first, one or more small swellings, or round buds, like grapes or berries, spring out over the veins, and are often exquisitely painful to the touch; in the beginning they are hard, but soon turn into soft blisters, which when broke discharge an oily or bloody ichor, and turn into very foul and ill-disposed ulcers. In some horses it appears on the head only; in some on the external jugular; in others on the plate vein, and runs downwards on the inside of the fore-arm towards the knee, and very often upwards towards the brisket: in some the farcy shews itself on the hind parts, about the pasterns, and along the large veins on the inside of the thigh, rising upwards into the groin, and towards the sheath; and sometimes it makes its appearance towards the flanks, and spreads by degrees towards the lower belly, where it often becomes very troublesome. As to the prognostics, when the farcy begins on those parts of the head where the muscular flesh is thin, and the veins small, it may be cured with ease. But when it attacks the loose parts, such as the kernels under the jaws, nostrils, and eyes, and continues so long as to creep to the neck vein, and render it corded, it is more difficult to manage. When it begins on any part, where the veins are small and kept in constant agitation by the motion of the horse, and always upon a stretch, such as the outside of the shoulder, and the outside of the hips, the disease can never take any deep root; because the action of these parts has a tendency to disperse obstructions. It is a great deal worse when it rises on the plate vein, swells and then turns corded, and the more when the glands or kernels, called the axillary glands, which lie under the arm-pit, become tumid with the anguish. The cure is still more difficult and tedious when the veins on the inside of the thigh are corded, especially when it rises upwards and affects the kernels of the groin, and the cavernous body of the yard. When the farcy begins on the pasterns, or lower limbs, it often becomes very uncertain, unless a timely stop is put to it; for the swellings in those dependent parts grow so excessively large in some constitutions, and the limbs so much disfigured thereby with foul sores and callous ulcerations, that such a horse is seldom fit for any thing afterwards but the meanest drudgery; but it is always a promising sign, wherever the farcy happens to be situated, if it spread no further. It is usual to affect only one side at a time; but when it passes over to the other, it shews great malignancy; when it arises on the spines, it is then for the most part dangerous; and is always more so to horses that are fat and full of blood, than to those that are in a more moderate case. This disease is at first of the inflammatory kind, therefore it will require plentiful bleeding, especially when the horse is fat and full of blood and humours. But this must be only in the beginning of the farcy, and while the disease continues in the inflammatory state, for afterwards when it is ulcerated it will do more harm than good. Likewise the bleeding must be moderate when the horse is low in flesh. Besides, his body must be kept open with the following cooling saline purge: Two ounces of Glauber's salts, one ounce of cream of tartar, and one ounce of nitre, dissolved in a quantity of water, given every day, or every other day, for a month. The sores at the very first must be anointed with the desiccative ointment, No. 44. The buds sometimes by this method are dispersed, leaving only little bald spots which the hair soon covers again; but to confirm the cure, and to disperse those little lumps which often remain for some time on the skin without hair, give crude antimony for a month; two ounces a-day for a fortnight, and then one ounce of the crocus for the largest dose per day for the other fortnight: by following this method, a farcy which affects only the small vessels may be stopped in a week or ten days, and soon after totally eradicated. When it appears in the thigh vein, it will cause a halting, or lameness, and then it will be soon discovered; as also by the swelling of the hock. In this case the liniment, No. 28, must

be applied to the vein as soon as possible. The alternate exhibition of the saline physic, and the antimonial medicines, must accompany this treatment. When there is a disposition in the blood, to a farcy, it may begin from the pricking of a sharp spur; it may likewise arise spontaneously about the spurred part without any pricking at all; and then the hair will stand up as a tuft all around the buds and blisters, and the matter that runs from thence will be purulent, and of a clammy, or greasy consistence. If this is not soon stopped, it will spread greatly. In this case use the liniment above prescribed, made with equal parts of the ingredients; and to prevent the swelling of the belly, apply the volatile liniment, No. 30, all over the affected side. The alterative balls, No. 9, 11, are proper in every stage of the farcy; and when the distemper is in its infancy, before the skin is much relaxed, will often cure it in a week or two, by giving them only once or twice a-day: but in an old farcy they should be given for two or three months together.

OF EXTERNAL AND LOCAL DISEASES.

OF DISEASES OF THE EYES.

In this very important part of farriery some considerable improvements have been practised of late at the Veterinary College. As the diseases of the eye, to which horses are so remarkably subject, are, in general, to be attributed to too great a derivation of blood to that organ, the experiment has been made in some cases, of taking up the carotid artery on the side of the affected eye. This has been attended with various success, yet sufficient to recommend it to the notice of every practitioner, who is desirous of improving the art of farriery in this very material respect. The cases that most frequently occur, requiring medical aid, or admitting of cure, are generally the effects either of cold, or of blows, bites, or other external injuries. In those proceeding immediately from cold, an inflammation is perceived from the globe of the eye, and internal surrounding parts, as the edge of the eye-lids, &c. Instead of its former transparency, the eye has a thick cloudy appearance upon its outer covering, and is constantly discharging an acrid serum, which in a short time almost excoriates the parts in its passage. The horse drops his ears, becomes dull and sluggish, is frequently shaking his head as if to shake off the tears, and in every action discovers pain and disquietude. In this case, after bleeding, the treatment prescribed for colds must be adopted and persevered in; and to cool the parts, and allay the irritation occasioned by the scalding serum, let the eyes and surrounding parts be gently washed twice or thrice every day with a sponge or tow impregnated with the collyrium, N° 29. If the inflammation should not seem likely to abate, but to wear a threatening appearance, one of the mild diuretic balls, N° 5, must be administered every morning, using gentle exercise with them. The effects arising from blows or bites form different appearances, according to the severity of the injury sustained. Should inflammation and swelling proceed from either cause, bleeding will be necessary without delay, and may be repeated at proper intervals till the symptoms appear to abate; and let the parts be plentifully embrocated four times a-day with the saturnine lotion, N° 31, diluted with six or eight times the quantity of water. If a large swelling, laceration, or wound, attend, after washing with the above, apply a warm poultice of bread, milk, and a little of the lotion, softened with a very small portion of lard or olive oil. In cases of less danger, or in remote situations where medicines are not easily procured, the following may be used as a substitute, viz. one of brandy, two of water, and four of vinegar. As to the gutta serena, cataract, film, &c. these are cases in which relief is very seldom obtained.

The **GUTTA SERENA** is a partial or universal loss of sight, where no palpable defect or fault appears in the eye, except that the pupil is more enlarged than in the natural state. The appearances of this blenheim are various, as well as the causes and effects, some of its subjects being totally blind, and others barely enabled to distinguish between light and darkness. The signs are a blackness of the pupil, an alteration of the size of the pupil, and its not contracting or dilating upon a sudden exposure to any degree of light. For the cure it is necessary to attend to the cause, and to apply such remedies as that may indicate: though, indeed, it is a disorder in which, from whatever cause originating, no great expectation can be formed from medicine either internally or externally.

A **CATARACT** is a defect in the crystalline humour of the eye, which

which, becoming opaque, prevents the admission of those rays upon the retina that constitute just and distinct vision. The disorder, called moon eyes, is only a cataract forming. It makes its appearance when a horse is rising at six, at which time one eye becomes clouded, the eye-lids being swelled, and very often shut up; and a thin water generally runs from the diseased eye down the cheek, so sharp as sometimes to excoriate the skin; the veins of the temple, under the eye, and along the nose, are turgid and full: though sometimes it happens that the eye runs but little. This disorder comes and goes till the cataract whitens; then all pain and running terminate, and the horse becomes totally blind, which is generally in about two years. During this time some horses have more frequent returns than others; which continue in some a week or more, in others three or four; returning once in two or three months, and they are seldom so long as five without a relapse.

There is another kind of MOON BLINDNESS, which is also the forerunner of cataracts, where no discharge of weeping attends. The eye is never shut up or closed, but now and then looks thick and troubled, at which time the horse sees nothing distinctly, it is not unusual in this case for one eye to escape. In all blemishes or defects, where a thickening of some one of the coats, membranes, or humours, of the eye, has formed an appearance of cataract or film, it has been an established custom among most farriers to bestow a plentiful application of corrosive powders, unguents, and solutions, for the purposes of obliteration; without reflecting (as Mr. Taplin observes) upon the absurdity of endeavouring to destroy by corrosion, what is absolutely separated from the surface by a variety of membranous coverings, according to the distinct seat of disease; with which it is impossible to bring the intended remedy into contact; without first destroying the intervening or surrounding parts by which the inner delicate structure is so numerously guarded. But in all disorders of this sort, whether moon eyes or confirmed cataracts with a weeping, general evacuations with internal alteratives can only take place. Indeed the attempts to cure cataracts have hitherto generally produced only a palliation of the symptoms, and sometimes have proved entirely destructive. Yet early care, it is said, has in some instances proved successful. To this end rowelling is prescribed, with bleeding at proper intervals, except where the eyes appear sunk and perishing. It is also directed, during the violence of the symptoms to observe a cooling treatment; giving the horse two ounces of nitre every day mixed into a ball with honey; and bathing the parts above the eye with verjuice or vinegar, wherein rose-leaves are infused, to four ounces of which half a drachm of sugar of lead may be added. The swelling on the lid may afterwards be bathed with a sponge dipt in equal parts of lime and Hungary water mixed together; and the cooling laxative drink, No. 12, should be given every fourth day, till the eye becomes clear. The haws are a swelling and sponginess that grows in the inner corner of the eye, so large sometimes as to cover a part of the eye. The operation here is easily performed by cutting part of it away; but the farriers are apt to cut away too much: the wound may be dressed with honey of roses; and if a fungus or spongy flesh arises, it should be sprinkled with burnt alum, or touched with blue vitriol.

OF STRAINS.

In all strains, it uniformly happens, that the muscular or tendinous fibres are overstretched; and sometimes ruptured or broke. To form, therefore, a true idea of these disorders, let us first consider every muscle and tendon as composed of springy elastic fibres, which have a proper power of their own to contract and extend themselves; or, to make their action more familiar, let us compare them to a piece of catgut, that we may the better judge with what propriety oily medicines are directed for their cure. Thus, then, if, by a violent extension of this catgut, you had so overstretched it as to destroy its springiness or elasticity, and were inclined to recover its lost tone, would you for that purpose think of soaking it in oil? And is not the method of treating strains, or overstretched muscles and tendons, full as preposterous, when you bathe or soak them in oily medicines, at a time that they want re-stringents to brace them up? Yet custom has so established this practice, and fallacious experience seemingly so confirmed it, that it would be a difficult task to convince the illiterate and prejudiced of the absurdity, who, by attributing effects to wrong causes,

are led into this error, and the oils usurp the reputation that is due only to rest and quiet: they seem, however, to be aware of the ill consequences by their adding the hot oils, as spike, turpentine, and origanum; which, though they in some measure guard against the too suppling quality of the other oils, yet the treatment is still too relaxing to be of real service. Indeed, in all violent strains of either tendons or muscles, whatever opinion we may entertain of bathing and anointing with favourite nostrums, which often succeed in slight cases, where perhaps bandages alone would have done; yet it is the latter, with properly resting the relaxed fibres, till they have thoroughly recovered their tone, that are the chief things to be depended on; and some months are often necessary for effecting the cure. All violent strains of the ligaments, which connect the bones together, especially those of the thigh, require time, and turning out to grass, to bring about a perfect recovery. External applications can avail but little, the parts affected lying too deep, and so surrounded with muscles that medicine cannot penetrate to them. The sooner, in these cases, a horse is turned out to grass, the better; as the gentle motion in the field will prevent the ligaments and synovia from thickening, and of course the joint itself from growing stiff. When a horse's shoulder is overstrained, he does not put out that leg as the other; but, to prevent pain, sets the sound foot hardly on the ground to save the other; even though he be turned short on the lame side, which motion tries him most of any. When trotted in hand, instead of putting his leg forward in a right line, he forms a circle with the lame leg; and when he stands in the stable, that leg is advanced before the other. To cure this lameness, the practice is first to bleed him, though perhaps this might as well be dispensed with; as in all cases where there are no positive inflammatory symptoms, bleeding only protracts the cure by weakening the system. Next let the whole shoulder be well bathed thrice a-day with hot verjuice or vinegar, in which are sal ammoniac, opodeldoc, No. 32, or two parts of camphorated spirits and one of oil of turpentine mixed. Soap dissolved in vinegar has been also prescribed; but this is impracticable as it will not dissolve in that or any other acid. When the strained part is very much swelled, it should be fomented with woollen cloths, large enough to cover the whole, wrung out of boiling water, and applied as hot as possible; a little brandy and vinegar, (equal parts of each,) being previously sprinkled upon them. They should be kept upon the part till they begin to cool, and then others should be applied as before. This must be repeated six or seven times. The last should be bound on with a dry one over it, to keep up a constant perspiration. Sometimes fomentations are made with a strong decoction of aromatic and emollient herbs: such as southernwood, wormwood, chamomile and elder flowers, mallows, &c. When the shoulder is much swelled, a rowel in the point of it often does great service; especially if the strain has been very violent, and the swelling very large: but as to boring up the shoulder with a hot iron, and afterwards inflating it, it is both a cruel and absurd treatment: and the pegging up the sound foot, or setting on a patten shoe, to bring the lame shoulder on a stretch, is a most preposterous practice, and directly calculated to render a horse incurably lame; for it can only be necessary in cases the very opposite to this, where the muscles have been long contracted, and we want to stretch them out. Where poultices can be applied, they are at first undoubtedly very effectual, after bathing with hot vinegar or verjuice; and are to be preferred greatly to cold charges, which, by drying so soon on the part, keep it stiff and uneasy: let them be prepared with oatmeal, rye-flour, or bran boiled up in vinegar, strong beer, or red wine lees, with lard enough to prevent their growing stiff; and when by these means the inflammation and swelling are brought down, bathe the part twice a-day with either of the above mixtures, opodeldoc, or camphorated spirit of wine; and roll the part three or four inches, both above and below, with a strong linen roller of about two fingers width; which contributes not a little to the recovery, by bracing up the relaxed tendon; and perhaps is more to be depended on than the applications themselves. In strains of the coffin joint, that have not been discovered in time, the cure will be extremely difficult. Strains of the back sinews are very common; and are easily discovered by the swelling, which extends sometimes from the back side of the knee down to the heel, but for the most part the horse sets that foot before the other. The tendon should be well bathed three or four times a-day with hot vinegar; and if much swelled, apply the poultices above recommended:

mended: and when the swelling is down, bathe with the mixtures above. Strains of the knees and pasterns arise frequently from kicks or blows: if they are much swelled, apply first the poultices; and when the swelling is abated, bathe with the embrocation, No. 34. As great weakness remains in the pasterns after violent strains, the best method is to turn the horse out to grass till he is perfectly recovered; when this cannot be complied with, the general way is to blister and fire. A lameness in the whirl bone and hip is discovered by the horse's dragging his leg after him, and dropping backward on his heel when he trots. If the muscles of the hip are only injured, this kind of lameness is cured easily; when the ligaments of the joint are affected, the cure is often very difficult, tedious, and uncertain. In either case, at first bathe the parts well with the cooling medicines, four or five times a-day: in the muscular strain, this method alone may succeed; but in the ligamentous, rest and time only can restore the injured parts to their proper tone.

OF TUMOURS AND IMPOSTHUMES.

Tumours or swellings, may arise either from external injuries or internal causes.

I. Tumours caused by external accidents, as blows and bruises, should at first be treated with restringents. Thus, let the part be bathed frequently with hot vinegar or verjuice; and, where it will admit of bandage, let a flannel wetted with the same be rolled on; if by this method the swelling does not subside, apply, especially on the legs, a poultice with red wine lees, strong beer grounds, and oatmeal, or with vinegar, oil, and oatmeal: either of these may be continued twice a day, after bathing, till the swelling abates; when, in order to disperse it entirely, the vinegar should be changed for camphorated spirit of wine, to four ounces of which may be added one of spirit of sal ammoniac; or it may be bathed with a mixture of two ounces of crude sal ammoniac boiled in a quart of chamber ley twice a-day, and rags dipped in the same may be rolled on. Fomentations are often of great service to thin the juices, and fit them for transpiration; especially if the injury has affected the joints. But in bruises, where the extravasated blood will not by these means be dispersed; the shortest way is to open the skin, and let out the coagulium. Critical tumours which terminate fevers, should by no means be dispersed; except when they fall on the pastern or coffin joint, so as to endanger them: in this case the discutient fomentation should be applied three or four times a-day, and a cloth or flannel, frequently wrung out of the same, should be bound on, to keep the joint in continued perspiration. But all tumours tending to certain maturation (from whatever cause they originated) should be expeditiously assisted by fomentation; and, after each time of using the fomentation, the ripening encouraged by suppurating poultices, wherever they can be applied; oatmeal boiled soft in milk, to which a proper quantity of oil and lard is added, may answer this purpose; or the emollient poultice, N° 52. These applications must be regularly continued till the matter is perceived to fluctuate under the fingers, when it ought to be let out: for which purpose let the tumour be opened with a knife or strong lancet, the whole length of the swelling, if it can be done safely; for nothing contributes so much to a kind healing as the matter having a free discharge, and the opening big enough to dress to the bottom. Pledgets of tow or lint spread with the digestive ointment, N° 45, II. and dipped in the same, melted with a fifth part of oil of turpentine, should be applied to the bottom of the sore, and filled up lightly with the same, without cramming: it may be thus dressed once or twice a-day, if the discharge is great, till a proper digestion is procured; when it should be changed for pledgets spread with the red precipitate ointment, N° 45, III. applied in the same manner. Should the sore not digest kindly, but run a thin water and look pale, foment, as often as you dress with the above fomentation; and apply over this dressing the strong beer poultice, and continue this method till the matter grows thick, and the sore florid. Wounds that look florid and fill up favourably while dressed with lint, will probably need no other application. If dressed too long with digestives, the flesh will rise fast, and if the sore is on a part where bandages cannot be applied, with compresses of linen cloth, these methods will be necessary to keep the granulations down, and to encourage the growth of the skin. The vulgar notion respecting proud flesh in healthy wounds, is a mischievous and vulgar error, which has led, both in the human and brute subject,

to an absurd and cruel practice, of employing escharotic and caustic dressings where they were not necessary. Writers on farriery have given in general very proper receipts to answer every intention of this kind by medicines; but as they have not laid down sufficient rules for their application in those cases where they are most wanted, the following general directions may be acceptable as the difficulty in healing some kinds of sores arises frequently from the unskilful manner of dressing them. We may then observe, once for all, that the cures of most sores are effected by the simplest methods; and that it is often of much more consequence to know how to dress a sore, than what to dress it with. In this indeed consists the chief art of this branch of surgery; for the most eminent in that profession have long ago discovered, that variety of ointments and salves is not necessary in the cure of most wounds and sores; and they have accordingly discarded the greatest part formerly in repute for that purpose; repeated observations having taught them, that, after the digestion, nature is generally disposed to heal up the wound fast enough herself; and that the surgeon's chief care is to prevent that luxuriance called proud flesh; which all ointments, wherein lard or oil enters, are apt to encourage, as they keep the fibres too lax and supple; and which dry lint alone, early applied, as easily prevents, by its absorbing quality, and light compression on the sprouting fibres. Thus, if a hollow wound or sore be crammed with tents, or the dressings be applied too hard, the tender shoots of flesh from the bottom are prevented from pushing up; and the sides of the sore by this distention may in time grow horny and fistulous; nor has the matter by this method a free discharge. On the other hand, if sores of any depth be dressed superficially, the external parts being more disposed to heal and come together than the internal, they will fall into contract, or heal too soon; and the sore, not filling up properly from the bottom, will break out afresh. Hence we may justly conceive how little stress is to be laid on famous ointments, or family salves, unskilfully applied; for unless this due medium be observed, or obtained in the dressing, no hollow sore can heal up properly. As soon then as a good digestion is procured, (which is known by the thickness and whiteness of the matter discharged, and the florid red colour at the bottom of the sore,) let the dressings be changed for the precipitate medicine; or the sore may be filled up with dry lint alone, or dipped in linewater, with a little honey and tincture of myrrh, or brandy, about a fifth part of the latter to one of the former: a pledget of lint dipped in this mixture, should also be applied to the bottom of the sore, which should be filled up with others to the surface or edges: but neither crammed in too hard, nor applied too loosely. By this method, the sore would heal up properly, and soft spongy flesh would be prevented or suppressed in time; whereas when ointments, or salves, are too long continued, a fungus, or proud flesh, is thereby so encouraged in its growth, that it requires some time to destroy and eat it down again; a proper compress of cloth, and a linen-roller, is absolutely necessary both for this purpose and to secure the dressings, wherever they can conveniently be applied. If any eschar of consequence should remain, and the hair not follow kindly, rub the part gently every night with a small quantity of camphorated spermaceti ointment, the best article known to promote the return of the hair upon the knees or any other part.

II. Tumours arising from INTERNAL CAUSES that require to be here noticed, are the scrofulous, encysted, and steatomatous.

1. SCROFULOUS TUMOURS are such as originate in scorbutic or hereditary taints, and increase or diminish according to the state or acrimony of the blood. For these the principal application is the strong mercurial ointment, No. 7, which must be assisted by a course of incercorial and antimonial alteratives.

2. ENCYSTED TUMOURS are such as originate in a cyst or bag, containing a kind of ichor, or gelatinous fluid; which being evacuated, the cyst does not always submit to digestives or escharotics, but must be extirpated with the knife, and cured as a common wound.

3. STEATOMATOUS TUMOURS, are those that form under the skin, on different parts, and pass under the denomination of WENS, though in fact they also are cysts: containing, when opened or extracted, a substance not unlike suet when hardly cold. Neither of the above are expected to submit to any topical application, unless upon the very first observation; when an attempt may be made by a small portion of the above mercurial ointment rubbed

in every night for a considerable length of time; but no radical cure can be in general obtained but by extirpation, which generally succeeds if well performed, and the wound be afterwards treated rationally. A seton is a good remedy for the cure of encysted tumours of considerable size. It should be passed quite through, from the highest to the lowest part, and suffered to remain till the sides of the cyst are united, after which it should be withdrawn.

OF WOUNDS.

As the blood therefore is the best balsam of Nature, and in cases of fresh wounds in a healthy system, is endowed with the vis medicatrix Naturæ, it becomes an important object in the veterinary art, to adopt the speediest and most effectual means of preventing any great loss of it, by the use of the best styptics, in cases where, from any sudden accident, a horse has been wounded in a large vein or artery, and in a situation where perhaps the aid of no surgeon or skilful farrier can be readily procured. On this subject a memoir was presented to the Royal Academy of Sciences by M. La Fosse, wherein he gives an account of the success he had met with, in stopping the bleedings of very considerable arteries in horses, by applying the powder of puff-balls, the arteries cicatrizing by this means only, without any succeeding hæmorrhage. In the dressing of wounds, sores, &c. the following general rules ought carefully to be attended to by every practitioner: 1. To remove all foreign bodies (if it can be done with safety), all lacerated or torn parts, whether of the flesh or of the hoof, &c. which, if left in the wound might possibly impede the cure. 2. All wounds should be carefully inspected at every dressing, observing attentively whether any alteration has been made on their surface, whether they be clean at the bottom, and free from any extraneous substance that may hinder or retard the cure. 3. Cramming wounds with hard tents, and syringing them frequently with spirituous tinctures, are extremely hurtful. The former increases the pain and inflammation, &c.; the latter produces a callus upon the internal surface of the wounds, which prevents their healing. 4. The dressing of wounds should lie smooth and easy upon the parts. 5. Over-tight ligatures or bandages should be carefully avoided.

In all FRESH WOUNDS made by cutting instruments, there is nothing more required, than to bring the lips of the wound into contact, by suture or bandage, provided the part will allow of it; for on wounds of the hips, or other prominent parts, and across some of the large muscles, the stitches are apt to burst on the horse's lying down and rising up in the stall. In such cases, the lips should not be brought close together: one stitch is sufficient for a wound two inches long; but in large wounds, they should be at an inch or more distance; and if the wound is deep in the muscles, care should be taken to pass the needles proportionably deep, otherwise the wound will not unite properly from the bottom. If the wound should bleed much from an artery divided, the first step should be to secure it, by passing a crooked needle underneath, and tying it up with a waxed thread: if the artery cannot be got at this way, apply a button of lint or tow to the mouth of the bleeding vessels dipped in a strong solution of blue vitriol, styptic water, oil of vitriol, or hot oil of turpentine, powdered vitriol, or colcothar, &c. and remember always to apply it close to the mouth of the bleeding vessels, and take care that it is kept there by a proper compress and bandage till an eschar is formed; otherwise it will elude your expectations, and frequently alarm you with fresh bleedings. In slighter bleedings we would recommend a pledget of lint dipt in oil, or rather lightly greased, to be laid over the wound; and above it a piece of sponge dipt either in melted wax, or strong glue, or mucilage of gum Arabic; and pressed till it hardens. This, secured with a firm bandage, will, in many cases, be effectual; for as the sponge dilates by heat or moisture, (according as it is prepared), the compression will not readily give way.

OF ULCERS IN GENERAL.

Simple ulcers, that are not attended with any particular obstacle to their healing in the general state of the system, require much the same treatment with wounds; but as all ulcers, difficult to heal, proceed from a particular indispotion of the blood and juices, before the former can be brought into any order, the latter must

be corrected by alteratives. The first intention in the cure of ulcers is to bring them to digest, or discharge a thick white matter; which will, generally, be effected by the ointment, No. 43, III. but should the sore not digest kindly by these means, but discharge a gleety thin matter, and look pale, we must then have recourse to warmer dressings, such as balsam, or oil of turpentine, melted down with common digestive, No. 45, I, and a strong beer poultice over them. It is proper also in these kinds of sores, where the circulation is languid, and the natural heat abated, to warm the part, and quicken the motion of the blood, by fomenting it well at the time of dressing. This will thicken the matter, and rouse the native heat of the part, and then the former dressings may be re-applied. If the lips of the ulcer grow hard or callous, foment strongly with a decoction of camomile and mallows, as hot as can be conveniently applied: then scarify superficially the whole part, both longitudinally and transversely with a fleam or abscess lancet, so as entirely to penetrate the callous substance upon the surface; after which it must be dressed with digestive ointment twice a day; the fomentation and scarifications to be repeated occasionally, till the callosity is quite sloughed off and comes away with the dressings. As soon as the callosity is removed, and the discharge comes to its proper consistence, dress in general with a small portion of lint thinly covered with either of the basilicons, placed under a pledget of tow spread with the simple digestive; or softened with oil of turpentine, where a copious discharge is required. Should the wound incarnate too fast, and fill with fungous flesh, treat it as directed for wounds.

OF A BONE SPAVIN.

This disorder is a bony excrescence, or hard swelling, growing on the inside of the hock of a horse's leg. A spavin, that begins on the lower part of the hock, is not so dangerous as that which puts out higher; between the two round processes of the leg bone; and a spavin near the edge is not so bad as that which is more inward toward the middle, as it does not so much affect the bending of the hock. A spavin that comes by a kick or blow, is at first no true spavin, but a bruise on the bone, or membrane which covers it; therefore not of that consequence as when it proceeds from a natural cause: and those that put out on colts and young horses, are not so bad as those that happen to horses in their full strength and maturity; but in very old horses they are generally incurable. The usual method of treating this disorder is by blisters and firing; without any regard to the situation, or cause whence it proceeds. Thus, if a fulness of the fore-part of the hock comes upon hard riding, or any other violence, which threatens a spavin: in that case, such coolers and repellers are proper as are recommended in strains and bruises. Those happening to colts and young horses are generally superficial, and require only the milder applications; for it is better to wear them down by degrees, than to remove them at once by severe means. A second application of the blistering ointment, will, in colts and young horses, make a perfect cure. But when the spavin has been of long standing, it will require to be renewed, perhaps five or six times: but after the second application, a greater distance of time must be allowed, otherwise it might leave a scar, or cause a baldness; to prevent which, once a fortnight or three weeks is often enough; and it may in this manner be continued six or seven times, without the least blemish, and will generally be attended with success. But the spavins that put out on older or full-aged horses are apt to be more obstinate, being seated more inward: and when they run among the sinuities of the joint, they are for the most part incurable. The best and safest method, is to apply the blistering ointment, No. 47, III, and continue it according to the directions for some months, if necessary; the horses in the intervals working moderately: the hardness will thus be dissolved by degrees, and wear away insensibly.

OF CURBS, JARDONS, AND RING BONES.

I. As a spavin rises among the bones on the fore-part of the hock, so a curb takes its origin from the junctures of the same bones, and rises on the hind part, forming a pretty large tumour over the back part of the hind leg, attended with stiffness, and sometimes with pain and lameness.

A CURB proceeds from the same causes that produce spavins; viz. hard riding, strains, blows, or kicks. The cure at first is generally easily enough effected by blistering, repeated two or three times.

times, or oftener. If it does not submit to this treatment, but grows excessively hard, the quickest and surest way is to fire with a thin iron, making a line down the middle from top to bottom, and drawing several lines pretty deep crosswise on each side like a feather; and then to apply a mild blistering plaster or ointment over it. This method will entirely remove it.

II. There is another swelling on the outside of the hock, which is called a **JARDON**. This commonly proceeds from blows and kicks of other horses; but frequently happens to manege horses, by setting them on their haunches: it is seldom attended with much lameness, unless it has been neglected; or some little process of the bone broke. It should first be treated with coolers and repellers; but if any swelling continues hard and insensible, the best way is to blister or fire; but the mild blisters alone generally succeed.

III. The **RING-BONE** is a hard swelling on the lower part of the pastern, which generally reaches half way round the fore-part thereof, and has its name from its resemblance to a ring. It often arises from strains, &c. and, when behind, from putting young horses too early upon their haunches; for in that attitude a horse throws his whole weight as much, if not more, upon his pasterns, than on his hocks. When it appears distinctly round the pastern, and does not run downwards towards the coronet, so as to affect the coffin-joint, it is easily cured: but if it takes its origin from some strain or defect in the joint originally, or if a callosity is found under the round ligament that covers that joint, the cure is generally dubious, and sometimes impracticable; as it is apt to turn to a quitter, and in the end to form an ulcer upon the hoof. The ring-bones that appear on colts and young horses, will often insensibly wear off themselves, without any application; but when the substance remains, no other remedy is necessary but blistering, unless when by long continuance it is grown to an obstinate hardness, and then it may require both blistering and firing.

OF SPLENTS.

A **SPLENT** is a hard excrescence that grows on the shank bone. They are of various shapes and sizes. Some horses are more subject to splents than others; but young horses are most liable to these infirmities, which often wear off and disappear of themselves. Few horses put out splents after they are seven or eight years old, unless they meet with blows or accidents. Splents that arise in the middle of the shank bone are nowise dangerous; but those that arise on the back part of it, when they grow large and press against the back sinew, always cause lameness or stiffness, by rubbing against it: the others, unless they are situated near the joints, seldom occasion lameness. As to the cure of splents, the best method is not to meddle with them, unless they are so large as to disfigure a horse, or so situated as to endanger his becoming lame. Splents in their infancy, and on their first appearance, should be well bathed with vinegar, or old verjuice; which, by strengthening the fibres, often put a stop to their growth; for the membrane covering the bone, and not the bone itself, is here thickened; and in some constitutions purging, and afterwards diuretic drinks, will be a great means to remove the humidity and moisture about the limbs, which often give rise to such excrescences.

OF THE POLL-EVIL; FISTULA AND BRUISES ON THE WITHERS; WARBLER, AND SIT-FASTS.

I. The **POLL-EVIL** is an abscess near the poll of a horse, formed in the sinuses between the poll-bone and the uppermost vertebra of the neck; which when it breaks spontaneously, or is opened, discharges great quantities of viscid matter, not unlike dirty glue. It generally proceeds from blows or strains, or hurts in drawing; or from a critical translation of matter in a fever. When the poll swells from a blow or bruise, it may be easily cured by fastening an ear-band to the collar, to prevent its pressing on the part, and bathing it two or three times a day with warm vinegar, and if there be an oozing through the skin it must be mixed with an equal quantity of spirit of wine. In this state the abscess may by these means be prevented. But when there is a heat in the part with inflammation, it will be proper to bleed, and then apply a poultice of bread and milk; or the discutient cataplasm, No. 55; either of which must be repeated once or twice a day till the itching is gone, and the swelling abated. This method with laxative physic may

prevent an abscess; but when it is formed, bleeding and purging are unnecessary, and it must be brought forward with the suppurating cataplasms, till it bursts of itself; and then the matter must be squeezed out gently once or twice, after which it may be laid open, keeping as much as possible according to the direction of the fibres of the muscles, without cutting the tendinous ligament, that runs along the neck under the mane. And therefore, if the matter is gathered on both sides, the best way will be to open it on both sides. This done, a leaden probe must be introduced as gently as possible, and by these means the orifice must be made so wide as to introduce the finger; or it may be better done with a short sponge tent, and a bit of dry sponge will do well enough for this use without any preparation. If the matter be white, and of a good consistence, it may be heated with turpentine, honey, and the tincture of myrrh. When proud flesh arises, strew a little red precipitate on it. If the matter flow in great quantities, resemble melted glue, and be of an oily consistence, it will require a second incision, especially if any cavities be discovered by the finger or probe; these should be opened by the knife, the orifices made depending, and the wound dressed with the common digestive of turpentine, honey, and tincture of myrrh; and, after digestion with the precipitate ointment, to inject a little of the detergent lotion, No. 36, made warm; and fill the wound up with tow moistened with the same; but it must lie very loose, lest it should hinder the growth of good flesh. Sometimes bathing it with this liquor alone will do, if it be filled with dry lint, and covered with tow to keep it from the air. In some cases once or twice a day may be necessary till the running decreases and the sore grows better. Then the sore should be bathed with spirit of wine alone, and it should be covered with tow dipt in vinegar and whites of eggs beat together, which will serve instead of a bandage. This should be covered with a piece of woollen cloth, with two loops of list round his ears, and it may be tied underneath by tape fastened thereto. The latest practice however in the cure of the poll-evil, and certainly the best, is that of passing a seton through the cavity, in such a way as to make a depending opening; and this will generally cure without any other remedy.

II. **BRUISES ON THE WITHERS** frequently imposthume, and for want of cure turn fistulous. They arise often from pinches of the saddle, and should be treated with repellers, as the lotions and embrocations, No. 37, 38. These will often prevent imposthumes; when the swelling is attended with heat, smarting, and little hot watery pimples, the saturnine liniment, No. 40, II, will be the best application. But when the swellings are critical, the consequence of a fever settled on this part, we must avoid the repelling method, and assist in bringing the swelling to matter, by suppurating poultices: experienced farriers advise, never to open these tumours till they break of themselves: for if they are opened before they are ripe, the whole sore will be spongy, and discharge a bloody ichor, which soon degenerates into a sordid ulcer.

III. **WARBLER** are small hard tumors under the saddle-part of the horse's back, occasioned by the heat of the saddle in travelling, or its uneasy situation. As soon as the saddle is taken off after a severe chase or hard journey, a good groom or hostler will be very minute in his examinations, to discover whether any injury has been sustained in this part or any other. He will instantly perceive, by the horse's wincing, whether there is any defect from which a warble may speedily ensue; if so upon the first appearance, or earliest discovery, bathe three or four times a day with the vegeto-mineral water. No. 35.

IV. A **SIT-FAST** proceeds generally from a warble, and is the horse's hide turned horny or callous. In some little time the hair comes off, and it bears the appearance of a foreign solid substance, fixed in the centre of what seems to be a superficial wound. For this simple and very trifling complaint, there is but one certain and expeditious cure, namely, extirpation; which may be performed with a common penknife. But the most ready and least painful method of taking it off is by just raising either edge, till it can be taken hold of with a pair of common pincers; when, by leaning them to any side, you have an immediate fulcrum, or lever, and separate it instantaneously without pain or inconvenience. After the extirpation, it may be treated as a simple superficial laceration, and may in general be healed by a frequent application of Friar's balsam, tincture of myrrh, or even with a little common brandy. Due care, however should always be taken to guard the

the cicatrix in its infancy, and prevent the buckle of the girth from coming into direct contact with the injured part, not only till the surface is sufficiently hardened to render a repetition unlikely, but upon all future occasions.

OF WIND-GALLS; AND OF BLOOD AND BOG SPAVINS.

I. A **WIND-GALL** is a flatulent swelling, which yields to the pressure of the finger, and recovers its shape on the removal thereof; the tumor is visible to the eye, and often seated on both sides of the back sinew, above the fetlocks, on the fore legs, but most frequently on the hind legs; though they are met with on various parts of the body, wherever membranes can be so separated, that a quantity of air and serosities may be included within their duplicatures. When wind-galls appear near the joints and tendons, they are generally caused by strains or bruises on the sinews, or the sheath that covers them; which, by being over-stretched, have some of their fibres ruptured; whence probably may ouze out that fluid which is commonly found with the included air: though, where these swellings shew themselves in the interstices of large muscles, which appear blown up like bladders, air alone is the chief fluid; and these may safely be opened, and treated as a common wound. On the first appearance of wind-galls, their cure should be attempted by restringents and bandages; for which purpose, let the swelling be bathed twice a-day with vinegar, or verjuice alone; or with the repellent embrocation, No. 37; or let the part be fomented with the restringent fomentation, No. 56; binding over it, with a roller, a woollen cloth soaked in the same. Some, for this purpose, use red wine lees; others curriers' shavings wetted with the same, or vinegar, bracing the part up with a firm bandage. If, after a proper trial, this method should not succeed, authors have advised the swelling to be pierced with an awl, or opened with a knife; but mild blistering is in general preferred to these methods; the included fluids being thereby drawn off, the impacted air dispersed, and the tumour gradually diminished.

II. A **BLOOD-SPAVIN** is a swelling and dilatation of the vein that runs along the inside of the hock, forming a little soft swelling in the hollow part, and is often attended with a weakness and lameness of the hock. The treatment is the same as that above recommended.

III. A **BOG SPAVIN** is an encysted tumour on the inside of the hough; or, according to Dr. Bracken, a collection of brownish gelatinous matter, contained in a bag or cyst, which he thinks to be the lubricating matter of the joint altered, the common membrane that incloses it forming the cyst. This case he has taken pains to illustrate in a young colt of his own, where he says, When the spavin was pressed hard on the inside of the hough, there was a small tumour on the outside, which convinced him the fluid was on the inside of the joint. He accordingly cut into it; discharged a large quantity of this gelatinous matter; dressed the sore with dossils dipped in oil of turpentine; putting into it, once in three or four days, a powder made of calcined vitriol, alum, and bole. By this method of dressing, the bag sloughed off, and came away, and the cure was successfully completed without any visible scar. If, through the pain attending the operation or dressings, the joint should swell and inflame, foment it twice a-day, and apply a poultice over the dressings till it is reduced.

OF MALLENDERS AND SALLENDERS.

I. **MALLENDERS** are cracks in the bend of the horse's knee, that discharge a sharp indigested matter; they are often the occasion of lameness, stiffness, and the horse's tumbling.

II. **SALLENDERS** are the same distemper, situated on the bending of the hough, and occasion a lameness behind. Both these disorders are cured by washing the parts with a lather of soap warmed, or old chamber ley; and then applying over the cracks a strong mercurial ointment spread on tow, with which they should be dressed night and morning, till all the scabs fall off; if this should not succeed, anoint them night and morning with a little of the ointment of nitrated quick-silver; No. 48; to one oz. of which two drachms of the extract of lead is added; or else with an ointment of corrosive sublimate, in the proportion of one drachm to one oz. of lard. It may be mixed with the lard by itself, after being rubbed into fine powder; or it may be previously dissolved in a little marine acid.

OF LAMPAS, BARBS, WOLVES TEETH, AND OTHER DISEASES OF THE MOUTH.

I. The **LAMPAS** is an excrescence in the roof of the horse's mouth, which is sometimes so luxuriant, that it grows above the teeth, and hinders his feeding. The ordinary method of cure is lightly cauterising the flesh with a hot iron, taking care that it does not penetrate too deep so as to scale off the thin bone that lies under the upper bars; the part may be anointed with burnt alum and honey, which is proper for most sores in the mouth. This operation is by some justly thought to be quite unnecessary; it being a general observation, that all young horses have their mouths more or less full of what are called lampas; and that sometimes they rise higher than the fore teeth. It is further observed, in proportion as a horse grows older, the roof flattens of itself, and the teeth then appear to rise. We are obliged to the ingenious M. La Fosse for this remark, which we hope will produce an abolition of this barbarous and useless operation.

II. **BARBS** are small excrescences under the tongue, which may be discovered by drawing it aside, and are cured by cutting close off, and washing with brandy, or salt and water.

III. A horse is said to have **WOLVES TEETH**, when the teeth grow in such a manner, that their points prick or wound either the tongue or gums in eating. Old horses are most liable to this infirmity, and whose upper overshoot the under teeth in a great degree. The remedy is to file down the superfluous parts of the teeth till they be sufficiently wasted.

IV. Besides these disorders of the mouth, there are often observed on the inside of the lips and palate, little swellings or bladders, called giggs. Slitting them open with a knife or lancet, and washing them afterwards with salt and vinegar, is in general their cure; but when they degenerate into what are called cankers, which are known by little white specks, that spread and occasion irregular ulcers, the best method then is to touch them daily with a small flat cautery, moderately heated till the spreading is stopped, and to rub the sores three or four times a-day with mel. *Ægyptiacum*, and tincture of myrrh; or borax and honey of roses. When by this dressing the sloughs are separated, they may be washed frequently with a sponge dipped in a strong solution of blue vitriol and alum.

V. A **RELAXATION AND SWELLING OF THE PALATE**, sometimes happens to horses on catching cold. To remedy this disorder anoint the part with honey of roses, acidulated with marine acid; or bathe it with the restringent fomentation, No. 56, cold, either applied with a sponge, or thrown into the mouth with a syringe.

OF THE GREASE.

The **GREASE** is a disease, of the nature and causes of which authors have given a very imperfect account. The name is probably derived from the discharge thrown out from the skin of the part affected, which is of a greasy or unctuous nature. The part in which it always begins is the fetlock of one of the hind legs. It scarcely ever is seen in the fore leg; and the reason why it affects the hind leg exclusively, is probably its greater distance from the centre of the circulation, the vessels acting more and more weakly in proportion to their greater distance from the heart. From this circumstance, it seems to be a disease primarily arising from local debility, and from an inert state of the circulating vessels. When a horse becomes affected with the grease, several transverse chaps or fissures take place at different distances above the heels. When these exist, they are greatly aggravated by the motions of the horse, which are continually varying; so that if there existed in these fissures a disposition to unite, it would still be counteracted by the parts being repeatedly put on the stretch, and the union, if any had taken place, would be forcibly torn asunder. Veterinarian authors have usually considered this disease as arising from two different causes: 1st, a fault or relaxation in the vessels; or 2dly, a bad disposition in the blood and juices. They observe, that the blood is brought to the extreme parts by the arteries, and returned by the veins; in which latter, the blood is to rise in perpendicular columns, to return the circulating fluids from the extremities; hence swellings in the legs of horses may easily be accounted for, from an inadequate motion of the venous blood in the finer vessels, where the circulation is most languid; and especially

cially when there is want of due exercise, and a proper muscular compression on the vessels; in short, they represent, that the blood in such cases cannot so readily ascend as descend, or a greater quantity is brought by the arteries than can be returned by the veins. The grease then, considered in this light, must be treated as a local complaint, where the parts affected are alone concerned, and the constitution actually takes no part; or as a disorder where they are both complicated; but when it is an attendant on some other distemper, as the farcy, jaundice, dropsy, &c. such diseases must first be cured before the grease can be removed. In the former case, moderate exercise, proper dressing, cleanliness, and external applications, will answer the purpose: in the latter, internal medicines must be employed. When a horse's heels are first observed to swell in the stable, and subside or go down on exercise, let care be taken to wash them very clean every time he comes in, with soap suds, chamberley, or vinegar and water; which, with proper rubbing, will frequently prevent or remove this complaint: or let them be well bathed twice a-day with old verjuice, or the vegeto-mineral water, which will brace up the relaxed vessels; and if rags dipped in the same are rolled on, with a proper bandage, for a few days, it is most likely the swellings will soon be removed by this method only, as the bandage will support the vessels till they have recovered their tone. To answer this end also, a laced stocking made of strong canvas or coarse cloth, neatly fitted to the part, would be found of great use. But if cracks or scratches are observed, which ooze and run, let the hair be clipped away, to prevent a lodgement which may become offensive, and to give room for washing out dirt or gravel, which, if suffered to remain, would greatly aggravate the disorder. When this is the case, or the heels are full of hard scabs, it is necessary to begin the cure with poultices, made either of boiled turnips, with a handful of linseed powdered; or oat-meal and rye-flour, with a little common turpentine, boiled up with strong beer grounds, or red wine lees. The digestive ointment being applied to the sores for two or three days, with either of these poultices over it, will by softening them promote a discharge, unload the vessels, and take down the swelling; when they may be dressed with the ointments recommended for the mallenders; particularly with the first of them. In obstinate cases, if the horse be full and fleshy, the cure must be begun by bleeding, rowelling, and purging; after which diuretics are frequently given with success. The legs should also be fomented twice a-day with the discutient fomentation, No. 38, in which a handful of wood ashes has been boiled. If the sores be very foul, they must be anointed with equal parts of oil of turpentine, tincture of myrrh, and *Ægyptiacum*; or two parts of burnt alum, and one of red precipitate rubbed to a fine powder and sprinkled over them previous to the dressing.

OF RUPTURES, AND COLT EVIL, OR GONORRHOEA.

I. Though ruptures are generally divided into particular classes, we shall only observe, that by violent efforts of the horse, or other accidents, the intestine or omentum, or a portion of each, may be forced between the muscles of the belly at the navel, or through the rings of the muscles into the scrotum. These swellings are generally about the size of a man's fist, sometimes much larger, descending to the very hock; they are frequently soft, and yield to the pressure of the hand, when they will return into the cavity of the belly with a rumbling noise: and, in most, the aperture may be felt through which they passed. Every method should be tried on their first appearance, to return them by the hand; but if the swelling should be hard and painful, in order to relieve the stricture, and relax the parts through which the gut or caul has passed, let a large quantity of blood be immediately taken away, and the part fomented twice or thrice a-day, applying over it a poultice of oat-meal and vinegar, which should be continued till the inflammation subsides, and the gut can be returned. In the mean time, throw up emollient oily clysters twice a-day, and let the horse's chief diet be boiled barley, with scalded malt, or bran. Should the swelling afterwards return, the restraining applications, usually recommended on these occasions, will avail nothing without a suspensory bandage; so that an ingenious mechanic in that art is chiefly to be relied on for any farther assistance. It has nevertheless been observed, that with moderate feeding, and gentle exercise, some horses have continued to be very useful under this complaint.

II. The *Colt Evil* is supposed to arise from stoned colts attempting to copulate with mares before they are able: whence frequently ensues an excoriation or fretting on the glands, and a swelling on the sheath. This last disorder frequently proceeds too from dirt or filth lodging there, and is often removed by washing the part clean with butter and beer: but when the yard itself is swelled, foment it twice a-day with a decoction of marshmallows. Dress the excoriation with simple ointment, or wash it with a sponge dipped in lime water, to a pint of which may be added two drachms of sugar of lead. The penis should be tied up to the belly; and if the swelling should increase with the inflammation, bleed, give some cooling physic, and apply a poultice of bread and linseed meal made with Goulard's water, No. 35. If a simple gonorrhoea, or seminal gleet, flows from the yard, (which is often the case in high fed young horses, where relaxation has been brought on by frequent emissions,) let the horse be plunged every day into a river or pond; give him two or three doses of rhubarb, at proper intervals; and afterwards some balls prepared with rhubarb and turpentine; two drachms of the former to half an ounce of the latter. They should be given every night till the complaint goes off.

OF WOUNDS IN THE FEET.

Wounds in the feet happen frequently; and we may add chiefly from inattention or neglect; and from injudicious treatment, they often become serious. The most approved and rational method of treating recent wounds is, to endeavour to bring them to a supuration, or discharge of laudable matter; for which purpose, poultices are most eligible, as they may be easily made more or less of a digestive quality, by melting and mixing any proper digestive ointment, with the poultice whilst warm. Many people are indeed prejudiced against the use of poultices, from a notion, that they (as the phrase is) draw humours to the wounded part; but the absurdity of this way of reasoning will be evident to those who are in the least acquainted with the healing art. Poultices may be continued till the wound appears to be well digested, by a kindly supuration of white well concocted matter, and looks smooth and equal, free from cavities or excrescences of proud flesh; in that case, the use of poultices may be left off, and the surface of the wound may be sprinkled over with a mild escharotic, prepared by mixing one ounce of Armenian bole, with three ounces of quick-lime, that has fallen to powder by exposure to the air, and then passing them together through a fine sieve. After the wound is sprinkled with this powder, a pledget of dry lint may be fixed gently over it; and when the surface of the wound is nearly equal with the skin, the powder will be sufficient, without any cloth or covering. There is a species of wounds to which the feet are much exposed, called punctures, on account of their small orifice, as the parts immediately after the wound is inflicted readily close up, whereby it becomes difficult to know the depth of the wound. They are generally occasioned by treading upon sharp stones, or bones, broken glass, nails, &c. and likewise by nails in shoeing; any of which perforating the sole or frog, may wound the internal parts of the foot. These from their situation and confinement within the hoof, are attended with the most violent pain and inflammation, which are frequently increased by the injudicious method generally observed in treating these wounds when first inflicted; viz. by pouring hot corrosive oils into the recent wound, to deaden it (as the phrase is,) which is productive of the worst of consequences. Punctures from nails in shoeing, are commonly said to proceed from ignorance or blundering. This may frequently be the case; but, at the same time, it is an accident that may, and indeed does, happen to the most expert artist; and it is surprising, considering the narrow space there is in some hoofs for driving nails, that it does not happen oftener. When discovered in time, it is easily cured, by opening a passage for the matter downwards, and dressing it with any digestive ointment or poultice, and keeping the foot moist, by applying an emollient poultice all round the hoof. But when it is overlooked, or a fragment of the nail remains in the wound, the inflammation increasing, it at last suppurates. The matter accumulating, and not finding a passage downwards, from the natural formation of the hoof, it moves upwards to the coronet or top of the hoof, and forms a round tumour, which afterwards breaks out, and degenerates into a most malignant ulcer, commonly termed a quitter. This tumour is usually attended with great pain and inflammation,

and a considerable swelling round its basis. The method of cure commonly practised, and recommended by authors, is the actual cautery, or some very active caustic. Punctures differ little or nothing, in the manner of treating them, from wounds; only the sole or frog should be scraped thin all round the orifice of the wound, which, at the same time, if too small, should be enlarged, and an emollient poultice applied, taking care that no fragment of extraneous substance remain in the wound, and keeping the whole hoof moist and soft with similar poultices around it; and, in cases attended with violent pain, recourse must be had to such remedies as are proper in inflammatory cases; particularly moderate doses of nitre, given as before directed. Contusions or bruises happen frequently on the coronet or top of the hoof, from the treading of other horses feet, which will occasion lameness; although at the same time no external mark of violence will appear on the coronet farther than a little swelling; but the horse will shew a sense of pain when the affected part is touched or pressed upon. The discutient poultice, No. 55, may be applied with success, if continued for some time.

OF FOUNDERED FEET.

The term *foundered* is frequently applied to lame horses in a very vague manner, and without any determined or fixed meaning; for, when a horse shews any defect or impediment in moving his fore feet, he is then pronounced to be *foundered*, whether he really has been so or not; that is, according to what is commonly understood by that term, owing to the want or neglect of not making proper distinctions of the different diseases in the feet. If we consult authors who have treated upon this subject, we shall find their accounts of it very dark and imperfect; they bewilder the reader, and convey but a very indistinct idea of the nature of the disease: hence many errors are committed in practice, to the destruction of a number of valuable horses, which otherwise, by proper management, might have been rendered sound and useful. When a horse is first attacked with the disorder, he shews a great restlessness, is hot and feverish, heaves much at the flanks, breathes quick, has a quick strong pulse, and groans much when moved about; at the same time, he shews symptoms of the most violent pain, sometimes in one, but more frequently in both fore feet; for which reason, he lies down much; but, when forced to move forwards, he draws himself together, as it were into a heap, by bringing forward his hind feet almost under his shoulders, in order to keep the weight of his body as much as possible from resting upon his fore feet. It is almost universally allowed, that the cause of this disease proceeds from too violent exercise, such as riding very hard upon stony grounds or turnpike roads, and that young horses are most liable to it; and to these we may likewise add, unequal pressure upon the internal parts of the foot, from the concave or hollow form of the common shoes. All these causes combined together, when a horse is of a plethoric or full habit of body, and not accustomed to violent exercise, occasion this disease in a greater or less degree. To form some faint idea of this malady in horses, we may in a great measure appeal to what we experience ourselves in running upon hard ground; for we find, that it occasions a great heat, attended with a smart pain in our feet, which would be greatly increased from uneasy shoes, especially if compelled, like horses, to continue the running for any considerable time. The feet likewise become turgid and painful after a long day's journey, especially if the person is not accustomed to travel; and this inflammation frequently terminates in blisters upon the soles of the feet. Hence it is evident, that, in proportion to the habit of body the horse is in at the time, and the violence of the labour or exercise he has undergone, the inflammation in the internal parts of the foot will be more or less violent; and besides being attended with all the symptoms of fever in general, particular local symptoms will indicate the seat of the disease to a certainty. In stepping forward he draws his leg backward, before setting his foot to the ground, setting down his heel with great caution, on which he rests most, the toe being turned a little upwards, as if afraid of touching the ground. From this symptom only, we may judge with certainty, even though at a distance, upon seeing a horse walk, whether he has ever been *foundered* or not. The hoofs at the same time are exceedingly hot; and if water is thrown upon them, they dry instantly: if any attempt is made to pull off any of the shoes, the horse shews great uneasiness upon the least twist or pressure made upon any part of the foot,

and a great unwillingness to support the weight of his body upon the other foot, especially when they are both alike affected. Since the circulation is greatly increased, and the current of blood chiefly determined towards the fore feet, attended with symptoms of the most violent pain, we may thence conclude, that there is an inflammation in these parts; therefore, the cure must first be attempted by diminishing the circulation of the blood, by topical bleedings in some of the veins of the leg; by giving cooling saline purges; clysters, an opening diet, and plenty of diluting liquor four or five times a-day, together with emollient poultices applied warm all round the hoofs, to soften them, and keep up a free and equal perspiration; observing, that his shoes be easy upon his feet, but by no means to pare the sole or frog to that excess which is commonly done in cases of this kind, farther than cleaning away the hardened surface of the sole and frog, in order that the poultice may have the desired effect, by increasing the perspiration through the pores; and to avoid all manner of greasy or oily applications to the hoofs, for the reasons already given.

OF HOOF-BOUNDNESS.

This complaint affects the hoofs differently, according to their natural shape, and the treatment they are exposed to, whether it be injudicious shoeing, keeping the hoofs too hot and dry, or paring the sole and binders at every time they are shod. Some are affected with a circular contraction of the crust, compressing the whole foot. In others the crust is contracted at the coronet only, compressing the annular ligament, &c. A third species is, when either one or both heels are contracted; hence, therefore, in proportion to the degree of contraction, the internal parts of the foot are compressed, and the horse becomes more or less lame. As to any method of cure, all that can be said is, that, as this disease is one of that kind which comes on gradually, yet perceptibly, it may by proper care and management, when early attended to, be prevented. But when it once becomes confirmed, it never will admit of a thorough cure. It may be so far palliated, however as to render a horse in some degree sounder, by keeping the hoofs cool and moist; as, in this case, they are apt to be very hot, dry, and hard, his shoes should be flat, narrow, and open heeled; the hoofs never greased nor oiled; the soles never pared. When it is considered how much the elastic power of the heels depends on the bars, which act as a spring between them and the frog, it must appear unreasonable that they should be shaved away, as is too often done by farriers, under the idea of preventing corns; though by such a process corns are created. A good open heel is the indication of a powerful foot. But as the crusts of the heels in these hoofs are preternaturally high and strong, they should always be pared down till they are lower than the frog, that if possible it may rest upon the ground.

OF CORNS.

In the human body, corns in the feet, are properly so termed, from their horny substance; but what are called corns in the feet of horses are very improperly named, as they are quite of an opposite nature, rather resembling contusions, not unlike those bruises which happen in the palms of the hands and fingers to working people, where the skin is thick, and appears of a blackish red colour; being exceedingly painful at first, and containing blood, but in the end the serum being absorbed, the red particles appear when the dead skin is removed, like red powder. In like manner corns, or rather bruises, appear red and foxy, as the phrase is. They are situated in the sharp angle of the sole at the extremity of the heels, where the crust reflects inward and forward, forming the binders. But they are more frequently met with in the inside heel, from the manner of the horse's standing, together with the pressure or weight of the body, which is greater upon the inside of the hoof than the outside. Bruises of this kind are exceedingly painful, inasmuch that the horse shrinks and stumbles when any thing touches or presses upon that quarter of the hoof; hence lameness. This complaint arises from different causes, according to the natural formation of the hoofs, together with the treatment they are exposed to. For the cure cut away as far as the extravasation, and apply a pledget of lint, dipped in tincture of myrrh, or in balsam of Peru. When the corn has been cut, the horse should be turned out to grass, without shoes if practicable; or, if his labour cannot be dispensed with, let a chambered shoe

shoe be put on; so as to avoid pressing the part. Corns or bruises in the feet of horses might, by taking proper care of them, be easily avoided; for in those countries where the horses go mostly barefooted, this malady is not known; neither are horses that go constantly at cart and plough subject to it. Hence it is oftenest to be met with in great towns, where horses go much upon hard causeway, having their shoes turned up with high caulkers on the heels, and frequently renewed; their hoofs at the same time being kept too dry and hard, from standing too much upon hot dry litter. Hence there is an evident necessity of coolness and moisture, together with using such a form of shoe as will press equally upon the circumference of the crust, without giving it any unnatural shape.

OF THE RUNNING THRUSH AND CANKER.

I. A **RUNNING THRUSH**, or **FRUSE**, is a discharge of ichorous matter, from the cleft in the middle of the frog, affecting one, often two, and in some cases all the four feet. But, generally, the fore-feet are most subject to this disease. In most cases, it seldom admits of a radical cure; but is subject to frequent relapses, occasioning lameness, from the rawness and tenderness of the parts affected on being exposed to sand, gravel, &c. or in rough ground, from the heels treading on sharp stones, &c. and when the horse happens to be in a bad habit of body, they degenerate into what is commonly called a canker. As to the cure, in most cases where the disease has been of long standing, affecting all the frogs more or less, it is impracticable to eradicate it by any assistance from art. But in those hoofs which are wide and open at the heels, where the complaint is recent, one or both of the fore feet only being affected, and where there is reason to suspect that it proceeds from the use of hollow shoes, or keeping the hoofs too hot, dry, and hard, the cure may be completed with ease and safety, by laying aside the use of concave shoes, washing the frogs clean after exercise, and dressing them with *mel Ægyptiacum*, or a solution of blue vitriol, in the proportion of one ounce to a quart of water, keeping the hoofs cool and moist. At the same time, recourse must be had to internal remedies by way of revulsion, or diuretic medicines, bleeding being first premised: if the former is made choice of, twice or thrice will be sufficient, repeated at proper intervals; but if the latter, which seems preferable, they may be continued for some time with great safety, without losing one day's work of the horse.

II. In horses of a bad habit of body, especially the heavy draught kind, running thrushes sometimes degenerate into what is called a canker. In this case the horny substance of the frog is soon thrown off; the fleshy parts grow to an immoderate size, the luxuriant substance or spongy flesh having a great number of papillæ or tubercles, which Mr. Gibson compares, not improperly, to cauliflower, the colour only excepted, which is of a pale red, sometimes variegated with blood; attended with a copious discharge of a thin ichorous fetid humour, having a most offensive smell. If its progress be not speedily stopped, the fleshy sole, from its vicinity becomes likewise affected; the horny sole rots, decays, and falls off; the whole foot turns into a kind of bog, in warm weather full of maggots, which it is almost impossible to prevent, even with the most corrosive dressings; the tendons become likewise affected, the bones carious, the hoof falls off, and the horse is rendered useless. To prevent these consequences, as soon as a running thrush begins to shew the least malignant disposition, proper means must be used to correct the habit of body, and to divert this discharge to some other outlet, either by purging or diuretic remedies, continued for some time, bleeding being first used. As to external applications, the first thing necessary to be done, is to pare down the crust till it is lower than the fungus, or growth of the canker, and to remove any hard pieces of the hoof or sole wherever it presses upon the tender parts; the circular part of the crust should be kept soft with an emollient poultice. For dressings the mildest escharotic powders may be first tried; as a mixture of blue vitriol and burnt alum, one part of the former to two of the latter. But when it degenerates into a canker, the strongest corrosive applications will be necessary, and sometimes hardly sufficient to keep down the luxuriance of the fungus. The concentrated mineral acids are preferable, or butter of antimony: either of these may be applied once every day; otherwise, if neglected dressing too long, or to every other day, which is the common practice, the great humidity and moisture issuing from

the fungus so weakens the force of the strongest oils, that they have little or no effect. When these sharp dressings seem to gain upon the canker, it may be dressed with equal parts of red precipitate and burnt alum pounded and mixed together, till the new sole begins to grow; the purging or diuretic medicines being given at proper intervals till the cure is completed.

OF FALSE QUARTERS AND SANDCRACKS.

I. A false quarter in the foot of a horse is a cleft or chink in the side or quarter of the hoof, running in a slanting direction with the horny fibres of the hoof, from the coronet to its basis, by which the horny substance of the crust is divided; one part of the hoof being in a manner detached from the other, and rendered unable to sustain its share of the weight of the limb, &c. and hence the name of false quarter: for, when the horse sets his foot on the ground, the chink widens: but, when it is lifted up, the hardened edges of the divided hoof take in between them the soft parts, and squeeze them so as to occasion frequent bleeding at the chink. This is often attended with inflammation, a discharge of matter, and of course lameness. Horses with this defect should be carefully observed; and when the thick hardened edges of the chink grow too high, by which it is so much the deeper, and, of course, lodges the greater quantity of sand, &c. these edges should be rasped, or pared with a crooked knife, till the seam disappears. But wherever there remains a blackness, or appearance of gravel, that must be traced farther; always observing, if possible, to avoid drawing blood.

II. A **SAND-CRACK** a perpendicular fissure extending more or less from above downwards, or from below upwards, but in all instances penetrating to the sensible parts, and thus causing lameness when the animal puts himself in motion. Where this happens there is a preternatural brittleness and dryness of the hoof, which should be counteracted, either by turning the horse out upon wet ground, or by applying moist poultices to his feet when in the stable. To cure this disease, the sides of the crack must be pared through its whole length, and the transverse incision also made; after which the reproduction of the hoof from the coronet must be watched, and when favourable, it must be secured from splitting in consequence of motion communicated from the old crack, by another transverse cut or incision in the crust.

A COLLECTION OF MEDICINES.

The following prescriptions are accommodated to the diseases of the horse, and the cases in which they may be applied are easily known by the references to the numbers prefixed.

BALLS.

Balls and pastes are the most convenient form for the exhibition of such medicines as require the dose to be ascertained with exactness; as opiates, cathartics, mercurials, &c. And likewise for disguising the taste of those that are nauseous, as the fetid gums, &c. As balls dissolve more slowly in the stomach, they are capable of producing more gradual and lasting effects, than any of the other forms; which, in most cases, is a considerable advantage, where the medicine is not required to exert its influence immediately; otherwise a drink is preferable. Balls should be of an oval shape, and not exceeding the size of a pullet's egg. When the dose is larger, it should be divided into two; and they should be dipped in oil to make them slip down the more easily. The following is the most accurate formulæ for making them up, according to the most improved modern practice, in the different diseases for which they are prescribed.

NO. 1. PURGING BALLS.

I. Take socotorine aloes six ounces, Castile soap and vitriolated tartar, three ounces each; jalap and ginger, two ounces each; oil of aniseeds, one ounce; syrup of buckthorn, enough to make a mass. The socotorine aloes should always be preferable to the Barbadoes or plantation aloes, though the latter may be given to robust strong horses; but even then should always be well divided by some neutral purging salt, as vitriolated tartar, or the cream of tartar; but with this ingredient soap should not be admitted into the compound, as all acids decompose it. Any of these additions, by destroying the tenacity of the aloes, prevents its adhesion to the coats of the stomach and bowels, from whence horrid gripings, and even death itself, have often ensued. This caution is well worthy of being attended to, as many horses have fallen sacrifices to the neglect of it. See **ALOES**. The above mass may be divided

vided into from four to eight doses, according to the age, strength, and constitution, of the horse; or the ingredients may be separately proportioned to the like circumstances, for a single dose.

II. Take Socotorine aloes, six ounces; gum guaiacum powdered, half an ounce; diaphoretic antimony and powder of myrrh, each two drachms; syrup of buckthorn, sufficient to make a ball. These balls will seldom take a horse from business above two or three days in a week: nor will he lose his appetite or flesh by using them, but will rather be improved in both. These advantages cannot be obtained by any other method of purging, and hence this is preferable in most cases.

No. 2. MERCURIAL PURGING BALL.

This ball is made by adding one-half or three drachms of calomel, to a dose of the above purging ball, No. 1; observing that this addition will allow a proportional diminution of the other ingredients, and being careful to adjust them to the strength of the subject, and the degree of evacuation required.

No. 3. FEBRIFUGE BALLS.

I. Take contrayerva root and snake root, half an ounce each; myrrh, two drachms; camphor, one drachm; opiate confection, three drachms; honey sufficient to make a ball. In slow fevers, attended with irregular symptoms, and especially in those of the putrid kind, this ball should be given twice or thrice a-day, washing it down with about one pint of red port, and as much vinegar mixed together. One drachm of camphor, and as much castor, may be added to this ball as occasion requires.

II. Take Peruvian bark, one ounce; snake-root and winter's bark, half an ounce each; honey, sufficient to make a ball. To be given in the decline of fevers, and in those of the intermittent kind, every six hours, till the horse's recovery is pretty well established, as the danger of a relapse will thus be prevented, and the cure sooner completed.

No. 4. ASTRINGENT BALLS.

I. Take prepared chalk, one ounce; tormentil and gum arabic, three drachms each; cassia two drachms; conserve of roses, as much as will make a ball; to which may be added, as occasion requires, twelve or twenty grains of opium. When a purge does not set in the usual time, and the horse is much depressed by the continuance of its operation, this ball may be given with the opium, and repeated every six or eight hours till the purging be stopped.

II. Take catechu, kino, and cassia, each two drachms; chalk prepared, two ounces; mucilage of gum Arabic, enough to form a ball.

No. 5. DIURETIC BALLS.

I. Take nitre, one ounce and a half; Castile soap, one ounce; filings of iron in fine powder, half an ounce; squills in powder, two drachms; honey or treacle as much as will make a ball.

Mild Diuretic Balls.

II. Take jalap, six drachms; vitriolated tartar and nitre, one ounce each; soap, two ounces; oils of aniseed and juniper, each one drachm: mix.

III. Take of Castile soap and nitre, one ounce and a half each; camphor, two drachms; oil of juniper, one drachm and a half; aniseed powder, two ounces; treacle, enough to make a mass: divide into two balls, one to be given six hours after the other.

No. 6. CARMINATIVE BALLS.

I. Take bay berries, cummin seeds, and caraway seeds, each four ounces; ginger and long pepper, each two ounces; essential oils of peppermint and pennyroyal, each one drachm; treacle, enough to make a mass. Of this mass three or four ounces may be given with advantage in the windy colic, after emptying the bowels with a clyster, or the laxative drink, No. 12. If relief be not obtained upon repeating this twice or thrice within a few hours, then give the following:—

II. Take of the above mass, three ounces; asafoetida, half an ounce; oil of amber and tincture of opium, each one ounce and a half; and make a ball with treacle or common syrup.

No. 7. STOMACHIC LAXATIVE BALL.

Take socotorine aloes, six drachms; rhubarb powdered, three drachms; myrrh, two drachms: make into a ball with syrup of ginger.

No. 8. DEOBSTRUENT BALL.

Take Castile soap, eight ounces; Indian rhubarb, two ounces;

long pepper, one ounce; syrup or honey, sufficient to make a mass: divide into ten balls.

No. 9. ALTERNATIVE BALLS.

I. Take quicksilver, one drachm; rub it, till it be perfectly extinguished, with two drachms of manna, softened with a little mucilage of gum Arabic: then add levigated antimony and rust of iron prepared, one ounce each, with as much honey as will make a ball. In obstinate chronic jaundice, this ball given once a-day till the mouth becomes affected, and the horse begins to slaver, will be of considerable service, and may be had recourse to when there is reason to suspect a schirrous liver.

II. Take precipitate sulphur of antimony and calomel, each one ounce; gum guaiacum in powder, four ounces; aniseed powder, six ounces; honey and mucilage of gum Arabic, equal parts of each, sufficient to make a mass: to be divided into twelve balls.

No. 10. DETERGENT DEOBSTRUENT BALLS.

Take precipitated sulphur of antimony, two ounces; garlic, four ounces; orris root and elecampane, three ounces each; gum ammoniac, myrrh, and asafoetida, two ounces each; honey and balsam of sulphur, each as much as will make a mass: to be divided into eighteen balls. One to be given every morning for asthmatic cough and broken wind. In many cases they will afford considerable relief.

No. 11. CAMPHORATED PURGING BALL.

Take calomel, opium, and camphor, each one drachm; jalap half an ounce; scammony, one ounce and a half; soap, one ounce; syrup, as much as to form a ball.

DRINKS.

As horses more willingly take sweet and palatable things than those that are bitter and of an ill taste, care should be taken that the latter be given in balls, and that their drinks be always contrived to be as little nauseous as possible, and sweetened either with honey or liquorice. Those that are prepared with grass powders are by no means so agreeable to a horse as those made by infusion; as the former often clam the mouth, irritate the membranes about the palate and throat, and frequently occasion the cough they are intended to prevent.

No. 12. LAXATIVE DRINK.

Take senna, two ounces; coriander seeds bruised, one ounce and a half; ginger, two drachms: infuse in one pint and a half of boiled water till cold: strain the infusion and dissolve in it three ounces of cream of tartar, and one ounce of salt of tartar; and then add four ounces of syrup of buckthorn. The cream of tartar, in the proportion set down in this drink, forms a neutral salt, called soluble tartar, which it is not necessary to have ready made, when it is intended to be given in a dissolved state. Instead of this, four ounces of Glauber's or Epsom salt may be used at the discretion of the prescriber. In all inflammatory disorders this drink may be given with the utmost safety, and is greatly preferable in such cases, to all other purges, as it passes into the blood, and operates also by urine. It may be repeated as circumstances require, and its effects assisted by opening clysters, or its operation quickened by the addition of another ounce of senna, or two drachms of jalap.

No. 13. DIURETIC CORDIAL DRINK.

I. Take juniper berries bruised, four ounces; caraway seeds and aniseed, one ounce each; lintseed, two ounces; boiling water in sufficient quantity to strain off two pints; to which add spirit of nitre and camphorated spirit of wine, one ounce each. This drink, given in two portions in the course of an hour, will be of considerable service in procuring an evacuation by urine, when the horse seems to be griped in consequence of a purge that does not operate freely, but makes him swell and refuse his meat and water. It is also very proper in the flatulent colic.

Mild Diuretic Drink.

II. Take salt of tartar, half an ounce; distilled vinegar, as much as may be necessary to make a neutral mixture; spirit of nitre, two ounces; strong infusion of juniper berries and lintseed, one pint. Mix.

No. 14. COOLING FEBRIFUGE DRINK.

Take of baum and sage, each a handful; liquorice root sliced, half an ounce; salt prunel or nitre, three ounces. Infuse in two quarts of boiling water; when cold, strain off, and squeeze into it the

the juice of two or three lemons, or add half a pint of vinegar. As the ingredient chiefly to be depended on in this drink is the nitre, it may perhaps be as well given in water alone; but as a horse's stomach is easily palled, and he requires palatable medicines, the other ingredients may be useful in this respect.

No. 15. ASTRINGENT DRINK.

Take logwood, half a pound; pomegranate peel, four ounces; cassia, half an ounce; lintseed, two ounces. Boil in three quarts of water to two, and strain off. Where it can be afforded, half a pint of port wine may be added to each dose.

No. 16. STRENGTHENING DRINK.

Take gentian, calamus, and orange-peel, two ounces each; chalybeate or smithy water made boiling hot, two quarts: infuse till cold; then strain, and add equal quantities of lime-water fresh made, one pint, or one and a half, to be given once or twice a-day for some weeks.

No. 17. DEOBSTRUENT DECOCTION.

Take parsley root, madder, and turmeric, four ounces each; burdock root, half a pound; liquorice root, two ounces; boil in a gallon of smithy or forge water to three quarts.

POWDERS.

Powders are a form of medicine not well adapted for internal use, in any other way than in a mash or corn; and for the reason assigned in the preceding section, every thing of a disagreeable flavour, whether in smell or taste, should be rejected, when the medicine is to be given in this form.

No. 18. VERMIFUGE POWDERS.

Take Æthiops mineral, and powdered tin, four ounces each; prepared steel and India pink in powder, each two ounces. Mix, and divide into twelve doses.

No. 19. STERNUTATORY POWDERS.

I. Take white hellebore, three ounces, lavender, betony, and marjoram, each one ounce. Mix.

II. Take turbith mineral, one drachm; powdered betony, or marjoram, two ounces. Mix. These powders are given with success in cases of apoplexy or staggers.

No. 20. ALTERNATIVE POWDER.

I. Take gum guaiacum, four ounces; levigated antimony, eight ounces; sulphur, six ounces. Mix, and divide into sixteen doses; one to be given at night and morning.

CLYSTERS.

CLYSTERS are differently denominated, according to the qualities of the ingredients composing them. There are many cases in which they may be administered with great success.

No. 21. LAXATIVE CLYSTER.

Take two or three quarts of thin water-gruel; Glauber's salts, or common salt, eight ounces; salad oil, six ounces.

No. 22. PURGING CLYSTER.

Take two quarts of gruel; coarse sugar, six ounces; Glauber's salts, four ounces; tincture of jalap, two ounces; and half a pint of olive oil. To be repeated every twenty-four hours, or oftener, if necessary.

No. 23. TURPENTINE CLYSTERS.

I. Take Venice turpentine, two ounces: dissolve it in the yolks of eggs, and add opiate confection, two ounces; Epsom salt, four ounces; thin gruel, two pints. Mix.

Diuretic Clysters.

II. Take two or three pints of thin gruel; dissolve it in one and a half ounce nitre; then add three ounces of Venice turpentine previously incorporated with the yolks of two eggs; and likewise half a pint of lintseed oil. When a clyster is designed to promote urine, this is very well calculated for the purpose, and should be thrown up moderately warm.

No. 24. STARCH CLYSTER.

Take thin starch, or tripe liquor, two quarts; oil of olives, half a pint; the yolks of six eggs well broken, and two or three ounces of coarse sugar. Mix the oil by degrees with the yolks of the eggs, and then gradually add the starch or tripe liquor, in which the sugar has been previously dissolved.

No. 25. ASTRINGENT CLYSTERS.

Take oak bark, four ounces; tormentil root, two ounces; burnt

harts-horn, three ounces. Boil in three quarts of smithy water to two; strain off, and add four ounces of starch, previously softened with a little warm water, towards the end of the boiling; and in the strained liquor while warm dissolve half a drachm of opium.

No. 26. VERMIFUGE CLYSTER.

In a pint of very strong decoction of two parts of common wormwood and one of rue, dissolve half an ounce of aloes, and add one pint of lime-water, and half a pint of lintseed oil. Let the whole be well incorporated and administered for a dose, in case of worms.

LINIMENTS, EMBROCATIONS, and LOTIONS.

A LINIMENT differs from an embrocation or lotion, by having some unctuous ingredients in its composition; though this distinction is not uniformly regarded. It differs from an ointment by being of a much thinner consistence.

No. 27. LOTION FOR THE MANGE.

Take corrosive sublimate, one ounce; common salt, three ounces; boiling water, one gallon, tobacco liquor, half a gallon. Mix.

No. 28. STYPTIC BALSAM, or LINIMENT FOR THE FARCY.

I. Take oil of turpentine, three ounces. Put it into a pint bottle, and drop into it two ounces of oil of vitriol; adding the latter gradually, to prevent a great and sudden effervescence, which might burst the bottle. To avoid this, let the first small quantity that is dropt in, (which must not exceed a tea spoonful at once,) have done smoking, before dropping in any more. When the farcy affects the larger blood-vessels, after bleeding, the parts must be first rubbed with a woollen cloth, and this liniment must then be applied over the buds and swellings twice a-day. It abates the acrimony of the humours, prevents the rising of fungous flesh, and makes the sores run. But when the disease lies loose in the fleshy parts, there must be equal quantities of the oils of vitriol and turpentine. This method may be continued a fortnight, or till the sores run plentifully and begin to dry; and till the lips and edges are no way thick and callous. Then mix equal parts of ointment of elder and honey, to promote the growth of the hair; or dress them with Turner's cerate, or any other soft ointment. This treatment must be accompanied with the internal use of alteratives. The alternative powder, No. 20, is the best for this purpose.

II. Take salad oil, three ounces, spermaceti, six drachms: bees-wax, four drachms: Melt them over a gentle fire, and stir them till quite cold.

No. 29. COOLING COLLYRIUM.

Take sugar of lead, one drachm; white vitriol, two scruples; camphorated spirit, one ounce; water, eight ounces. Mix.

No. 30. VOLATILE LINIMENT.

Take neat's foot oil, two ounces; strong spirit of sal ammoniac, and one ounce and a half tincture of cantharides, half an ounce. Mix. This is an useful application in various topical inflammations, especially where there is a tendency to suppuration.

No. 31. SATURNINE LOTION.

I. Take extract of lead, two ounces; camphorated spirit, eight ounces; distilled vinegar, one pint. Mix.

II. Take extract of lead, one ounce; distilled vinegar, seven ounces; water, eight ounces. Mix. In recent bruises, strains, and swellings occasioned by external accidents, the part affected may be bathed frequently with this lotion; and where it will admit of bandage, let a double or triple fold of flannel be wetted with it, and rolled on.

No. 32. SOAP LINIMENT, or OPODELDOC.

Take Castile or white soap, four ounces; camphor, two ounces. Dissolve the soap in a pint of proof spirit, and the camphor in as much rectified spirit: Then mix the two solutions, and add half an ounce of essential oil of rosemary. Opodeldoc is often successfully used against strains, bruises, &c. but its efficacy is increased by the addition of the ingredients which form the anodyne balsam. See No. 33.

No. 33. ANODYNE BALSAM.

Take crude opium, one ounce; vinous spirit of sal ammoniac, (or spirit of wine and spirit of sal ammoniac equal parts of each mixed,) half a pound; soap liniment, one pound and a half. Digest the opium in the vinous spirit of sal ammoniac till it be dissolved: then add the solution to the soap liniment, and strain the whole

whole for use. This is a very penetrating embrocation, and is highly useful in allaying pain and swelling, by relaxing the irritated fibres, and promoting the perspiration of the obstructed matter; speedily restoring the affected part to its former state. It should be plentifully applied and diligently rubbed in, that its efficacy may be properly excited to produce the desired effect.

No. 34. DISCUTIENT EMBROCATION.

I. Take opodeldoc, four ounces; spirit of sal ammoniac, one ounce. Mix.

No. 35. VEGETO-MINERAL WATER.

I. Take extract of lead, one ounce; camphorated spirit, two ounces; spring water, one quart. Mix.

Goulard's vegetable-mineral water.

II. Take extract of lead and camphorated spirit, one ounce each; distilled vinegar, two ounces; spring water, one pint and a half. Mix.

No. 36. DETERGENT LOTIONS.

I. Take rectified spirit of wine and white wine vinegar, each half a pint; white vitriol, half an ounce. Dissolve the vitriol in the vinegar; and add tincture of myrrh, four ounces. Mix these together, and shake the bottle before using.

II. Take white vitriol and sugar of lead, three ounces each; tincture of myrrh, one ounce; spring water, half a pint. Mix.

No. 37. REPELLENT EMBROCATIONS.

I. Take extract of lead, and camphorated spirit, two ounces each; vinegar, one pint. Mix.

II. Take Mindererus's spirit and camphorated spirit, each four ounces. Mix.

No. 38. REPELLENT LOTIONS.

I. Take white vitriol and alum, one ounce each; vitriolic acid, half an ounce; vinegar, one pint. Mix.

II. Take crude sal ammoniac, three drachms; distilled vinegar, four ounces; French brandy, two ounces. Mix.

No. 39. EXTRACT OF LEAD.

Boil one pound of litharge in two quarts of vinegar, to one quart. Set it aside till it settle; and then decant what is clear for use.

No. 40. SATURNINE LINIMENTS.

I. Take camphor rubbed to powder with a little spirit of wine, half an ounce. Dissolve it in half a pint of green oil, and add half an ounce of extract of lead.

II. Take extract of lead one ounce; olive oil three ounces. Add the oil gradually to the extract, and rub them well together in a marble mortar, till the whole be mixed. Two drachms of camphor rubbed to powder, with spirit of wine, may be added to this. This is the most proper liniment that can be used for the grease, cracked heels, and similar complaints. After having washed the parts perfectly clean with a strong lather of soap, and dried them well, if they are very foul, they should, before using the liniment, be gently bathed with tincture of myrrh, and when that is dried in, the liniment is to be rubbed over the whole.

TINCTURES.

No. 41. TINCTURE OF MYRRH.

Take myrrh, one ounce and a half; hepatic aloes, one ounce; proof spirit, two pounds; rectified spirit, half a pound. Digest the myrrh in both spirits for three days with a gentle heat; afterwards add the aloes, and digest again for three days longer, frequently shaking the bottle. Then strain off the tincture. This tincture is well known for its use in healing slight wounds and detaching ulcers when foul. Gentlemen who travel should never ride abroad without it, as it is a speedy and efficacious remedy, (either alone, or mixed with an equal quantity of oil of turpentine,) for warbles and lamenesses in the feet, occasioned by nails, thorns, gravel, or any other extraneous substances. The part affected should be frequently wetted with it, after the offending body has been extracted. Though much cheaper, it will amply supply the place of a more costly composition, called Turlington's balsam, to which it is not in the least inferior, for external application.

No. 42. TINCTURE OF OPIUM, OR LAUDANUM.

Take crude opium, two ounces; and proof spirit, one pound. Digest four days, and strain off the tincture. The virtues of opium are as extensive as those of any other article whatever in the materia medica. As answering the purposes of mitigating pain, allaying inordinate action, and diminishing sensibility, no medicine can be employed with greater advantage in a variety of different

diseases than opium; and though, in some inflammatory cases, the premature use of it may not be altogether proper, yet as it affords a temporary relief in the violence of an acute complaint; and has a very quick effect upon the whole system, in all cases of extreme pain it ought on such occasions to be had immediate recourse to.

No. 43. NERVOUS TINCTURE.

Take valerian, mustard seed, and horse-radish, two ounces each; long pepper, two drachms. Infuse in three pints of port wine, and strain off the tincture; then add four ounces of compound spirit of lavender. This tincture is given internally with success, in paralytic and nervous disorders; and may also be administered with much advantage in cases of scouring, to the extent of three or four pints a day.

OINTMENTS.

Ointments are used with various intentions in farriery; some for mollifying and moistening; others for drying the parts they are applied to; some for digesting tumours and callosities; others for stimulating and blistering particular parts. Hence they are distinguished by various names, according to their nature and operation, as well as from the articles of which they are composed.

No. 44. DESICCATIVE OINTMENTS.

I. Take oil of turpentine, two ounces; ointment of elder, four ounces; sugar of lead, half an ounce; white vitriol, two drachms. Mix them in a gallipot, after reducing the sugar of lead and the vitriol to a fine powder. The buds and swellings in the farcy must be anointed with this; and as often as they become dry, the ointment should be repeated, till the sores begin to run. If the matter be thick and well digested, the disease will soon terminate.

II. Take simple diachylon plaster and olive oil, three ounces each. Melt them together, and add sugar of lead and camphor in fine powder, each three drachms, and stir the ointment frequently, till it is cold. This is a very proper ointment for the grease, and cracked heels. The parts should be well washed with a strong soap lather, before applying the ointment. If they are very foul, they must also be previously bathed with a mixture of vinegar and tincture of myrrh, equal parts each.

No. 45. DIGESTIVE OINTMENTS.

I. Take yellow rosin, two pounds; common turpentine, one pound; lard, one pound and a half; bees wax, half a pound. Mix.

II. Take yellow rosin, three pounds; linseed oil, one pint; wax, 12 ounces. Mix.

Red Digestive Ointment.

III. Take digestive ointment, (No. 1.) four ounces; red precipitate, half an ounce. Mix them cold with a knife, or spatula. This last, applied early, will prevent a fungus, or proud flesh, from shooting out: for if dressed too long with the above digestive, the fungus will rise fast, and give some trouble to suppress it; when it will be necessary to wash the sore, as often as it is dressed, with a solution of blue vitriol in water, or to sprinkle it with burnt alum and precipitate.

No. 46. OINTMENT FOR THE MANGE.

Take sulphur vivum, eight ounces; white hellebore powder, four ounces; sal ammoniac, one ounce; hog's lard and oil, each eight ounces. Mix. This ointment generally succeeds in curing the mange; but where the disease is inveterate, it must be accompanied with proper alteratives; and the yellow mercurial ointment, No. 48, applied to the sorest parts.

No. 47. BLISTERING OINTMENTS.

I. Take Venice turpentine, two ounces; hog's lard, one ounce; cantharides and euphorbium finely powdered, each half an ounce. Mix.

II. Take of the above, and strong mercurial ointment, (No. 49,) each two ounces; corrosive sublimate, one drachm. Mix.

III. Take ointment of elder, or any other soft ointment, four ounces; cantharides and euphorbium in powder, half an ounce each; oil of origanum, two ounces. Mix.

IV. To make it very strong, add to this last, one ounce or one ounce and a half of strong mercurial ointment, or two drachms of sublimate in powder. The hair is to be cut as close as possible, and then the ointment applied pretty thick over the part. This should be done in the morning, and the horse kept tied up all day without any litter till night; when he may be untied, in order to lie down; and a pitch or any sticking plaster may be laid over it, and bound on with a broad tape or bandage to keep all close. After the blister has done running, and the scabs begin to dry and peel

peel off, it may be applied a second time, and in the same manner a third, fourth, or as many more times as the case may require.

No. 48. OINTMENT OF NITRATED QUICKSILVER, or YELLOW MERCURIAL OINTMENT.

Dissolve one ounce of quicksilver in an equal quantity of nitrous acid; add to it one ounce of lard, and as much olive oil previously melted, stirring them frequently together, till cold.

No. 49. STRONG MERCURIAL OINTMENT.

Take quicksilver, four ounces; hog's lard, three ounces; tallow, one ounce. Melt a little of the lard, keeping it on the fire till it be somewhat burnt; with this rub the quicksilver till it be extinguished. Then add to it the rest of the lard and the tallow, melted together.

No. 50. MEL ÆGYPTIACUM, EGYPTIAN HONEY OR OINTMENT.

Take verdigrise in fine powder, two ounces; honey, six ounces; vinegar, four ounces. Boil them over a gentle fire till they acquire a reddish colour.

POULTICES and CATAPLASMS.

"Poultices, says Mr. Bartlett, are of such real and extensive use in farriery, that we thought the composition of them could not be too general. How simple soever the ingredients may appear to some (which are generally at hand,) yet they will be found to answer most intentions, where present ease is to be obtained by warmth, softening, and relaxing, the injured part. Many are the cases which demand such assistance, as recent swellings, inflammations, treads, bruises, cracked and swelled heels and feet, burns, scalds, bruised and lacerated wounds from stumps, thorns, glass, nails, &c. which last are much better treated with such simple emollient applications, than by hot oils or scalding plasters dropt into the wounds; which, under the absurd notion of drawing, but too often sear up the mouths of the vessels, hinder digestion, and consequently increase both pain and inflammation. In short, it is certain that very great services are daily done by the use of poultices, not only in those disorders to which the human body is incident, but also in those wherewith the brute part of the creation is afflicted. One advantage which they have over most outward applications is peculiar to them, that they convey and retain an additional heat, besides what is often in the ingredients; and as most of them have also something emollient in their composition, they must necessarily soften and relax the skin and vessels, abate tension, attenuate and thin viscid and obstructed juices, so that their return into the common course of circulation, or discharge by the pores of the skin, must in general be much better answered by poultices than by other methods."

FARRINGDON, a town of England, in Berks, N. W. of Oxford.

FARSA, a town of European Turkey in Thessaly, anciently called Pharsalia. It is 14 miles S of Larissa.

FARISTAN or **FARS**, a province of Persia, bounded on the N. by a desert, which separates it from Chorasán; on the E. by the Gulf of Persia; and W. by Chusistan. It is 420 miles long from N. to S. and 360 broad from E. to W. The S. part of it is hot, sandy, and barren; the N. mountainous, and abounding in wild boars, falcons, &c. The centre is fertile. Its chief productions are rice, fruits, wood, mastic, and emeralds.

FARTACH, **FARTAK**, or **FARTAQUE**, a sea-port of Arabia Felix, in the province of Hadramaut. It is 480 miles E. of Mocha. Lon. 68. 10. E. Lat 14. 40. N.

FARTHING, [*feorthling*, Sax. from *feower*, four, that is, the fourth part of a penny,] the fourth of a penny; the smallest English coin.

FARTHING OF GOLD, a coin used in ancient times, containing in value the farthing or fourth part of a noble, or 20d. silver. It is mentioned in stat. 9 Hen. V. cap. 7, where it is enacted, that there shall be good and just weight of the noble, half-noble, and farthing of gold.

FARTHING OF LAND, seems to differ from farding-deal. For in a survey book of the manor of West Hapton in Devonshire, there is an entry thus: "A. B. holds six farthings of land at 126l. per ann." So that the farthing of land must have been a considerable quantity, far more than a rood.

No. 51. MUSTARD POULTICE.

Take flour of mustard, four ounces; cantharides, half an ounce; linseed powder, half a pound; vinegar, enough to make a poultice. This is a powerful stimulant in rheumatic swellings, where blistering can be dispensed with.

No. 52. EMOLLIENT POULTICE.

Take coarse bread, barley meal, and camomile or elder flowers, each a handful; boil over the fire in a sufficient quantity of milk, or in the decoction for the fomentation; into which stir about a third (of the whole quantity) of white lily root, washed clean and pounded to a paste; adding linseed and fenugreek in powder, of each an ounce; stirring in, while hot, of turpentine, two ounces, and of lard, four ounces; laying it on moderately warm, and bandaging firmly. To serve for two poultices.

No. 53. TURNIP POULTICE.

Take boiled turnips and brown bread, or linseed meal, one pound each; mash them well over a fire, adding by degrees a proper quantity of stale strong beer to bring them to due consistence; then stir in one ounce of the best flour of mustard; two ounces of oil of turpentine, and four ounces of hog's lard. This poultice is useful for the grease.

No. 54. STIMULANT CATAPLASM.

Take mustard seed pounded small, or mustard ready made, a pint; garlic, six heads; camphor, two ounces; soap, enough to make a poultice.

No. 55. DISCUTIENT CATAPLASM.

Take crumb of white bread, eight ounces; white hard soap, one ounce; milk, a sufficient quantity to make a poultice. Boil the whole together for a little time.

FOMENTATIONS and PLASTERS.

No. 56. RESTRINGENT FOMENTATION.

Take oak bark, one ounce; pomegranate rind, half an ounce; smithy water, three pints. Boil them to two pints, and add two drachms of rock alum. Dip flannel in this decoction, and bind it about the parts, while the horse stands in the stable.

No. 57. STRENGTHENING PLASTER.

Take black rosin, and Burgundy pitch, four ounces each; diachylon plaster, two pounds; colcothar of vitriol, one pound. Mix.

No. 58. DISCUTIENT FOMENTATION.

Take burnt alum and white vitriol, two ounces each; mel Ægyptiacum, one ounce; lime water, three pints. Mix and foment with it three times a day. Those who wish to pursue the study of farriery further would do well to consult the works of Messrs. Clark, Talpin, Lawrence and Blane, on this subject.

FARTREY, a river of Ireland, which runs into the Irish sea. It is nine miles N. of Wicklow.

FASCENINA, or **FASCINATA**, [low Lat.] pales, fascines, &c. used to inclose ancient castles.

FASCES, in Roman antiquity, axes bound up together with rods or staves, and carried before the Roman magistrates as a badge of their authority and office. The use of the fasces was introduced by the elder Tarquin, as a mark of sovereign authority: in after times they were before the consuls, but by turns only, each his day. They had twelve of them carried by so many lictors. After the consuls, the prætors assumed them, and Censorinus observes they had only two, though Plutarch and Polybius give them six. In the government of the decemviri, it was the practice at first for only two of them to have the fasces. Afterwards, each of them had twelve, in the same manner as the kings.

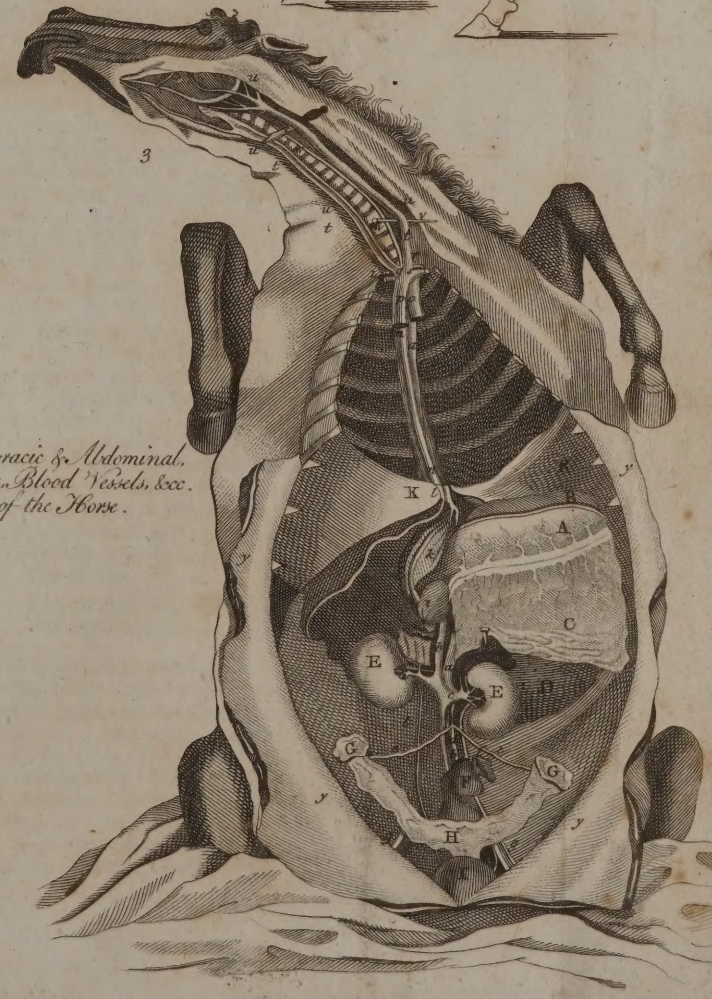
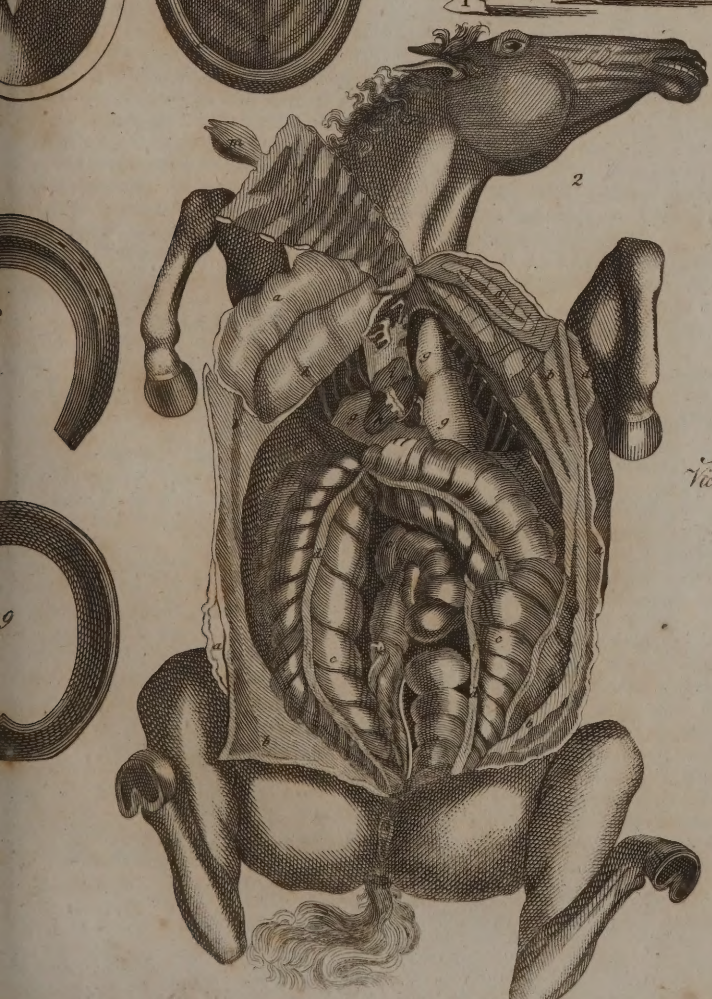
FASCETS, in the art of making glass, are the irons thrust into the mouths of bottles, in order to convey them to the annealing tower.

FASCIA, in antiquity, a thin sash which the Roman women wrapped round their bodies, next to the skin, to make them slender. Something of this sort seems also to have been in use among the Grecian ladies. See Terence. Eun. Act. 2. Sc. 4.

FASCIA, in architecture, signifies any flat member having a considerable breadth and but a small projecture, as the band of an architrave, larmier, &c. In brick buildings, the juttings out of the bricks beyond the windows in the several stories except the highest are called fasciæ.

FASCIE.

Skeleton of the Horse.



*Thoracic & Abdominal,
Viscera, Blood Vessels, &c.
of the Horse.*

FASCIE, in astronomy, certain parts on Jupiter's body resembling belts or swathes. They are more lucid than the rest of that planet, and are terminated by parallel lines, sometimes broader and sometimes narrower. M. Huygens observed a fascia in Mars much broader than those of Jupiter, and possessing the middle part of his disk, but very obscure. See **ASTRONOMY**.

FASCINATION, [from the Greek *βασκανισμός*, to fascinate or bewitch,] a sort of witchcraft which operates either by the eye or the tongue. Ancient writers distinguish two sorts of fascination, one performed by looking, or the efficacy of the eye. Such is that spoken of by Virgil in his third eclogue:

Nescio quis teneros oculus mihi fascinat agnos.

The second by words, and especially malignant praises: Such is that mentioned in his seventh eclogue:

*Aut, si ultra placitum laudârit, baccare frontem
Cingite, ne vati noceat mala lingua futuro.*

Horace touches on both kinds in his first book of epistles:

*Non istic obliquo oculo mea commoda quisquam
Limat, non odio obscuro, morsuque venenat.*

FASCINES, in fortification, faggots of small wood, of about a foot diameter, and six feet long, bound in the middle, and at both ends. They are used in raising batteries, making chandeliers, in filling up the moat to facilitate the passage to the wall, in binding the ramparts where the earth is bad, and in making parapets of trenches to screen the men. Some of them are dipped in melted pitch or tar; and, being set on fire, serve to burn the enemy's lodgments or other works.

FASCIOLA, in zoology, the **FLUKE** or **GOURD WORM**, a genus of insects of the order of vermes intestina. Body flattish, with a vent-hole at the extremity and on the belly. See Plate XXXVII. There are about fifty species:

F. BARBATA, is white, with transverse papillæ in the mouth. It is of an oblong shape, and about the size of a cucumber seed. It is found in the intestines of sepia lotigo.

F. HEPATICA, the **LIVER FLUKE** grows to two-thirds of an inch in length, though it is more usually met with not half that size; and its breadth is nearly equal to two-thirds of its length: it is flattish, but somewhat rounded on the back, and has about eight deep longitudinal furrows in two series; its skin is soft and whitish, with a tinge of brown. The hinder part is rounded, the fore part is furnished with a large mouth; it bears some resemblance to the seed of the common gourd, whence it has acquired the name of the gourd worm. It is found in fresh waters, in ditches, at the roots of stones, sometimes in the intestines, and often in the substance of the other viscera in quadrupeds. It often infests the livers of sheep, and on that account is called hepatica. Bags with salt in them should be placed in the fold that the sheep may lick them, which is the only remedy.

F. INTESTINALIS, or **INTESTINAL FLUKE**, of a long slender form, when extended; when contracted, of a suboval form. It inhabits the intestines of fresh water fish, particularly breams.

FASHION-PIECES, in the sea-language, the aftmost timbers of a ship, which terminate the breadth, and form the shape of the stern. They are united to the stern-post, and to the extremity of the wing-transom, by a rabbit, and a number of strong nails or spikes driven from without.

FAST, or **FASTING**, in general, denotes the abstinence from food; but is more particularly used for such abstinence on a religious account. Solemn fasts have been observed in all ages and nations, especially in times of mourning and affliction. Among the Jews, the calamities for which fasting was enjoined, were a siege, the sword, pestilence, locusts, the caterpillar, diseases, famine, and the like. Upon these days, they wore sack-cloth next the skin, their cloaths were rent, and they wore no shoes: they likewise sprinkled ashes upon their heads, and neither washed their hands, nor anointed their bodies with oil, as usual. The neighbouring heathens, viz. the Egyptians, Phœnicians, and Assyrians, also had their fasts. The Egyptians, according to Herodotus, sacrificed a cow to Isis, after having prepared themselves by fasting and prayer: a custom which he likewise ascribes to the women of Cyrene. Porphyry affirms, that the Egyptians, before their stated sacrifices, always fasted many days, sometimes six weeks; and that the least behoved to be for seven days; during all which

time the priests and devotees not only abstained from flesh, fish, wine, and oil; but even from bread, and some kinds of pulse. These austerities were communicated by them to the Greeks, who observed their fasts much in the same manner. The Athenians had the Eleusinian and Thesmophorian fasts, the observation of which was very rigorous, especially among the women, who spent one whole day sitting on the ground in a mournful dress, without taking any nourishment. In the island of Crete, the priests of Jupiter were obliged to abstain all their lives from fish, flesh, and baked meats. Apuleius informs us, that whoever had a mind to be initiated in the mysteries of Cybele, were obliged to prepare themselves by fasting ten days; and, in short, all the Pagan deities, whether male or female, required this duty of those that desired to be initiated into the mysteries, of their priests and priestesses that gave the oracles, and of those that came to consult them. Among the heathens fasting was also practised before some of their military enterprises. Aristotle informs us, that the Lacedæmonians having resolved to succour a city of the allies, ordained a fast throughout the whole extent of their dominions, without excepting even the domestic animals: and this they did for two ends; one to spare provisions in favour of the besieged; the other to draw down the blessing of heaven upon their enterprise. The inhabitants of Tarentum, when besieged by the Romans, demanded succours from their neighbours of Rhegium, who immediately commanded a fast throughout their whole territories. Their enterprise having proved successful by their throwing a supply of provisions into the town, the Romans were obliged to raise the siege; and the Tarentines, in memory of this deliverance, instituted a perpetual fast. Fasting has for ages been reckoned a particular duty among philosophers and religious people, some of whom have carried their abstinence to an incredible length. At Rome it was practised by kings and emperors themselves. Numa Pompilius, Julius Caesar, Augustus, Vespasian, &c. had their stated fast days; and Julian the apostate was so exact in this observance as to outdo the priests themselves, and even the most rigid philosophers. The Pythagoreans kept a continual lent; but with this difference, that they believed the use of fish to be equally unlawful with that of flesh. Besides their constant temperance, they also frequently fasted rigidly for a very long time. The gymnosophists, or Brachmans of the east, are also very remarkable for their severe fastings; and the Chinese, according to father le Comte, have also their stated fasts, with forms of prayer for preserving them from barrenness, inundations, earthquakes, &c. The Mohammedans too, who possess so large a part of Asia, are very remarkable for the strict observance of their fasts; and the exactness of their dervises in this respect is extraordinary.

FASTERMANS, or **FASTING-MEN**, [q. d. *hōmīnes habentes*,] was used in our ancient customs for men in repute and substance; or rather for pledges, sureties, or bondsmen, who, according to the Saxon polity, were fast bound to answer for one another's peaceable behaviour.

FASTI, in Roman antiquity, a chronicle or register of time, wherein the several years were denoted by the respective consuls, with the principal events that happened during their consulates; these were called also

FASTI CONSULARES, or **CONSULAR FASTI**.

FASTI, or **DIES FASTI**, also denoted the court days. The word *fasti* is formed of the verb *fari*, "to speak," because during those days the courts were opened, causes might be heard, and the pretor was allowed *fari*, to pronounce the three words, *do, dico, addico*: The other days wherein this was prohibited, were called *nefasti*: thus Ovid,

*Ille nefastus erit, per quem tria verba silentur:
Fastus erit, per quem lege licebit agi.*

These dies *fasti* were noted in the calendar by the letter F: but there were some days *ex parte fasti*, partly *fasti*, partly *nefasti*, i. e. justice might be distributed at certain times of the day, and not at others. These days were called *intercisi*, and were marked in the calendar thus, F. P. *fasto primo*, where justice might be demanded during the first part of that day.

FASTI signified also the calendar wherein were expressed the several days of the year, with their feasts, games, and other ceremonies. There were two sorts of *fasti*, the *magistrales*, and *calendares*, or the greater and less.

1. **FASTI CALENDARES**,

1. **FASTI CALENDARES**, which were what was properly and primarily called *fasti*, are defined by Festus Pompeius to be books containing a description of the whole year: *z. c.* Ephemerides, or diaries, distinguishing the several kinds of days, *festi*, *profesti*; *fasti*, *nefasti*, &c.

2. **FASTI MAGISTRALES**, the greater *fasti*, expressed the several feasts, with every thing relating to the gods, religion, and the magistrates; the emperors, their birth-days, offices, days consecrated to them, and feasts and ceremonies established to their honour, or for their prosperity, &c. With a number of such circumstances did flattery at length swell the *fasti*; when they became denominated *Magni* to distinguish them from the bare calendar, or *fasti calendares*.

FAT, an oily and sulphureous matter, secreted from the blood, and deposited in the cells of the *membrana adiposa*, from the innumerable little vessels which are spread amongst them. The fat is to be found immediately under the skin, in most parts of the body. There are two sorts of fat; one yellow, soft, and lax, easily melted; another firm, white, brittle, and not so easily melted, called *suet* or *tallow*. Some reckon the marrow of the bones for a third sort of fat. See **ANATOMY**.

FAT, in the sea language, signifies the same with broad. Thus a ship is said to have a fat quarter, if the trussing in or tuck of her quarter be deep.

FAT, [perhaps properly *vat*, from *vas*, a vessel.] likewise denotes an uncertain measure of capacity. Thus a fat of isinglass contains from 3½ hundred weight to 4 hundred weight; a fat of unbound books half a maund or four bales; of wire, from 20 to 25 hundred weight; and of yarn, from 220 to 221 bundles.

FATA MORGANA, a very remarkable aerial phenomenon, which is sometimes observed from the harbour of Messina, and adjacent places, at a certain height in the atmosphere. The name, which signifies the Fairy Morgana, is derived from an opinion of the superstitious Sicilians, that the whole spectacle is produced by fairies, or such like visionary invisible beings. The populace are delighted whenever it appears; and run about the streets shouting for joy, calling every body out to partake of the glorious sight. This singular meteor has been described by various authors: but the first who mentioned it with any degree of precision was Father Angelucci, whose account is thus quoted by Mr. Swinburne in his "Tour through Sicily:" "On the 15th of August 1643, as I stood at my window, I was surprised with a most wonderful delectable vision. The sea that washes the Sicilian shore swelled up, and became, for ten miles in length, like a chain of dark mountains; while the waters near our Calabrian coast grew quite smooth, and in an instant appeared as one clear polished mirror, reclining against the aforesaid ridge. On this glass was depicted, in *châtro scuro*, a string of several thousands of pilasters, all equal in altitude, distance, and degree of light and shade. In a moment they lost half their height, and bent into arcades, like Roman aqueducts. A long cornice was next formed on the top, and above it arose castles innumerable, all perfectly alike. These soon split into towers, which were shortly after lost in colonnades, then windows, and at last ended in pines, cypresses, and other trees, even and similar. This is the Fata Morgana, which for 26 years I had thought a mere fable."—To produce this pleasing deception, many circumstances must concur, which are not known to exist in any other situation. The spectator must stand with his back to the east, in some elevated place behind the city, that he may command a view of the whole bay; beyond which the mountains of Messina rise like a wall, and darken the back ground of the picture. The winds must be hushed, the surface quite smoothed, the tide at its height, and the waters pressed up by currents to a great elevation in the middle of the channel. All these events coinciding, as soon as the sun surmounts the eastern hills behind Reggio, and rises high enough to form an angle of 45 degrees on the water before the city, every object existing or moving at Reggio will be repeated 1000 fold upon this marine looking-glass; which, by its tremulous motion, is as it were cut into facets. Each image will pass rapidly off in succession as the day advances, and the stream carries down the wave on which it appeared. Thus the parts of this moving picture will vanish in the twinkling of an eye. Sometimes the air is at that moment so impregnated with vapours, and undisturbed by winds, as to reflect objects in a kind of aerial screen, rising about thirty feet above the level of the sea. In cloudy heavy weather, they are drawn

on the surface of the water, bordered with fine prismatical colours. To the above account we shall add the following, given by M. Houel, whose judgement and veracity render his authority highly respectable. "In fine summer days, when the weather is calm, there rises above the great current a vapour, which acquires a certain density, so as to form in the atmosphere horizontal prisms, whose sides are disposed in such a manner, that when they come to their proper degree of perfection, they reflect and represent successively, for some time (like a moveable mirror,) the objects on the coast or in the adjacent country. They exhibit by turns the city and suburbs of Messina, trees, animals, men, and mountains. They are certainly beautiful aerial moving pictures. There are sometimes two or three prisms, equally perfect; and they continue in this state eight or ten minutes. After this, some shining inequalities are observed upon the surface of the prism, which render confused to the eye the objects which had been before so accurately delineated, and the picture vanishes. The vapour forms other combinations, and is dispersed in air. Different accounts have been given of this singular appearance; which for my part I attribute to a bitumen that issues from certain rocks at the bottom of the sea, and which is often seen to cover a part of its surface in the canal of Messina. The subtle parts of this bitumen being attenuated, combined, and exhaled, with the aqueous globules that are raised by the air, and formed into bodies of vapour, give to this condensed vapour more consistence; and contribute, by their smooth and polished particles, to the formation of a kind of aerial crystal, which receives the light, reflects it to the eye, and transmits to it all the luminous points which colour the objects exhibited in this phenomenon, and render them visible." An account of this appearance is given from a treatise by Menasi, in Nicholson's "Journal," 4to. vol. i. p. 225, with a large engraving. See Priestley's "Optics for Atmospheric Phenomena," Huddart and Vince in the "Philosophical Transactions," 1797 and 1799. These are also in Nicholson's "Journal."

FATAGAR, a country of Africa, S. E. of Abyssinia. Lon. 39. 0. E. Lat. 9. 0. N.

FATE, denotes an inevitable necessity depending upon a superior cause. The word is formed from *fari*, *fatum*, to speak; and primarily implies the same with *effatum*, viz. a word or decree pronounced by God; or a fixed sentence whereby the Deity has prescribed the order of things, and allotted to every person what shall befall him. The Greeks called it *μαρτυρη*, as it were a chain or necessary series of things indissolubly linked together. It is also used to express a certain unavoidable destination of things, by which all agents, both necessary and voluntary, are swayed and directed to their ends. See **NECESSITY**. In this last sense, fate is distinguished into *Astrological* and *Stoical*, by the ancients; but by later authors, into *Divine* and *Physical*.

1. **FATE ASTROLOGICAL**, that arising from the influence and position of the heavenly bodies, which were supposed both to give laws to the elements and mixed bodies, and to the wills of men.

2. **FATE STOICAL**, is defined by Cicero a series of causes, wherein, cause being linked to cause, each produces another, and thus all things flow from one prime cause. To this fate the Stoics subjected even the gods.

3. **FATE, DIVINE**, is what is more usually called Providence. See **PROVIDENCE**.

4. **FATE, PHYSICAL**, is an order and series of natural causes appropriated to the effects. By this fate it is that fire warms, bodies communicate motion to each other, &c. and the effects of it are all the events and phenomena of nature.

FATEMITES, FATHIMITES, or FATHIMITES, the descendants of Mohammed by Fathema, or Fatima, his daughter. They never enjoyed the khalifat of Mecca or Bagdad, but reigned in Barbary and Egypt.

FATES, in mythology. See **PARCÆ**.

FATHER, [*father*, Saxon. This word is found likewise in the Persian language,] a well-known term of relation. See **PARENT**. By the laws of Romulus, a father had an unlimited power over his children. Amongst the Lacedæmonians, as we learn from Aristotle's politics, the father of three children was excused from the duty of mourning guard for the security of the city; and a father of four children was exempted from every public burden. The Poppæan law, amongst the Romans, granted many valuable privileges to the fathers of three children; amongst which one

was, that he should be excused from civil offices, and that the mother should have liberty, in her father's life-time, to make a will, and manage her estate without the authority of tutors.

FATHER, in theology, is used in speaking of the first Person of the ever-blessed Trinity. See **TRINITY**.

FATHER is also used in speaking of spiritual and moral things. Thus, Abraham is called the father of the faithful.

FATHER, in church history, is applied to ancient authors who have preserved in their writings the tradition of the church. Thus St. Chrysostom, St. Basil, &c. are called Greek fathers, and St. Augustine and St. Ambrose Latin fathers. No author who wrote later than the twelfth century is dignified with the title of Father.

FATHER is also a title of honour given to prelates and dignitaries of the church, to the superiors of convents, to congregations and ecclesiastics, and to persons venerable for their age or quality. Thus we say the right reverend father in God, the father general of the benedictines, the fathers of the council of Nice, father of his country, &c.

FATHOM, [*fædm*, Saxon,] a measure of length containing six feet, or two yards; the space to which a man can extend both arms.

FATNESS. See **CORPULENCY**. It is said, that for one fat person in France or Spain, there are 100 in England and Holland.

FATSISIO, an island of Japan, barren and almost inaccessible, 80 miles from the S. coast of Nippon.

FATTENING OF COLOURS, is a term employed by painters, and signifies a coagulation of the oil, which is occasioned by mixing it with several kinds of pigments: hence, when it has been kept for a considerable time, it becomes so viscid and glutinous, as to be wholly incapable of being worked, either with the brush or pencil. In this state, a due proportion of fresh oil should be added.

FATTIPOUR, or **FATEPOUR**, a town of Hindostan in the province of Agra, 25 miles W. of Agra.

FATUA, in mythology, the wife of the god Faunus, who was supposed to inspire women with the knowledge of futurity, as Faunus himself did the men.—Fatua had her name from *furi*, q. d. *vaticinari*, to prophesy. See **FAUNA**.

FATUARI, in antiquity, where persons who, appearing inspired, foretold things to come.

FAVAGNANA, or **FOVOGNANA**, a fertile island on the W. coast of Sicily, 15 miles in circumference, with a fort. Lon. 12. 25. E. Lat. 38. 16. N.

FAVANI, a river of Naples, which runs into the sea, 9 miles S. S. E. of Squillace.

FAVARA, a river of Sicily, which runs into the Mediterranean, 5 miles S. of Modica.

FAUCIGNY, or **FAUSSIGNY**, a late province of Savoy, now annexed to France, and included in the department of Mont Blanc.

FAVERNEY, a town of France in the department of Upper Saône, 8 miles N. of Vesoul.

FAVISSÆ, in antiquity, were, according to Festus and Gellius, cisterns to keep water in.

FAULQUEMONT, a town of France, in the department of Moselle, seated near the Nied, 16 miles E. of Metz.

FAUNA, a deity among the Romans. She was daughter to Picus, and was originally called Manica. Her marriage with Faunus procured her the name of Fauna, and her knowledge of futurity those of Fatua and Fatidica. It is said, that she never saw a man after her marriage with Faunus, and that her uncommon chastity occasioned her being ranked among the gods after her death. She is the same, according to some, with Bona Mater.

FAUNALIA, in antiquity, Roman feasts celebrated in honour of the god Faunus, who was the same among the Romans with Pan of the Greeks. The Faunalia were held on the nones or 5th of December. The principal sacrifice was a roe-buck: or rather, according to Horace, a kid, attended with libations of wine and burning of incense. It was properly a country festival, being performed in the fields and villages with peculiar joy and devotion. Horace gave a very gay description of it, in Lib. iii. Ode 18.

FAUNI, or **FAUNS**, among the ancients, were a species of demi-gods, inhabiting the forests; called also Sylvani, and little

differing from the Satyrs. They were said to delight in vineyards: and generally appear as attendants of Bacchus, in the representations of Bacchanal feasts and processions. They were represented as half men, half goats, having the horns, ears, feet, and tail, of a goat, a very flat nose, and the rest human.

FAUNUS, in fabulous history, the son of Picus, who reigned in Italy, about 1300 years before the Augustan age. His bravery, as well as wisdom, gave rise to the tradition, that he was the son of Mars. His great popularity, and his fondness for agriculture, made his subjects revere him as one of their country deities after his death. He was represented with all the equipage of the satyrs, and was consulted to give oracles.

FAVONIUS, among the Romans, the wind which blew directly from the west.

FAVORITO, in music, as choro favorito, a chorus in which are employed the best voices and instruments, to sing the recitatives, play the ritornellas, &c.; this is otherwise called the little chorus, or choro recitante.

FAUSSEBRAYE, a small mount of earth, four fathoms wide, erected on the level round the foot of the rampart, to fire upon the enemy, when he is so far advanced that you cannot force him back; and also to receive the ruins which the cannons make in the body of the place.

FAUSSIGNY. See **FAUCIGNY**.

FAWKES, FRANCIS, an ingenious poet, who was educated at Leeds, whence he was transplanted to Jesus College, Cambridge, where he took the degree of M. A. Entering into orders, he settled first at Bramham in Yorkshire, near Mr. Lane's elegant seat, which he celebrated in verse in 1745. His first poetical publications were, "Gavin Douglas's Description of May and Winter modernised." Removing afterwards to Croydon in Surrey, he recommended himself to the notice of Archbishop Herring, to whom he addressed an Ode on his recovery in 1754, printed in Dodsley's Collection; and who collated him in 1755 to the vicarage of Orpington. Mr. Fawkes lamented his patron's death in 1757, in a pathetic Elegy, entitled "Aurelius," first printed in 1763. He married at this time Miss Purrier of Leeds. In April 1774, he exchanged his vicarage for the rectory of Hayes. He was also one of the chaplains to the Princess Dowager of Wales. He published a volume of Poems by subscription in 8vo. 1761; the Poetical Calendar in 1763; and Poetical Magazine, 1764, in conjunction with Mr. Woty; Partridge-shooting, an Eclogue, 1767, 4to.; and a Family Bible, with notes, in 4to, a compilation. But his great strength lay in translation, in which few, since Pope, have equalled him. Witness his fragments of Menander, his Works of Anacreon, Sappho, Bion, Moschus, and Musæus, 12mo. 1760; his Idylliums of Theocritus, 8vo. 1767, and his Argonautics of Apollonius Rhodius; both by subscription, but the latter posthumous, and completed by the Rev. Mr. Meen, in 8vo. 1780. He died Aug. 26, 1777.

FAWN, among sportsmen, a buck, or doe, of the first year; or the young one of the buck's breed in its first year.

FAYAL, the most western of the Azores. It is about 27 miles long and 9 broad; and abounds in cattle, fowls, fish, and beech-trees. The chief town is Villa Horta.

FAYENCE, a town of France, in the department of Var, 10 miles N. E. of Draguignan. Lon. 7. 0. E. Lat. 43. 38. N.

FAYETTE, a county of Kentucky, surrounded by Clarke, Bourbon, Scott, Franklin, Woodford, Maddison, and Mercer counties. Lexington is the capital.

FAYETTE, a county of Pennsylvania, bounded on the N. by Westmoreland, E. by Somerset, S. by the States of Maryland and Virginia, and W. by the Monongahela. The western parts are fertile; the eastern mountainous, abounding in iron ore. Two iron manufactories are established in it.

FAYETTE, a district of North Carolina, comprehending six counties, bounded on the N. by Hillsborough, S. E. by Wilmington and Newbern, S. by South Carolina, and W. by Salisbury.

FAYETTEVILLE, a flourishing town of North Carolina, the capital of Cumberland county, and of Fayette district; seated in a settlement of Scots Highlanders, on the N. W. branch of Cape Fear river, 55 miles N. W. of Camden.

FAYOUM, or **FEIUM**, a province of Egypt, on the W. side of the Nile, extending from that river to Moeris, now Bir-

Ket el Korum. It was anciently called Arsinoe, and intersected by canals, cut by the ancient Egyptians between the river and the Lake of Moeris; but though formerly very wealthy and fertile, it is greatly declined, through the oppressions of the Mamelukes.

FAVOUR, the capital of the above province, is seated on Joseph's Canal, which runs through it, and surrounded by gardens; 49 miles S. S. W. of Cairo.

FE, FO, or FO-HI. See FOHI.

FE, SANTA. See SANTA FE.

FEAL DIKES, a cheap sort of fence common in Scotland; built with feal or sod dug up by the spade, from the surface of grass ground, consisting of the upper mould rendered tough and coherent by the matted roots of grass thickly interwoven with it.

FEALTY, in law, an oath taken on the admittance of any tenant, to be true to the lord of whom he holds his land: by this oath the tenant holds in the freest manner, on account that all who have fee hold per fidem et fiduciam, that is, by fealty at least. This fealty at the first creation of it, bound the tenant to fidelity, the breach of which was the loss of his fee. It has been divided into general and special: general, that which is to be performed by every subject to his prince; and special, required only of such as, in respect of their fee, are tied by oath to their lords. To all tenures, except tenancy at will and frank almoign, fealty is incident, though it chiefly belongs to copyhold estates held in fee and for life. The form of this oath by stat. 17 Ed. II. is to run as follows: "I A. B. will be to you my lord D. true and faithful, and bear to you faith for the lands and tenements which I hold of you, and I will truly do and perform the customs and services that I ought to do to you. So help me God."

FEAR, [*fearan*, Sax. to fear; *vaer*, Dut. *feakle*, Erse.] in scripture, is used in various senses. The fear of God is either filial or servile. Filial fear is a gracious habit in the soul, whereby it is inclined to obey all God's commands, and to hate and avoid evil. Slavish or servile fear is the consequence of guilt; it is an alarm within that disturbs the rest of a sinner; though it often proves preparative to faith and repentance.

FEAR, in the mythology. See PAVOR.

FEAR, in scripture is also frequently taken for a painful apprehension of danger; a dejection of mind; anxious concern for some object; that which causes fear; and the person or thing which is feared. The fear of God is used in three senses. 1. For a terror which arises from a consciousness of guilt and of the justice of God in punishing sin: this fear is removed by accepting the reconciliation made by Jesus Christ the Redeemer, and it preserves us from every other dependence. 2. For that awe, or reverential dread, which arises from the consideration, that God alone possesses all power to communicate happiness or to inflict misery, as seemeth right to him. Thus, Jer. x. 7. "Who would not fear thee, O king of nations? for to thee doth it appertain." This fear directs us to avoid whatever God has forbidden, and to attend with care to his commandments. 3. For that concern and solicitude, to keep at the utmost distance from sin, which arises from a detestation of any breach of God's law, and a consciousness of the weakness and insufficiency of human nature, and of the danger of being led astray without the greatest care and watchfulness. This fear is stiled the beginning of wisdom, that is, one of the principal points of sound wisdom; it makes us circumspect and diligent, and directs us to place an entire dependence on God.

FEAR, one of the passions of the human mind. It is defined, an apprehension of impending evil, attended with a desire of avoiding it. Fear in the extreme is called fright, or terror. See DRAWING and FRIGHT.

FEAST, or FESTIVAL, [Lat. *festum*,] is derived by some from *feriari*, to keep holiday; by others from *ferre*, to feast or entertain; by others, particularly M. Huet, from *festinare*, which is used by Origen in the same sense, in his Comment on Matthew. Social or civil feasts were also expressed by the words *convivium*, *compositio*, or *concanatio*. Cicero observes that *convivium* means "people assembled at table," which is more significant than the Greek words *συναγoge*, or *συνελευσις*; the Latin term expressing the union of body and mind, which ought to take place at an entertainment: the Greek denoting only what relates to the body. We learn from Herodotus, that the ancients had neither cups nor

bowls, at their feasts, but they drank out of little horns tipped with silver or gold. The Greeks and Romans kept a domestic for the purpose of reading during their meals and feasts. Sometimes the chief of the family himself performed the office of reader; and history informs us, that the Emperor Severus often read while his family ate. The time of reading was generally at supper; and guests were invited to a reading as they are now a-days to play cards. The Greeks, in their flourishing times, did not profane, (according to their own expression,) the holiness of the table; but rather adorned it with ingenious and elegant conversation: they proposed moral topics, of which Plutarch has preserved a collection. Heroes rarely assembled convivially without bringing affairs of consequence into discourse, or deliberating upon those that regarded either present events or future contingencies. The Scythians, while at meat, used to make the strings of their bows resound, lest their warlike virtues might be enfeebled or lost in the season of pleasure. People of rank among the Rhodians, by a fundamental law of the state, were obliged to dine daily with those who had the management of affairs, in order to deliberate with them concerning such things as were necessary or useful for the country; and on this account the principal ministers of the kingdom were obliged to keep open table for all who could be of use to the state. The Persians also generally deliberated on business at table, but never determined, or put their determinations in execution, except in the morning before having eaten. Among the Romans, the place where they supped was generally the vestibule, that a more retired part of the house might not encourage licentiousness and disorder. There were several laws that restricted their meals to these vestibules. When luxury reigned in Rome, they had superb halls for their entertainments, Lucullus had many, each of which bore the name of some deity; and this name was a mark which indicated to the servants the expence of the entertainment. The expence of a supper in Lucullus's hall of Apollo amounted to 50,000 drachmas. Singers, dancers, musicians, stage-players, jesters, and buffoons, were brought into these halls to amuse the guests. Plutarch informs us, that Caesar, after his triumphs, treated the Roman people at 22,000 tables; and by calculation it would seem, that there were at these tables upwards of 200,000 persons. Feasting seems to have been the chief delight of the Britons, Germans, Gauls, and all the other Celtic nations; in which they indulged themselves to the utmost, as often as they had opportunity. "Among these nations (says M. Pelloutier, in his Hist. Celt. l. 2. c. 12. p. 463.) there is no public assembly, either for civil or religious purposes, duly held; no birth-day, marriage, or funeral, properly celebrated; no treaty of peace or alliance rightly cemented, without a great feast." When the Germans, says Tacitus, wanted to reconcile enemies, to make alliances, to name chiefs, or to treat of war and peace; it was during the repast, that they took counsel; a time in which the mind is most open to the impressions of simple truths, or most easily animated to great attempts. These artless people during the conviviality of the feast spoke without disguise. Next day they weighed the counsels of the former evening: they deliberated at a time when they were not disposed to feign, and took their resolution when they were least liable to be deceived. It was by frequent entertainments of this kind that the great men or chieftains gained the affections and rewarded the services of their followers, and those who made the greatest feasts were sure to be most popular, and to have the greatest retinue. These feasts (in which plenty was more regarded than elegance lasted commonly several days, and the guests seldom retired until they had consumed all the provisions. Athenæus describes an entertainment that was given by Arcamnes, a very wealthy prince in Gaul, which continued a whole year without interruption, and at which all the people of Gaul, and even all strangers who passed through that country, were made welcome.

FEASTS, or FESTIVALS, in a religious sense, are ceremonies of feasting by way of thanksgiving. Such feasts have made part of the religion of almost all nations and sects; witness those of the Greeks, Romans, Hebrews, Christians, and Mohammedans.

FEASTS, ANCIENT GRECIAN. The first feasts among the Greeks were celebrated in solemn assemblies of the whole nation, on occasion of their games, as the Olympic, the Pythian, the Isthmian, and Nemean: in process of time they had many others, the principal of which are enumerated in the course of this work.

FEASTS, ANCIENT ROMAN. The Romans had also abundance

of stated feasts in honour of their deities and heroes; such were the Saturnalia, Cerealia, Lupercalia, Liberalia, Neptunalia, Consualia, Portumnalia, Vulcanalia, Palilia, Divalia, &c. See these articles. They had also feasts instituted occasionally; as Carmentalia, Quirinalia, Terminalia, Floralia, Compitalia, Lemuria, Vernalia, besides other moveable and occasional ones; as to give thanks to the gods for benefits received; to implore their assistance or to appease their wrath, &c. as the Paganalia, Feralia, Bacchanalia, Ambarvalia, Amburbalia, Suovetaurilia, and divers others, particularly denominated *Feriae*; as *Sementinae*, *Latinae*, &c. See these articles. The feasts were divided into days of sacrifice, and days of banqueting and feasting: days of games, and days of rest or *feriae*. There being but little history written, or at least published, in those days, one end of feasts was to keep up the remembrance of past occurrences.

FEASTS, CHINESE. The Chinese have two solemn religious feasts annually, in memory of Confucius, besides several others of a civil nature, in honour of agriculture, &c.

FEASTS, JEWISH. The principal feasts of the Jews were the feasts of trumpets, that of the expiation, of tabernacles, of the dedication, of the passover, of pentecost, and that of purification. See **EXPIATION**, &c. The modern Jews have other feasts marked in their calendar of modern institution.

FEASTS IN THE CHURCH OF ENGLAND. The four feasts which the English laws take particular notice of are, the Annunciation of the blessed Virgin Mary, or Lady-day, the 25th March; the nativity of St. John the Baptist, held on the 24th of June; the feast of St. Michael the Archangel, on the 29th of September; and that of St. Thomas the Apostle, on the 21st of December; on which quarterly days rent on leases is usually paid. (5 and 6 Edw. VI. cap. 3. 3 Jac. I. cap. 112. Car. II. cap. 30.) Besides these feasts which are general, and enjoined by the church, there are others local and occasional, enjoined by the magistrate, or voluntarily set on foot by the people; such are the days of thanksgiving for victories, delivery from wars, plagues, &c. Such also are the vigils or wakes in commemoration of the dedications of particular churches. See **VIGIL**, &c. The feasts of the church of England are either Immoveable or Moveable:

1. **FEASTS, IMMOVEABLE**, are those constantly celebrated on the same day of the year; the principal of these are Christmas or the Nativity, the Circumcision, Epiphany, Candlemas or the Purification; the Annunciation, called also the Incarnation and Conception; All Saints, and All Souls; besides the days of the several apostles, St. Thomas, St. Paul, &c. which in the church of England, are feasts though not *Feriae*. See these articles.

2. **FEASTS, MOVEABLE**, are those which are not confined to the same day of the year. Of these the principal is Easter, which gives law to all the rest, all of them following and keeping their proper distances from it; such are Palm Sunday, Good Friday, Ash Wednesday, Sexagesima, Ascension-day, Pentecost, and Trinity Sunday. See **EASTER**, **PENTECOST**, **SEXAGESIMA**, **TRINITY**, &c.

FEASTS IN THE CHURCH OF ROME. The prodigious increase of feast days in the Romish church commenced towards the close of the 4th century, and was occasioned by the discovery that was then made of the remains of martyrs and other holy men, for the commemoration of whom they were established. These, instead of being set apart for pious exercises, were abused in indolence, voluptuousness, and criminal practices. Many of them were instituted on a Pagan model, and perverted to similar purposes.

FEASTS, MOHAMMEDAN. The Mohammedans, besides their feast or sabbath, which is kept on Friday, have two solemn feasts, the first of which is called the Feast of Victims, and celebrated on the 10th day of the last month of their year; and the second called Bairam. See **BAIRAM**.

FEASTS OF THE DEAD, solemn religious ceremonies in use among the American Indians. By some nations they are celebrated every eight years; by others, as the Hurons and Iroquois, every 10 years.

FEATHER, in physiology, a general name for the covering of birds; it being common to all the animals of this class to have their whole body, or at least the greatest part of it, covered with feathers or plumage. There are two sorts of feathers found on birds, viz. the strong and hard kind, called quills, found in the wings and tail; and the other plumage, or soft feathers, serving for the de-

fence and ornament of the whole body. All birds, so far as yet known, moult the feathers of their whole body yearly.

FEATHER. See **ORNITHOLOGY**. Feathers make a considerable article in commerce, particularly those of ostriches, herons, swans, peacocks, geese, hens, &c. for plumes, ornaments of the head, filling of beds, writing pens, &c. Geese are plucked sometimes in Great Britain five times in the year, and in cold seasons many of them die by this barbarous custom. The feathers that are brought from Somersetshire are esteemed the best, and those from Ireland the worst. Eider down is imported from Denmark; the ducks that supply it being inhabitants of Hudson's Bay, Greenland, Iceland, and Norway. See **DOWN**. Our own Western Islands breed numbers of these birds, which turn out a profitable branch of trade to the poor inhabitants. Hudson's Bay also furnishes very fine feathers, supposed to be of the goose kind. The down of the swan is brought from Dantzic, as well as great quantities of the feathers of the cock and hen. The London-poulterers deal largely in the feathers of those birds, and of ducks and turkeys: those of ducks being weaker, are inferior to those of the goose; and turkeys feathers are the worst of any. The best method of curing feathers is to lay them in a room, in an exposure to the sun; and when dried, to put them in bags, and beat them well with poles to get the dust off.

FEATHERS are chiefly used for the stuffing of beds, which are certainly less wholesome than wool or horse hair mattresses, and tend greatly to relax and enervate the human body. Within the last two or three years, they have been manufactured into hats; a mode of employing them far preferable to that we have just mentioned. See **PLUME**.

FEATHER, in the manege, a sort of natural frizzling of the hair, which in some parts rises above the rest, resembling the tip of an ear of corn. This happens most frequently between the eyes; and if lower, it is a sign of a weak sight.

MID-FEATHER, in the salt-works, the partition in the middle of the furnace, which it divides into two chambers.

FEATHER-EDGED, among carpenters, an appellation given to planks or boards, which have one side thicker than the other.

FEBRIS, [Lat.] **FEVER**, was worshipped as a goddess by the ancient Romans. She had a temple on mount Palatine, and in other two places in Rome. The following inscription to this goddess is still extant, *FEERI DIVÆ, FEBRI SANCTÆ, FEBRI MAGNÆ, CAMILLA AMATA PRO FILIO MALE AFFECTO*.

FEBRUA, a feast of atonement held by the ancient Romans for 12 days together, in February.

FEBRUA, **FEBRUALIS**, and **FEBRUATA**, names of the goddess Juno.

FEBRUARY, in chronology, was the second month of Numa's year, and under the protection of the god Neptune. It was not in the calendar of Romulus, being added to the year by Numa. It had its name from Februa, a name of Juno, who presided over the purifications of women; and in this month the Lupercalia were held in honour of Juno, and women were purified by the priests of Pan Lyceus at that festival. See **LYPERCALIA**. February, in a common year, consists only of 28 days; but every bissextile year it has 29, by the addition of the intercalary day.

FECAMP, an ancient sea-port of France, in the department of Lower Seine, having 1000 houses, and a Benedictine abbey long famed for its riches. The church is one of the largest in France. The chief trade of the inhabitants is in linens, serges, laces, hats, and leather. Many vessels are employed in the herring fishery. It is 27 miles S.W. of Dieppe, and 15 N.N.E. of Montvilliers.

FECES. The excrementitious matter of animals, evacuated per anum, consists of all that food which cannot be employed for purposes of nutrition, considerably altered, at least in part, and mixed or united with various bodies employed during digestion to separate the useless part of the food from the nutritious.

FECIALES, or **FOECIALES**, an order of priests or officers, consisting of 20 persons among the ancient Romans, appointed to proclaim war, negotiate peace, &c. Festus derives the word from *ferio*, I strike; as, *ferire fœdus* signifies "to conclude a treaty;" and accordingly, instead of *feciales*, he would have it written *feriales*. Others derive it from *fœdus*, which was anciently written *fœdus*; or from *fides*, "faith." Others from *ficio*, *fecit*, I make, &c. because they made war and peace. Vossius derives it from

from *fatu*, of the verb *fare*, "to speak;" in which sense the *feciales* should be the same with orators; which sentiments is also confirmed by Varro, who says they were called indifferently *feciales* and orators. The *feciales* were a sort of heralds, who, when the Romans had any dispute with their neighbours, were sent first to demand the thing pretended to be usurped, or require the satisfaction for the injury alleged to be done. If an answer was not returned by them, that was satisfactory to the people and the senate, they were dispatched again to declare war, and the like in treating of peace; the *feciales* being the only persons appointed to negotiate between the senate, &c. and the enemy.

FEE, [*feoh*, Sax. *fee*, Danish, cattle; *feudum*, low Lat.] in law, all land tenements that are held by any acknowledgement of superiority to a higher lord. All lands and tenements, wherein a man hath a perpetual estate to him and his heirs, &c. are divided into *allodium* and *feudum*; *allodium* is every man's own land, which he possesses merely in his own right, without acknowledgement of any service or payment of any rent to any other. *Feudum*, or *fee*, is that which we hold by the benefit of another, and in name whereof we owe services, or pay rent, or both, to a superior lord.

FEE ABSOLUTE, or FEE SIMPLE. A tenant, says Blackstone, in fee simple, (or, as he is frequently styled, tenant in fee,) is he that hath lands, tenements, or hereditaments, to hold to him and his heirs for ever; generally, absolutely, and simply; without mentioning what heirs, but referring that to his own pleasure, or to the disposition of the law. The true meaning of the word *fee*, (*feodum*), is the same with that of *feud* or *fief*, (See **FEE-DOM** SYSTEM;) and in its original sense it is taken in contradistinction to *allodium*; which is property in its highest degree; and the owner thereof hath *absolutum et directum dominium*, and therefore is said to be seised thereof absolutely in *dominio suo*, in his own demesne. But this *allodial* property no subject in Britain has; it being a received and now undeniable principle in the law, that all the lands are holden mediately or immediately of the king. A subject therefore hath only the usufruct, and not the absolute property of the soil. And hence in the most solemn acts of law, the strongest and highest estate that any subject can have is expressed by these words, "he is seised thereof in his demesne, as of fee." It is a man's demesne, dominion, or property, since it belongs to him and his heirs for ever: yet this property or demesne, is strictly not absolute or *allodial*, but qualified or *feodal*: it is in his demesne, as of fee; that is, it is not purely and simply his own, since it is held of a superior lord, in whom the ultimate property resides. This is the primary sense and acceptation of the word *fee*. But (as Sir Martin Wright very justly observes) the doctrine, "that all lands are holden," having been for so many ages a fixed and undeniable axiom, the English lawyers do very rarely (of late years especially) use the word *fee* in this its primary original sense, in contradistinction to *allodium* or absolute property, with which they have no concern; but generally use it to express the continuance or quantity of estate. A *fee* therefore, in general, signifies an estate of inheritance; being the highest and most extensive interest that a man can have in a *feud*: and when the term is used simply, without any other adjunct, or has the adjunct of simple annexed to it, it is used in contradistinction to a *fee conditional* at the common law, or a *fee-tail* by the statute; importing an absolute inheritance, clear of any condition, limitation, or restrictions, to particular heirs, but descendible to the heirs general, whether male or female, lineal or collateral. And in no other sense than this is the king said to be seised in *fee*, he being the feudatory of no man. Taking therefore *fee* in this its secondary sense, as a state of inheritance, it is applicable to, and may be had in, any kind of hereditaments either corporeal or incorporeal. But there is this distinction between the two species of hereditaments; that of a corporeal inheritance a man shall be said to be seised in his demesne, as of fee; of an incorporeal one he shall only be said to be seised as of fee, and not in his demesne. For as incorporeal hereditaments are in their nature collateral to, and issue out of, lands and houses, their owner hath no property, dominion, or demesne, in the thing itself, but hath only something derived out of it; resembling the servitudes, or services, of the civil law. The dominion, or property, is frequently in one man, while the appendage, or service, is in another. Thus Gaius may be seised as of fee, of a way going over the land, of which Titius is seised in his demesne as of fee.

The *fee simple* or inheritance of lands and tenements is generally vested and resides in some person or other; though divers inferior estates may be carved out of it. As if one grants a lease for 21 years, or for one or two lives, the *fee simple* remains vested in him and his heirs; and after the determination of those years or lives, the land reverts to the grantor or his heirs, who shall hold it again in *fee simple*. Yet sometimes the *fee* may be in *abeyance*, that is (as the word signifies) in expectation, remembrance, and contemplation, in law; there being no person in esse, in whom it can vest and abide, though the law considers it as always potentially existing, and ready to vest whenever a proper owner appears. Thus, in a grant to John for life, and afterwards to the heirs of Richard, the inheritance is plainly neither granted to John nor Richard, nor can it vest in the heirs of Richard, till his death, *nam nemo est hæres viventis*: it remains therefore in waiting, or *abeyance*, during the life of Richard. This is likewise the case of a parson of a church, who hath only an estate therein for the term of his life; and the inheritance remains in *abeyance*. And not only the *fee*, but the freehold also, may be in *abeyance*; as, when a parson dies, the freehold of his glebe is in *abeyance* until a successor be named, and then it vests in the successor. The word heirs is necessary in the grant or donation in order to make a *fee* or inheritance.

FEES, LIMITED, or such estates of inheritances as are clogged and confined with conditions or qualifications may be divided into two sorts, viz. 1. Qualified or base fees: and, 2. Fees conditional, or fees tail.

1. **FEE QUALIFIED, or BASE FEE**, is such as has a qualification subjoined, and which must be determined whenever the qualification annexed to it is at an end. As, in the case of a grant to A and his heirs, tenants in the manor of Dale; in this instance, whenever the heirs of A cease to be tenants of that manor, the grant is entirely defeated.

2. **FEE TAIL** is so called in consequence of the statute de donis, or fee conditional, as it is called at common law, is an estate restrained to some particular heirs, exclusive of others; as to the heirs of a man's body, or to the heirs male of his body: in which cases it was held, that as soon as the grantee had issue born, the estate was thereby converted into *fee simple*, at least so far as to enable him to sell it, to forfeit it by treason, or to charge it with incumbrances. But the statute de donis having enacted, that such estates so given, to a man and the heirs of his body, should at all events go to the issue, if there were any, or if none, should revert to the donor; this was by the judges denominated an estate in tail. Plowd. 251.

FEE also signifies a certain allowance to physicians, barristers, attorneys, and other officers, as a reward for their pains and labour. If a person refuse to pay an officer his due fees, the court will grant an attachment against him, to be committed till the fees are paid; and an attorney may bring an action on the case for his fees, against the client that retained him in his cause.

FEE also denotes a settled perquisite of public officers, payable by those who employ them. The fees due to the officers of the custom-house, are expressly mentioned in a schedule, or table, which is hung up in public view in the said office, and in all other places where the said fees are to be paid or received. And if any officer shall offend, by acting contrary to the regulations therein contained, he shall forfeit his office and place, and be for ever after incapable of any office in the custom-house. The other public officers have likewise their settled fees, for the several branches of business transacted in them.

FEE-FARM, is a tenure without homage fealty, or other service, except that mentioned in the feoffment, which is usually the full rent, or at least a fourth part of it. The nature of this tenure is, that if the rent be behind, and unpaid for two years, then the feoffor and his heirs may have an action for the recovery of the lands.

FEELERS, the horns, or antennæ, of insects.

FEELING is one of the five external senses, by which we obtain the ideas of solidity, hardness, softness, smoothness, roughness, heat, cold, wetness, dryness, and other tangible qualities. This sense, though the coarsest, is the surest and most universal of all others, and is indeed the basis of all other sensations.

FEET-BEARER, an officer in the courts of the ancient Anglo-Saxon and Welsh kings. He was a young gentleman whose duty it

it was to sit on the floor, with his back towards the fire, and hold the king's feet in his bosom all the time he sat at table, to keep them warm and comfortable: a piece of state and luxury unknown in modern times. Leges Wallia, p. 58.

FEHRENBACH, a town of Suabia, 16 miles E. of Friburg.

FEHRENLIN, a town of Upper Saxony, in the Middle Mark of Brandenburg, 28 miles N.W. of Berlin.

FEJEE, one of the Friendly Islands, three days sail N.W. by W. of Tongataboo. It abounds, in hogs, dogs, fowls, roots, and fruits.

FEINT, in fencing, a mere motion of the wrist, without stirring the foot.

FEIRA, a town of Portugal, in the province of Beria, 10 miles S. of Oporto.

FELAPTON, in logic, one of the six first modes of the third figure of syllogisms; whereof the first proposition is an universal negative, the second an universal affirmative, and the third a particular negative.

FELDKIRCH, or **FELDKIRK**, a county of Germany, formerly in Suabia, now annexed to the Tyrolese. It is bounded on the north by the county of Montfort; east by Pludentz; south by the Grisons; and west by the Rhine.

FELDKIRCH, the capital of the above county, seated on the Ill, near the Rhine, 15 miles E. of Appenzel.

FELDSBERG, a town of Carinthia, belonging to the archbishop of Salzburg, 4 miles N. of Saxenburg.

FELDSBURG, a town of Austria, 28 miles N.N.E. of Vienna, and 32 N.E. of Tulln.

FELICITAS, **FELICITY**, or **HAPPINESS**, was deified by the ancient Pagans. Lucullus built a temple to her. She had another erected by Lepidus. The Greeks worshipped her under the name of **MACARIA**. This deity is often represented upon medals, and generally with a cornucopia in one hand, and a caduceus in the other. The inscriptions are, **FELICITAS TEMPORUM**, **FELICITAS AUGUSTI**, **FELICITAS PUBLICA**, &c.

FELICUDI, one of the Lipari islands, 28 miles W. of Lipari.

FELIS, **CAT**, in zoology, a genus of the class mammalia, order *Feræ*. Front teeth, six; the intermediate ones equal; grinders, three on each side; tongue aculeated backward; claws retractile. The feet are provided with sharp-hooked claws, which are lodged in a sheath, and may be extended or drawn in at pleasure: the head is mostly round, and the visage short. Animals of this genus are ferocious, generally temperate, very agile in climbing trees; alight on their feet when falling from a height. The females bring a considerable number at a birth, and have all eight paps. They dart on their prey with astonishing rapidity, which they eat slowly, growling almost perpetually, as though afraid of losing it: they have little relish for vegetable food. There are twenty-three species, with varieties. The following are the most remarkable. See Plate LXIX.

I. **F. CATUS**, the **COMMON CAT**, inhabits the woods of Europe and Asia, and is domesticated almost every where. Of this species there are many varieties, of which are the following:

1. **F. CATUS ANGORENSIS**, the **ANGORA CAT**, with hair of silvery whiteness and silky texture, and very long, especially about the neck, where it forms a fine ruff. It is a large variety; found about Angora, the same country which produces the fine-haired goat. It degenerates after the first generation in our climate.

2. **F. CATUS AUREUS**, the **LONG-HEADED CAT**, is of a reddish yellow colour, and has a long-shaped head, sharp snout, short legs, with weak claws, and round flat ears. It inhabits New Spain.

3. **F. CATUS CÆRULEUS**, the **BLUE** or **CYPRUS CAT**, is of a blue-grey colour, or greyish black. It is much cultivated in Siberia, on account of its fine fur.

4. **F. CATUS DOMESTICUS**, the **DOMESTIC** or **TAME CAT**, is of a smaller size, and has the hair shorter and thicker than the wild cats. It is an useful, but deceitful, domestic. Although when young they are playful and gay, they possess an innate malice and perverse disposition, which increases as they grow up, and which, from education, they learn to conceal, but never to subdue. Constantly bent upon theft and rapine, though in a domestic state, they are full of cunning and dissimulation; they conceal all their designs; seize every opportunity of stealing, and then fly from

punishment. They easily take on the habits of society, but never its manners; for they have only the appearance of friendship and attachment. This disingenuity of character is betrayed by the obliquity of their movements, and the ambiguity of their looks. In a word, the cat is totally destitute of friendship; he thinks and acts for himself alone. He loves ease, and searches for the softest and warmest places to repose in. The cat is extremely amorous; and which is very singular, the female is more ardent than the male: she not only invites, but searches after and calls upon him to satisfy the fury of her desires; and, if the male disdains or flies from her, she pursues, bites, and in a manner compels him. The cat is incapable of restraint, and consequently of being educated to any extent. However, we are told that the Greeks in the island of Cyprus trained this animal to catch and devour serpents, with which that island was greatly infested. This, however, was not the effect of obedience, but of a general taste for slaughter; for he delights in watching, attacking, and destroying all kinds of weak animals indifferently. He has no delicacy of scent, like the dog; he hunts only by the eye: neither does he properly pursue; he only lies in wait, and attacks animals by surprise; and after he has caught them, he sports with and torments them a long time, and at last kills them (when his belly is full), purely to gratify his sanguinary appetite. The eye of the cat differs greatly from that of most other animals. The pupil is capable of a great degree of contraction and dilatation. It is narrow and contracted like a line during the day, round and wide in the dark. It is from this conformation of the eye that the cat sees best in the night, which gives him a great advantage in discovering and seizing his prey. Although cats live in our houses, they enjoy full liberty; for they never act but according to their own inclination. Besides, a great part of them are half wild; they do not know their masters, and frequent only the barns, out-houses, &c. unless when pressed with hunger. Cats have a natural antipathy at cold and wetness. They likewise hate bad smells; but they are fond of certain aromatics, and particularly of marun, catmint, and valerian. The fur of the cat readily yields electric sparks when rubbed; and if a clean and perfectly dry domestic cat is placed, in frosty weather, on a stool with glass feet, or insulated by any other means, and rubbed for a certain space in contact with the wire of a coated vial, it will be effectually charged by this method.

5. **F. CATUS FERUS**, the **WILD CAT**, is three or four times as large as the house cat; the head larger, and the face flatter. The teeth and claws are tremendous: its muscles very strong, as being formed for rapine: the tail is long and very thick, marked with alternate bark of black or brown, and white, the end always black: the hips and hind part of the lower joints of the leg are black: the fur is very soft and fine. The general colour is a yellowish white, or yellowish brown and whitish, mixed with deep grey or blackish stripes.

II. **F. TIGRINA**, **MARGAY**. The margay is a native of South America, and is about the size of a common cat. The ground-colour is a bright tawny; the face striped downwards with black; the shoulders and body marked both with stripes and large oblong black spots; on the legs the spots are small; the breast, belly, and insides of the limbs, are whitish: the tail is long, and marked with black, grey, and fulvous. It resides principally on trees, preying on birds: it is said to breed in the hollows of trees, and to bring but two young at a birth. It is very fierce and untameable.

III. **F. CONCOLOR**, the **PUMA**, the cougar of Buffon, has a very small head, ears a little pointed, and eyes large. According to some zoologists, the back, neck, rump, and sides, are of a pale brownish red, mixed with dusky hairs; the breast, belly, and inside of the legs, cinereous; the tail is dusky and ferruginous, the tip black; and the teeth are of a vast size. It is as big as a large wolf, being long bodied, and high on its legs; the length from nose to tail five feet three inches; that of the tail two feet eight. This animal inhabits the continent of America, from Canada to Brasil: in South America it is called puma, and by the Europeans is mistaken for the lion. It is the scourge of the colonies of the hotter parts of America, being fierce and ravenous to the highest degree. It swims over the broad rivers, attacks the cattle in the very inclosures, and when pressed with hunger spares not even mankind.

IV. **F. DISCOLOR**, the **BLACK TIGER**, or **COUGUAR NOIR** of Buffon, is covered with short very glossy hairs of a dusky or brownish

brownish black colour; the throat, belly, and inside of the legs, whitish. It grows to the size of a heifer of a year old, and has vast strength in its limbs. It inhabits Brasil and Guiana; and is a cruel and fierce beast, but happily is a scarce species.

V. F. JUBATA, the HUNTING LEOPARD, is of the size of a large greyhound, of a long make, with a narrow chest and long legs. The colour of the body is of a light tawny brown marked with numbers of small round black spots; the neck is shaggy, having a mane four or five inches long; the hair on the belly is of the same length, and the tail is longer than the body. It inhabits India, where it is tamed and trained for the chase of antelopes.

VI. F. LEO, the LION, is principally an inhabitant of Africa, but is also found, though far less plentiful, in the hotter regions of Asia. It is, however, in the interior of Africa that he exerts his greatest ravages, and attains his highest perfection. A lion of the largest size has been found to measure about eight feet from the nose to the tail, and the tail itself about four feet; the general colour is a pale tawny, still paler or more inclining to white beneath; the head is very large, the ears rounded, the face covered with short or close hair, the upper part of the head, the neck, and shoulders, coated with long shaggy hair, forming a pendent mane; on the body the hair is short and smooth; the tail is terminated by a tuft of blackish hair. The lioness, which is smaller than the lion, is destitute of the mane, and is of a whiter cast beneath. The lion, like the tiger, frequently conceals himself in order to spring on his prey, bounding to the distance of a great many feet, and seizing it with his claws. His strength is prodigious: it has been even affirmed, that a single stroke of his paw is sufficient to break the back of a horse; and that he carries off with ease a middle-sized ox or buffalo. He does not often prey in open sunshine, but commences his depredations at the close of day. The roaring of the lion, when in quest of prey, resembles the sound of distant thunder; and, being re-echoed by the rocks and mountains, appals the whole race of animals, and puts them to sudden flight; but he frequently varies his voice into a hideous scream or yell: he is supposed to be destitute of a fine scent, and to hunt by the eye alone. The lion is commonly said to devour as much as will serve him for two or three days, and when satiated with food, to remain in a state of retirement in his den, which he seldom leaves except for the purpose of prowling about for his prey. His teeth are so strong that he breaks the bones with perfect ease, and often swallows them together with the flesh; his tongue, as in other animals of this genus, is furnished with reversed prickles; but they are so large and strong in the lion as to be capable of lacerating the skin. The lioness is said to bring forth in the spring, in the most sequestered places, and to produce but one brood in the year. The young are four or five in number, which the parent nurses with great assiduity, and attends in their first excursions for prey. When brought into Europe lions have been known to breed even in a state of confinement; instances of which are recorded by some of the older naturalists. In the Tower of London also, examples of a similar nature have occurred. The young animals are scarcely so large as small pug dogs, and are said to continue at the teat about the space of a year, and to be five years in coming to maturity. Lions have sometimes constituted a part of the established pomp of royalty in the eastern world. The monarch of Persia, as we are informed by Mr. Bell, in his travels, had, on days of audience, two large lions chained on each side the passages of the hall of state, being led thither, by proper officers, in chains of gold. The Romans, struck with the magnificent appearance of these animals, imported them in vast numbers from Africa, for their public spectacles. Quintus Scævola, according to Pliny, was the first in Rome who exhibited a combat of lions; but Sylla the dictator, during his prætorship, exhibited a hundred lions; and after him Pompey the Great exhibited no less than 600 in the grand circus, viz. 315 males, and the rest females; and Caesar the dictator 400. The Romans, says Mr. Shaw, brought many more lions out of Libya for their public shows, than are now to be found in that country. The lions in Turkey, Persia, and the Indies, are also said to be less numerous than formerly. As this formidable and courageous animal makes a prey of most other animals, and is himself a prey to none, this diminution in the number of the species can be owing to nothing but an increase in the number of mankind: for the strength of this king of beasts is not a match for the dexterity and address of a negro or Hottentot, who will often dare to attack him face to face, and with very slight weapons. The

ingenuity of mankind augments with their number; that of other animals continues always the same. All the noxious animals, as the lion, are reduced to a small number, not only because mankind are become more numerous, but likewise because they have become more ingenious, and have invented weapons which nothing can resist. This superiority in the numbers and industry of mankind, at the same that it has broke the vigour of the lion, seems likewise to have enervated his courage. This quality, though natural, is exalted or lowered according to the good or bad success with which any animal has been accustomed to employ his force. In the vast deserts of Zaara, in those which separate the Negroes and Moors, between Senegal and the boundaries of Mauritania; in those uninhabited regions above the country of the Hottentots; and, in general, all the meridional parts of Africa and Asia, where mankind have disdained to dwell, lions are still as numerous and ferocious as ever. Accustomed to measure their strength by that of all other animals which they encounter, the habit of conquering renders them haughty and intrepid. Having never experienced the strength of man, or the power of his arms, instead of discovering any signs of fear, they disdain and set him at defiance. Wounds irritate, but do not terrify them: they are not even disconcerted at the sight of numbers. A single lion of the desert has been known to attack a whole caravan; and if, after a violent and obstinate engagement, he found himself weakened, he retreats fighting, always keeping his face to the enemy. On the other hand, the lions which live near the villages or huts of the Indians or Africans, being acquainted with man and the force of his arms, are so dastardly as to fly and leave their prey at the sight of women or children. This softening in the temper and disposition of the lion, shews that he is capable of culture, and susceptible, at least to a certain degree, of the impressions that he receives: accordingly, history informs us of lions yoked in triumphal chariots, trained to war, or the chase; and that, faithful to their masters, they never employed their strength or courage but against their enemies. It is certain, that a lion taken young, and brought up among domestic animals, will easily be accustomed to live and sport with them; that he is mild and caressing to his master, especially when he is young; and that, if his natural ferocity sometimes breaks out, it is rarely turned against those who have been kind to him. But, as his passions are impetuous and vehement, it is not to be expected that the impressions of education will at all times be sufficient to balance them: for this reason it is dangerous to let him suffer hunger long, or to vex him by ill-timed teazings: bad treatment not only irritates him, but he remembers it long, and meditates revenge. On the other hand, he is exceedingly grateful, and seldom forgets benefits received. He has been often observed to disdain weak or insignificant enemies, to despise their insults, and to pardon their offensive liberties. When led into captivity, he will discover symptoms of uneasiness, without anger or peevishness: on the contrary, his natural temper softens, he obeys his master, caresses the hand that gives him food, and sometimes gives life to such animals as are thrown to him alive for prey: by this act of generosity he seems to consider himself as for ever bound to protect them; he lives peaceably with them; allows them a part, and sometimes the whole, of his food; and will rather submit to the pangs of hunger, than fill his stomach with the fruit of his beneficence. The lion is not a cruel animal: he kills rather from necessity than choice, never destroying more than he eats; and whenever his appetite is satisfied, he is mild and peaceable. For his ordinary subsistence, he requires about 15 pounds of raw flesh each day. The aspect of the lion corresponds with the noble and generous qualities of his mind. His figure is respectable; his looks are determined; his gait is stately, and his voice tremendous. In a word, the body of the lion appears to be the best model of strength joined to agility. The force of his muscles is expressed by his prodigious leaps and bounds, often 20 feet at once; by the brisk motion of his tail, a single sweep of which is sufficient to throw a man to the ground; by the ease with which he moves the skin of his face, and particularly of his forehead; and, lastly, by the faculty of erecting and agitating the hair of his mane when irritated. See Plate LXIX.

VII. F. LEOPARDALIS, the LESSER LEOPARD of Pennant, resembles the Leopard, but is not half so large; the tail is shorter in proportion to its size, and tapers to a point; it has a large black spot on each side of the upper lip; the back sides and rump are covered with bright yellow hair, marked with small circular com-

pound spots; the face is spotted; the chin white; the breast is marked with small spots, and the belly is white spotted with black. One of this species from the E. Indies, was kept in the tower of London several years ago.

VIII. *F. LEOPARDUS*, the *LEOPARD*, differs from the panther and the ounce, in the beauty of his colour, which is a lively yellow, with smaller spots than those of the two latter, and disposed in groups. He is larger than the ounce, and less than the panther, being about four feet long, and the tail from two to two and a half feet. He inhabits Senegal and Guinea; and spares neither man nor beast. When beasts of chase fail, the leopards descend from the internal parts of Africa in crowds, and make great havoc among the numerous herds that cover the rich meadows of the lower Guinea. It tears its prey to pieces with both claws and teeth; but is always thin, though perpetually devouring. The panther destroys numbers of them.

IX. *F. LYNX CANADENSIS*, the *CANADIAN LYNX*, has pale yellow eyes, and erect ears tufted with long black hair. The body is covered with soft and long fur, cinereous tinged with tawny, or grey mixed with white, and marked with black or dusky spots, more or less visible in different subjects, dependent on the age or season in which the animal is killed: the legs are strong and thick; the claws large. It is about three times the size of a cat; though only about a foot high, and the tail is four inches long, tipped with black. This species inhabits the vast forests of North America. It is called in Canada le chat cervier, or le loup cervier, on account of its being so destructive to deer; which it drops on from the trees, like the puma, and, fixing on the jugular vein, never quits its hold till the exhausted animal falls through loss of blood. The English call it a wild cat. It is very destructive to the young pigs, poultry, and all kind of game. The skins are in high esteem for the softness and warmth of the fur; and great numbers are annually imported into Europe.

X. *F. LYNX CHAUS*, the *CASPIAN LYNX*, has a round head, a little more oblong than that of the common cat; shining restless eyes, with a most brilliant golden pupil; ears erect, oval, and lined with white hairs; their outside reddish, their summits tufted with black. The hairs are coarser than those of the cat or common lynx, but less so than those of the wolf. They are shortest on the head, but on the top of the back above two inches long. The colour of the head and body is a yellowish brown; the breast and belly of a bright brown nearly orange. The tail reaches only to the flexure of the leg; is thick and cylindric; of the same colour with the back, tipped with black, and thrice obscurely annulated with black near the end. In general appearance it has the form of the domestic cat.

XI. *F. LYNX VULGARIS*, the *COMMON LYNX*, is about two feet and a half long, and 15 inches high. He has a great resemblance to the common cat; but his ears are longer and tufted, and his tail much shorter: his head and body are of a greyish colour tinged with red; his hair is streaked with yellow, white, and black, colours. The lynx inhabits the vast forests of the north of Europe, Asia, America, and Japan. His eyes are brilliant, his aspect is soft, and his air is gay and sprightly. Like the cat, he covers his urine with earth; he howls something like the wolf, and is heard at a considerable distance; he does not run like the dog or wolf, but walks and leaps like a cat; he pursues his prey even to the tops of trees; neither wild eats nor squirrels can escape him; he lies in wait for stags, goats, hares, weasels, birds, &c. and darts suddenly upon them; he seizes them by the throat and sucks their blood, then opens the head and eats the brain; after this, he frequently leaves them and goes in search of fresh prey. The colour of his skin changes according to the season or the climate; the winter furs are more beautiful than those of summer. These furs are valuable for their softness and warmth: numbers are annually imported from North America, and the north of Europe and Asia; the farther north and east they are taken, the whiter they are, and the more distinct the spots.

XII. *F. ONCA*, *AMERICAN TIGER*, the *JAGUAR* of Buffon, is of a bright tawny colour; the top of the back marked with long stripes of black; the sides with rows of eye like annular spots, open in the middle, which is of the ground colour of the hair: the thighs and legs are marked with full spots of black, the breast and belly whitish; the tail is half the length of the body. This species, which grows to the size of a wolf, and even larger, inhabits the hottest parts of South America, from the isthmus of Darien to

Buenos Ayres. It is fierce, and destructive to man and beast. Like the tiger, it plunges its head into the body of its prey, and sucks out the blood before it devours it. It makes a great noise in the night, like the howling of a hungry dog; and is very cowardly. It is easily put to flight, either by the shepherds' dogs, or by a lighted torch, being very fearful of fire. It lies in ambush near the sides of rivers; and there is sometimes seen a singular combat between this animal and the crocodile. When the jaguar comes to drink, the crocodile, ready to surprise any animal that approaches, raises its head out of the water: upon which the former instantly strikes its claws into the eyes of this dreadful reptile, the only penetrable part, who immediately dives under the water, pulling his enemy along with it, where they commonly both perish.

XIII. *F. PARDALIS*, the *MEXICAN PANTHER*, or *OCELOT* of Buffon, has its head, back, upper part of the rump, and tail, of a bright tawny; a black stripe extending along the top of the back, from head to tail; and from the nostrils to the corners of the eyes, there also runs a stripe of black; the sides are whitish, marked lengthways with long stripes of black, hollow and tawny in the middle, in which are sprinkled some small black spots; the legs are whitish, varied with small black spots; and the tail is also varied with small spots near its base, and larger near the end, which is black. It is above four times the size of a large cat, and strongly made. It inhabits Mexico, California, the neighbourhood of Carthagen, and Brasil.

XIV. *F. PARDUS*, the *PANTHER*, is about the size of a large dog, and has a great resemblance to a domestic cat. The tongue is rough, and remarkably red; the teeth are strong and sharp; the skin is exceedingly beautiful, being of a yellow or bright tawny colour, variegated with roundish black spots, and the hair is short. Each spot is composed of four or five small spots, with a single spot in the centre. He has a cruel and ferocious aspect; his motions are brisk and lively; his cry resembles the growl of an enraged dog, but is more strong and rough. The panther inhabits Africa, from Barbary to the remotest parts of Guinea. The species is next in size to the tiger; next to it in cruelty, and in its general enmity to the animal creation: it is to Africa what the former is to Asia, with this alleviation, that it prefers the flesh of brutes to that of mankind; but when pressed with hunger, attacks every living creature without distinction.

XV. *F. SERVAL*, the *SERVAL*, has the upper part of the body of a dusky brown, interspersed with round black spots; the belly and the orbits of the eyes are white. This animal, which is very fierce and untameable, inhabits the woods in the mountainous parts of India and Thibet; where it lives in trees, and breeds in them. It scarcely ever descends on the ground; but leaps with great agility from tree to tree.

XVI. *F. TIGRIS*, the *TIGER*, according to some authors, is larger, and, according to others, somewhat less, than the lion. M. de la Landemagon assures us, that he has seen a tiger in the East Indies fifteen feet long, including undoubtedly the length of the tail, which, supposing it to be four feet, makes the body of the tiger about eleven feet in length. The skeleton preserved in the late royal academy at Paris, indicates that the animal was about seven feet long from the point of the muzzle to the origin of the tail; but then it must be considered that he was caught young, and lived all his days in confinement. The head of the tiger is large and roundish; and the ears are short, and at a great distance from each other. The form of the body has a great resemblance to that of the panther. The skin is of a darkish yellow colour, striped with long black streaks; the hair is short, excepting on the sides of the head, where it is about four inches long. The point of the tail is black, and the rest of it is interspersed with black rings. His legs and claws resemble those of a lion, only the legs are much shorter in proportion to the size of the animal. The tiger is more ferocious and savage than the lion. Although gorged with carnage, his thirst for blood is not appeased; he seizes and tears in pieces a new prey with equal fury and rapacity, the very moment after devouring a former one; he lays waste the country he inhabits; he neither dreads the aspect nor the weapons of men; slaughters whole troops of domestic animals; and attacks young elephants, rhinoceroses, &c. and sometimes even braves the lion himself. The tiger seems to have no other instinct, but a constant thirst after blood, a blind fury which knows no bounds or distinction, and which often stimulates him to devour his own young, and to

tear

tear the mother in pieces for endeavouring to defend them. He lies in wait on the banks of rivers, &c. where the heat of the climate obliges other animals to repair for drink. Here he seizes his prey, or rather multiplies his massacres; for he no sooner kills one animal than he flies with equal fury upon the next, plunges his head into their bodies, and drinks their blood. However, when he kills a large animal, as a horse or buffalo, he sometimes does not tear out the entrails on the spot, but, to prevent any interruption, drags off the whole carcass to the wood, with incredible swiftness. This is a sufficient specimen of the strength of this rapacious animal. Neither force, restraint, nor violence, can tame the tiger. He is equally irritated with good as with bad treatment: he tears the hand which nourishes him with equal fury, as that which administers blows: he roars and is enraged at the sight of every living creature. Almost every natural historian agrees in this horrible character of him. There is a sort of cruelty in his devastations, unknown to the generous lion; as well as a cowardliness in his sudden retreat on any disappointment. "I was informed (says Mr. Pennant) by very good authority, that in the beginning of this century, some gentlemen and ladies, being on a party of pleasure, under a shade of trees, on the banks of a river in Bengal, observed a tiger preparing for its fatal spring: one of the ladies, with amazing presence of mind, laid hold of an umbrella, and furlled it full in the animal's face, which instantly retired, and gave the company an opportunity of removing from so terrible a neighbour.

XVII. F. UNCIA, the OUNCE, is less than the panther; the tail is longer; the hair is likewise longer, and of a whitish grey colour, marked with irregular black spots. The ounce is easily tamed; and is employed in hunting in several parts of Asia, where dogs are very scarce. He has not the delicate scent of a dog; does not trace other animals by the smell: neither can he run them down in a fair chase; but lies in wait for their approach, and then darts upon them unawares. He leaps so nimbly, that he easily clears a ditch or a wall several feet high; besides, he often climbs trees, waits till some animal passes, and instantly leaps upon them. This method of catching their prey, is practised by the panther and leopard, as well as by the ounce. The ounce inhabits Barbary, Persia, Hyrcania, and China. It is under as much command as a setting-dog; returns at the least call, and jumps up behind its master. This animal is supposed to be the *Παυδαλις*; *μυωταρος*, or lesser panther of Oppian, and the panther of Pliny.

FELIU DE QUIXOLO, a port of Spain in Catalonia, on the sea-coast, 21 miles S. of Gerona.

FELIX, Str. an island in the Pacific Ocean, N. N. W. of Juan Fernandez.

FELL, DR. JOHN, a very learned English divine who entered a student at Christ church at Oxford in 1636. In 1648, he was ejected by the parliamentary visitors, being then in orders; and from that time to the restoration lived at Oxford a retired and studious life. He was installed canon of Christ church, in July 1660; and dean in 1661; in which places he did great services to the college, and reformed several abuses. He was consecrated bishop of Oxford in 1675; and had leave to hold his deanry in commendam, that he might continue his services to the college and university. He published several works, and died in 1686.

FELLA, CAPE, a cape of Naples, on the W. coast of Calabria Citra.

FELLEN, a town of Livonia, S. E. of Revel. Lon. 24. 5. E. Lat. 58. 22. N.

FELLEIN, a town of France, in the department of Creuse, and late province of Marche, 21 miles S. S. E. of Gueret.

FELLOWSHIP, or COMPANY, in arithmetic, is when two or more join their stocks, and trade together, dividing their gain, or loss, proportionably. See ARITHMETIC.

FELO DE SE, in law, one who is felon of himself; i. e. being of sound memory, and of the age of discretion, or 14 years, kills himself. A felo de se forfeits all chattels real and personal, which he has in his own right; and also all such chattels real whereof he is possessed, either jointly with his wife, or in her right; and also all bonds and other personal things in action, belonging solely to himself; and also all personal things in action, and entire chattels in possession, to which he was entitled jointly with another, on any account, except that of merchandize; but it is said that he shall forfeit a moiety only of such joint chattels as may be severed, and nothing at all of what he was possessed of as executor or administrator. Stamford. P. C. 183, 189. Plow. 243, 262. 3 Inst. 55.

FELONY, a crime denounced capital by the law. Felony (says Judge Blackstone,) in the general acceptation of the law, comprises every species of crime, which occasions at common law the forfeiture of lands or goods. This most frequently happens in those crimes for which a capital punishment either is or was to be inflicted: for those felonies that are called clergyable, or to which the benefit of clergy extends, were anciently punished with death in all lay, or unlearned, offenders; though now, by the statute law, that punishment is for the first offence universally remitted. Treason itself, says Sir Edward Coke, was anciently comprised under the name of felony; and in confirmation of this we may observe, that the statute of treasons, 25 Edw. III. c. 2, speaking of some dubious crimes, directs a reference to parliament; that it may there be judged, "whether they be treason or other felony." All treasons, therefore, strictly speaking, are felonies; though all felonies are not treason. And all offences, now capital, are in some degree or other felony: but this is likewise the case with some other offences which are not punished with death; as suicide, where the party is already dead; homicide by chance-medley, or in self-defence; and petit larceny, or pilfering; all which are (strictly speaking) felonies, as they subject the committers of them to forfeitures. So that, upon the whole, the only adequate definition of felony seems to be, an offence which occasions a total forfeiture of either lands or goods, or both, at the common law; and to which capital or other punishment may be superadded, according to the degree of guilt. To explain this farther: the word felony, or felonía, is of undoubted feudal original, being frequently to be met with in the book of feuds, &c. but the derivation of it has much puzzled the juridical lexicographers, Prataeus, Calvinus, and the rest: some deriving it from the Greek, *φύλος*, an impostor or deceiver; others from the Latin, *fallo*, *fefelli*, to countenance whence they would have it called felonía. Sir Edward Coke has given us a still stranger etymology; that it is crimen animo felleo perpetratum, "with a bitter or a gallish inclination." But all of them agree in the description; that it is such a crime as works a forfeiture of all the offender's lands or goods. And this gives a great probability to Sir Henry Spelman's Teutonic or German derivation of it: in which language indeed, as the word is clearly of feudal original, we ought rather to look for its signification, than among the Greeks and Romans. Felon then, according to him, is derived from two northern words; *fee*, which signifies the fief, feud, or beneficiary estate; and *lon*, which signifies price or value. Felony is therefore the same as pretium feudi, the consideration for which a man gives up his fief; as we say in common speech, such an act is as much as your life, or estate, is worth. In this sense it will clearly signify the feudal forfeiture, or act by which an estate is forfeited, or escheats, to the lord. To confirm this, we may observe, that it is in this sense, of forfeiture to the lord, that the feudal writers constantly use it. Felony may be without inflicting capital punishment as in the cases instanced of self-murder, excusable homicide, petit larceny; and it is possible that capital punishments may be inflicted, and yet the offence be no felony; as in case of heresy by the common law, which, though capital, never worked any forfeiture of lands or goods, an inseparable incident to felony. And of the same nature was the punishment of standing mute, without pleading to an indictment; which at the common law was capital, but without any forfeiture, therefore such standing mute was no felony. In short, the true criterion of felony is forfeiture: for, as Sir Edward Coke justly observes, in all felonies which are punishable with death, the offender loses all his lands in fee simple, and also his goods and chattels; in such as are not punishable, his goods and chattels only. The idea of felony is indeed so generally connected with that of capital punishment, that we find it hard to separate them; and to this usage the interpretations of the law do now conform. And therefore, if a statute makes any new offence felony, the law implies that it shall be punished with death, viz. by hanging as well as with forfeiture: unless the offender prays the benefit of clergy; which all felons are entitled once to have, unless the same is expressly taken away by statute. Felonies by statute are very numerous; they are set forth in alphabetical order in the Table of the 4to. edition of the Statutes.

FELT, a kind of stuff, which derives its consistence merely from being fulled or wrought with lees and size, without being either spun or woven. The mechanism of felting is equally simple and curious; though its theory is little understood, even by professional

professional hatters. As the surface of hair and wool is by no means smooth, but formed either of plates resembling the scales of fish, or of zones placed over each other, as we find in the structure of horns, it follows that hair or wool, when promiscuously entangled, cannot be easily disengaged, on account of its rough sides, which may be readily perceived, by drawing a hair between the fingers against the root-end. Thus, each inequality of surface accommodates itself to that of another hair, and forms at length a natural texture. Felt is made either of wool alone, or of a mixture of that article with camel's or other hair, and is used principally in the manufacturing of hats.

FELTRI, a town of Austria, capital of the Feltrin, 38 miles N. of Padua. Lon. 11. 55. E. Lat. 46. 3. N.

FELTRIA, in ancient geography, a town on the borders of Rætia towards Italy; now called Feltri.

FELTRIN, or **FELTRINO**, a mountainous district of Maritime Austria, in the Trevisan, at the foot of the Alps, 28 miles long and 10 broad.

FELUCCAS, [*felleu*, Fr. *felkon*, Arab.] small open boats with six oars; they are common in the Mediterranean, and have this peculiarity, that the helm may be applied either in the head or stern, as occasion requires.

FEMEREN, or **FEMERN**, a fertile island of Denmark, in the Baltic, three miles from the coast of Holstein; containing the town of Burg, and several villages. Lon. 11. 5. E. Lat. 54. 30. N.

FEMINEUS FLOS, a female flower. Linnaeus thus denominates a flower which is furnished with the pistillum, or female organ of generation, but wants the stamina or male organ. Female flowers may be produced apart from the male, either on the same root, or on distinct plants. The birch and mulberry are examples of the first case; willow and poplar of the second. See **BOTANY**.

FEMININE, in grammar, one of the genders of nouns. See **GENDER**. The feminine gender is that which denotes the noun or name to belong to a female.

FEMME COVERTE, in law, a married woman. See **COVERTURE**.

FEMME SOLE, an unmarried woman, whose debts, contracted before marriage, become those of her husband after it. A femme sole merchant, is where a woman, in London, uses a trade alone, without her husband, on which account she shall be charged without him.

FEMOE, a small island of Denmark between Zealand and Laland. Lon. 11. 32. E. Lat. 55. 1. N.

FEMORIS Os, the thigh bone. See **ANATOMY**.

FEMUR, the thigh. See **ANATOMY**.

FEN, a place overflowed with water, or abounding with bogs; the term is also applied to such boggy lands as are naturally disposed to produce coarse vegetables from the retention of water. In many parts of the kingdom since the introduction of a laudable spirit of improvement in agriculture, much valuable land has been redeemed both in England and Ireland from bogs and fens. Several statutes have been made for the draining of fens, chiefly in Kent, Cambridgeshire, Bedfordshire, and Lincolnshire; and by an act, 11 Geo. II. commissioners shall be appointed for the effectual draining and preserving of the fens in the isle of Ely, who are authorised to make drains, dams, and proper works thereon; and they may charge the landholders therein with a yearly acre-tax, and, in default of payment, sell the defender's lands. The fens in Lincolnshire and elsewhere in England, bring many advantages to the inhabitants. Fowls and fish are very plentiful in them. The pikes and eels are large and easily caught, but they are usually coarse. Ducks, mallards, and teals, are in such plenty as is scarce to be conceived. They are taken by decoys in prodigious flocks at a time, and sent to London market twice a week during the season.

FENCE, in gardening and husbandry, a wall, ditch, bank, or other inclosure, made round gardens, fields, woods, &c. In hot climates, where they have no occasion for walls to ripen their fruit, their gardens lie open, where they can have a water fence, and prospects; or else they are bounded with groves, which are much more pleasing to the sight than dead walls; but, in cold countries, we are obliged to have walls to shelter and ripen our fruit, although they take away much from the pleasant prospect of the garden. Brick walls are accounted the best and warmest for fruit; and these being built pannelwise, with pillars at equal dis-

tances, save a great deal of expence, as they can be built thinner than if they were made plain without the pannels; and, besides, these pannels, make the walls look the handsomer. Stone walls, however, on account of their durability, are to be preferred to brick, especially those of square hewn stones. Those that are made of rough stones, though they are very dry and warm, yet, by their unevenness, are inconvenient to nail up trees to, unless pieces of timber be laid in them here and there for that purpose. But, in large gardens, it is better to have the prospect open to the pleasure garden; which should be surrounded with a fosse, that from the garden the adjacent country may be viewed. Where the fosses are made round a garden situated in a park, they are extremely proper; because hereby the prospect of the park will be obtained in the garden, which renders those gardens much more agreeable than those that are confined. In places where there are no good prospects to be obtained from a garden, it is common to make the inclosure of park-paling; which, if well performed, will last many years, and has a much better appearance than a wall: and this pale may be hid from the sight within, by plantations of shrubs and evergreens; or there may be a quick hedge planted within the pale, which may be trained up, so as to be an excellent fence by the time the pales begin to decay. Fences round parks are generally of paling; which, if well made of winter fallen oak, will last many years. But a principal thing to be observed, is not to make them too heavy, else their own weight will cause them to decay: therefore the pales should be cleft thin; and the rails should be cut triangular, to prevent the wet lodging upon them; and the posts should be good, and not placed too far asunder. One of these pales will thus last upwards of forty years. Dr. Anderson, in his "Essays on Agriculture, &c." observes, that, "The fences that are most universally employed, are either stone dikes or hedges. Dikes, if well built, as effectually preserve a field from the intrusion of domestic animals, as any other kind of fence whatever; but they afford little warmth or shelter to the fields: whereas hedges, if good, answer both these purposes equally well. But the most material distinction between dikes and hedges is, that dikes are in their highest degree of perfection as soon as they are reared, and from that moment begin to tend towards decay; so that the person who builds this kind of fence immediately receives the full benefit thereof: whereas hedges, being at first weak and tender, stand in need of attention and care, and do not become a fence for several years after they are planted; and, as they continue to increase in strength, and gradually acquire a higher and higher degree of perfection, it is long before they begin to fall towards decay; so that they are, in general, infinitely more durable than dikes, although they are longer in becoming of use to the person who plants them. Which of these two kinds of fences may, upon the whole, be most eligible, must, in general, be determined by the circumstances and views of the possessor of the ground to be inclosed. Various kinds of plants have been recommended for constructing the common fences, of which we shall point out the principal: 1. The White-Thorn is the most proper for fences, as it grows quickly, is very durable, and makes a very handsome appearance. It thrives on any soil, where a ditch and a new bank are prepared for its reception, unless the soil consist entirely of sand or gravel: it will nevertheless grow even in such situations, if the planting be succeeded by heavy rains. 2. Black-Thorn is another excellent shrub for a fence: it is, however, much inferior to the white-thorn, as its growth is not so certain; and, where it thrives, its roots spread, and are apt to run in too much upon the land. For dead hedges and mending open places, the bushes of this plant are superior even to the white-thorn; they are likewise less liable to be cropped by cattle. 3. The Holly, which is indeed preferable to either of the plants above-mentioned; for, though its growth is slower, and more uncertain, yet where it succeeds, it amply compensates for the delay and expence incurred, by its thickness, height, and strength. The best mode of making a fence with these trees is, to plant them with the quick or white-thorn, in the proportion of one of the former to four of the latter. Both will flourish; and, as the hollies increase in size, the white-thorns may be pulled up: so that when the trees have attained their full growth, they will require the whole of the space occupied by the thorns, and will make a most durable fence. If any vacancies should intervene, they may be easily closed, by bending down, and covering the lower branches with earth: thus, they will shoot forth.

forth in the ensuing year, and form a barrier impenetrable to cattle. Beside these, alder, and even elder, make, in certain situations, excellent fences. If sticks or truncheons of the latter, from ten to twelve feet in length, be set in a sloping direction each way, so as to form a kind of chequer-work, they will grow speedily, and continue for several years. This plant is excellently adapted to watery places, as its lowest roots are continually spreading, and thus prevent the banks on which they stand, from being undermined, or washed away by the current. The last tree which we shall mention is the Horn-Beam. It is chiefly used in Germany for the purpose of fencing lands; and is propagated from sets or slips, which are planted on a parapet of earth, with a ditch on each side, in such a direction that every two plants may intersect each other. The bark is then scraped off the place where they meet, and which is covered with bands of straw: in consequence of this operation, the two plants become conjoined, and put forth horizontal slanting shoots, forming a kind of palisade; which, if lopped annually, will render every part of the fence equally impenetrable to men and cattle.

FENCE-MONTH, the month wherein deer begin to fawn, during which it is unlawful to hunt in the forest. It commences 15 days before midsummer, and ends 15 days after it. This month, by ancient foresters, is called defence-month.

FENCING, the art of making a proper use of the sword, either for attacking an enemy, or defending one's self. This art is acquired by practising with foils, called in Latin *rudes*: whence fencing is also denominated *gladiatura rudaria*. It is one of the exercises learnt in the academies. Pyrrard assures us, that the art of fencing is so highly esteemed in the East Indies, that none but princes and noblemen are allowed to teach it. They wear a badge or cognizance on their right arms, called in their language *esaru*; which is put on with great ceremony, like the badges of our orders of knighthood, by the kings themselves. Fencing is divided into two parts, simple and compound.

1. **FENCING, COMPOUND**, includes all the possible arts and inventions to deceive the enemy, and make him leave that part, we have a design on, bare and unguarded, upon finding we cannot come at it by force, nor by the agility of the simple play. The principal means hereof are, on the offensive side, feints, appeals, clashings, and entanglings of swords, half thrusts, &c.; and, on the defensive, to push in parrying. Of these a detail would be here useless, as they are only to be understood and acquired from personal instructions conjoined with practice.

2. **FENCING, SIMPLE**, is performed directly and nimbly, on the same line; and is either offensive or defensive. The principal object of the first, is whatever may be attempted, in pushing or making passes, from this or that point, to the most uncovered part of the enemy. The second consists in parrying and repelling the thrusts aimed by the enemy.

FEN-CRICKET. See **GRYLLUS**.

FENELON, FRANCIS DE SALIGNAC DE LA MOTTE, was of an ancient and illustrious family, and born at the castle of Fene-Jon in Perigord, in 1651. In 1689, he was appointed tutor to the dukes of Burgundy and Anjou; and, in 1695 was consecrated Archbishop of Cambray. After this, a storm rose against him, that obliged him to leave the court for ever, occasioned by his work entitled, "An Explication of the Maxims of the Saints concerning the Interior Life;" in which he seemed to favour the extravagant notions of Madam Guyon, and the principles of Quietism. A controversy on this occasion was for some time carried on between him and M. Bossuet, bishop of Meaux; which terminated in an appeal to the pope, who condemned the book, March 12th, 1699. Some allege that there was more of court policy than religious zeal in this affair; but be this as it may, the archbishop submitted patiently, and retiring to his diocese, performed the duties of his station, and led a most exemplary life. The work that gained him the greatest reputation, and which will render his memory immortal, is his "Adventures of Telemachus;" the style of which is natural, the fictions well contrived, the moral sublime, and the political maxims tending all to the happiness of mankind. Hence it is thought, as the printing of this work was stopped at Paris, that the prelate's heresy was rather in politics than religion; and though his disgrace was prior to this work, he had, while he was tutor to the young princes, taught them the same principles asserted and exemplified in Telemachus.

Fenelon died in 1715; and a collection of all his religious works was afterwards printed at Rotterdam, under the care of the Marquis Fenelon his grand nephew, when ambassador to the States-General.

FENERI, the capital of Chiampa.

FENESTRELLE, a town of Piedmont, in the Vaudois, 18 miles W. of Turin.

FENNEL, in botany. See **ANETHUM**.

FENNEL FLOWER. See **NIGELLA**.

FENUGREEK. See **TRIGONELLA**.

FEOD, or **FEUD**, is defined to be a right which a vassal hath in lands or some immovable thing of his lord's, to use the same, and take the profits thereof hereditarily, rendering unto the lord such feudal duties and services as belong to military tenure, &c. and the property of the soil always remaining to the lord. Pontoppidan says, that *odh* in the northern languages is the same word with *proprietas*, and all with *totum* in the Latin: hence, *odhall* signifies right; and hence we may conjecture, that the udal right in Finland is derived. By transposing these two syllables, we form the word *allodh*; whence we have the etymology of the *allodium* or absolute property claimed by the holders of fiefs or feuds; and combining *odh*, signifying property, with the word *fee*, signifying, a conditional stipend or reward, we have the word *feodh*, signifying, a property given by way of stipend or reward upon a certain condition." See **FEODAL SYSTEM**.

FEODAL SYSTEM, the constitution of Fiefs or Feuds. About 12 centuries ago, this system was so universally received in Europe, that Sir Henry Spelman calls it "the law of nations in our western world." Hence it deserves our attention in a particular manner; a knowledge of the different feuds being indispensably requisite for a proper understanding either of the civil government of our own country, or the laws by which its landed property is regulated. The military policy of the Celtic or northern nations, known by the names of Goths, Vandals, Franks, Huns, and Lombards, furnished the original constitution or system of feuds. These people pouring out in vast multitudes from the same officina gentium, or store-house of nations, over-ran all the European countries on the declension of the Roman empire. They brought the feudal system along with them from the countries out of which they emigrated; and, supposing it to be the most proper method of securing their new conquests, they introduced it into their more southerly colonies. According to this system, the victorious general allotted considerable tracts of land to his principal officers; while they, in like manner divided their possessions among the inferior officers, and the common soldiers who were thought to be the most deserving. Allotments of this kind were named *feoda*, fiefs, fees, or feuds, from a combination of words, in the language of these barbarians, signifying a reward or stipend bestowed on certain conditions. The condition upon which these rewards were given was, that the possessors should faithfully serve the person from whom they were received, both at home and abroad, in the military way. To this they engaged themselves by a *juramentum fidelitatis*, or oath of fealty, in the event of a breach of which, either by not performing the service agreed upon, or by deserting their lord in time of battle, &c. the lands were to return to their original possessor. The possessors of feudal allotments thus became interested in the defence of them; and not only the receivers, but those who gave them, were equally and mutually bound to defend their possessions, none of them being able to pretend any right but that of conquest. For this purpose, government and subordination were absolutely necessary; it being impossible to conduct any system of defence where every thing was tumultuous and irregular. Every person, therefore, who was a feudatory, *i. e.* who had received lands, was bound to do every thing in his power to defend the lord of his fee; while, on the other hand, the latter was no less subordinate to his immediate superior; and so up to the prince himself. In like manner a reciprocal bond of defence existed down from the prince to the lowest feudists. Such were the foundations on which the feudal system was properly established: and the natural consequence was, a military subjection throughout the whole community. The prince could always collect an army of feudatories ready to defend not only the kingdom in general, but the particular possessions of each person; and the propriety of this constitution was soon apparent in the strength which these newly erected kingdoms acquired,

ed, and the valour with which their conquests were defended. Besides these feudal grants, however, which were held only on the terms of military service above mentioned, there were others called allodial, which were given upon more enlarged principles. To these every freeman had a title; and could not only claim his territory as well as the rest, but dispose of it at his pleasure; and this freedom was denominated allodality. These allodials, however, were not exempted from military service. A part of their freedom consisted in liberty to go to the wars; for this, in the barbarous times we speak of, was the only way to acquire any degree of renown. Only the slaves were destined to follow the arts of peace; while every free person was not only at liberty to defend his country, but under an obligation to do it in case of any urgent necessity. Thus there was a feudal and a national militia. The free people only were allowed to possess property; the feudal vassals constituted the army, properly so called; while the national militia was composed of the allodial proprietors. This allodality, however, was not confined to landed property, but included likewise moveable estates or money; so that proprietors of the latter kind were obliged also in times of danger to bear arms and appear in the field. Between the feudal and allodial proprietors, however, there was this farther difference, that the latter had no concern with any private quarrels which might take place among the lords themselves; so that they were never obliged to appear in the field unless when called forth by the sovereign against the enemies of the nation at large. This circumstance we might suppose to be an advantage, but it ultimately operated otherwise; becoming the means of changing the allodial right into a feudal tenure. For some time the holders of fiefs had an eminent advantage over the allodial proprietors. This was owing to the imperfection of government in those days: so that the nobles had it in their power to revenge their own quarrels, while the weak were equally exposed to the insults of both parties. The lord and his vassals therefore were always formidable; but the allodial proprietors had scarce any means of defending themselves. The reasons of this were, 1st, that the law did not allow them to commit any hostilities; and 2dly, they were too distant and unconnected to form any proper league for mutual defence; and hence proceeded the necessity of converting allodial property into feudal tenure. This was indeed owing in a great measure to the absurdity and violence of the times, by which gifts of property, burthened with service, and which might return to the person who granted them, were rendered superior in value to the absolute and unconditional possession of a subject. Other considerations likewise contributed to produce the same effect. As in those dark ages no right existed but what had its origin in conquest, it thence followed, that the greatest conqueror was the most honourable person. The king, in whom the whole exploits of the community centred, as being their head, was the most honourable person; all others derived from him that portion of honour which they enjoyed, and which was most nicely adjusted in proportion as they approached him. Allodial proprietors therefore having no pretensions of this kind, were treated with contempt as a kind of poltroons. From this disagreeable situation they wished to free themselves; by converting their allodial property into feudal tenures; while the princes, supposing it their interest to extend those tenures as much as possible, discouraged the allodial possessions. As the feudists supported the importance of the nation and dignity of the monarch, it was not thought proper to allow the allodial proprietors any greater compensations than what were given to vassals in similar cases. Thus they were exposed to continual mortifications in the courts of justice; they were neglected by the king; denied sufficient protection from the laws; exposed not only to continual insults, but to have their property on all occasions destroyed by the great; so that they were without resource except from the feudal tenures, and were obliged even to solicit the privileges, which were bestowed in other cases on vassals. In these unhappy circumstances, they were glad to yield up their lands to any superior whom they thought most agreeable, and to receive them back from him as a feudal gift. Thus the landed property was every where changed into feudal tenures, and fiefs became universal. See FEOD, FIEF, and TENURE. For some time the feudal system was not only useful in itself, but honourable in its principles; but this continued no longer than while the importers of it into Europe adhered to their original simple and noble maxims. During that period, the

lord exercised his bounty to the vassal, which the latter repaid by acts of gratitude: so that the intercourse betwixt them was of the most affectionate kind; and this gave rise to what are called the Feodal Incidents. The expectants of fiefs were educated in the hall of the superior, while the tenures were precarious, or only for life: and even when they became hereditary, the lord took care of the son and estate of his deceased vassal; not only protecting his person, but taking charge of his education, and directing the management of his affairs. He took pleasure in observing his approach to maturity; and when he came of age, never failed to deliver to him the lands, with the care of which had he been entrusted, and which he had been careful to improve. This was called the incident of wardship. The incident of relief was founded upon the gratitude of the vassal; who, upon entering on his fief, brought a present to his lord, as an acknowledgment of his care of him during the early part of his life, and in order to conciliate his future regard. The incident of marriage proceeded also upon the principle of gratitude on the part of the vassal. The latter, conscious of the favours he had received, did not choose to ally himself with a family inimical to his chief: while the superior himself, ambitious to aggrandise and augment the importance of his family, sought the most advantageous match for his vassal. Sometimes the superior himself was reduced in his circumstances by war or other accidents: but from whatever cause his distress proceeded, even though it had arisen from his own extravagance or prodigality, or when only destitute of means to support his ambition or grandeur, his vassals were bound to support and relieve him according to their circumstances; and this was called the incident of aid. The incident of escheat took place on the part of the vassal, when, through cowardice, treachery, or any remarkable misbehaviour, he rendered himself unworthy of his fief. In that case, the taking of it from him, and giving it to one more worthy, was called an escheat. While the lords and vassals thus vied with one another in mutual acts of friendship and benevolence, universal happiness, liberty, and activity, were diffused through the society. The vassals behaved courteously towards the retainers, who were immediately below them; while they again were courted by the lords as constituting their importance and strength; the lords, lastly, giving a like importance and dignity to the sovereign himself. Thus a regular, powerful, and compact system of government took place; an unanimity and attention pervaded the various departments of state; so that while the subjects were free, the nation at large was formidable. During this happy state of affairs, the members of the national assembly in every country in Europe appeared there in arms, whether they came personally, or by their representatives. Such particularly was the case under the Anglo-Saxon government; and the happiness they at that time enjoyed made the oppression and tyranny of the Normans appear the more intolerable. In process of time, the state of society began to suffer a remarkable alteration. The high and disinterested notions, from which the happiness above mentioned, took its origin, declined; the romantic ideas of chivalry ceased; and much more interested notions of property came in their stead. The separation of the interest of the lords from their vassals was the first step towards the destruction of the feudal system. Thus the incidents, which had hitherto promoted their happiness, now did the very reverse. Property being looked upon as a distinction superior to personal merit, introduced the most mercenary views. In consequence of these, the infant ward, the care of whom was wont to be considered as a sacred and honorary trust, was now only looked upon as a mean of procuring emolument to the superior. The latter regarded the profits of his vassals as so many diminutions of his own wealth. Instead of taking care to improve the state of his ward as formerly, he impoverished it; not only neglecting the education of the heir, but offering insults to himself; inasmuch that the relations of the unfortunate vassal were often obliged to ransom from the avaricious superior both his person and effects. By merchandise of this kind the coffers of princes were filled, and wardships let out to strangers, who might exercise their rapacity with greater freedom. When the vassal at last attained the years of maturity, he came to the possession of his lands without any of that joy and festivity which usually took place on the occasion. He received an inheritance wasted and impoverished, while new grievances daily presented, to augment the horrors of his situation. All the incidents, which formerly were so many expressions of gratitude

gratitude on the part of the vassal, were now changed into taxes exacted at the pleasure of the lord. Before the vassal was invested in his land, the superior exacted from him a certain sum or gift, to be measured only by his own rapacity; and in case of delay or inability to pay this demand, the superior continued in possession of the estate. Such scandalous oppression could not but produce the greatest discontent and clamour. Applications were made to the law without success; nor were even the laws regarded which were fabricated on purpose for their relief. The incident of marriage now proved a source of the most dreadful oppression. The lord assumed a right of marrying his vassal to whom he pleased; and he not only exerted this right himself, but would sell it to a stranger, or allow the vassal to buy it himself; while the penalty annexed to a marriage without the consent of the superior involved no less punishment than the loss of the estate itself, or some such grievous infliction as for a crime of the first magnitude. The case was still worse with a female ward; whose beauty and accomplishments became a source of gain to the superior, or were sacrificed to please his whim or caprice; so that her relations were frequently obliged to buy from him the privilege of marrying her to the person she or they thought most proper. In like manner the aid, which was formerly a voluntary gift from the vassal in cases of distress happening to his lord, now became an unavoidable tax. An aid formerly was demanded when the superior's eldest daughter was married, when his eldest son was knighted, or when he himself was taken prisoner in battle. These were the only legal causes of making a demand of this kind; but in the subsequent times of degeneracy, the most frivolous pretences were very frequently made use of by the prince to oppress the lords, and by the lords to oppress their vassals; demanding subsidies at pleasure, which their inferiors were always obliged to comply with. Lastly, the escheat, which in former times took place only in cases of cowardice, treachery, or some other heinous crime, was now inflicted on the most trifling occasions. If the vassal happened to be too long in attending the court of his superior to take the oath of fealty; if he committed any action which could in the least be construed an infringement of the oath; if he neglected to give his lord warning of any misfortune which he might suppose was about to befall him; revealed anything concerning him; made love to his sister or daughter, &c. or even if he should grant a tenure of land to another person in form different from that in which he held his own; all these, nay others still more ridiculous, were judged sufficient reasons for the superior to seize on the estate of the vassal, and involve him and his family in ruin. Notwithstanding these oppressions, however, the vassal was still obliged to submit to his lord; to own him as his superior; and even, in appearance, to pay him the same respect as formerly, when unanimity and cordial affection subsisted between them. Still he was obliged to perform the same military service; because failure in that respect would have subjected him to forfeiture of lands according to the original agreement. A vast difference, however, now took place in the valour and activity which inspired the army. The vassals, forced into the field with desponding hearts, were indifferent as to the success of the cause in which they were engaged, and frequently obstructed instead of forwarding the operations of the field. Hence the sovereign found himself embarrassed; and, though nominally at the head of a martial and powerful people, was frequently unable to effect any thing by reason of the mutual hatred and dissension which every where prevailed. Thus the feudal states of Europe became unnaturally weak: a remedy was necessary; and it is remarkable, that the same remedy was applied all over the continent. This was, the making fiefs hereditary, which till now had only been granted for a long term of years; and, in return, burdening the lands with a certain number of soldiers, which were not to be refused upon any pretence whatever. Hence was derived the tenure of knight-service. A certain portion of land, burthened with the service of one soldier or knight, was called a knight's fee; and thus an estate, furnishing any number of soldiers, was said to contain as many knight's fees; so that now the manors, baronies, &c. became powerful according to the number of soldiers they were bound to furnish. In the grants from the crown, the nobility were obliged to furnish a certain number for the service of the sovereign; and in those from the nobility to their vassals, the like service was required. Even the commons who had grants from the crown furnished a certain proportion of

knights. The force of the nation was called into action by grants in capite, or from the sovereign and nobility. A numerous and powerful army was instantly assembled, and at once ready for action. Of this army the king was the general, the nobility the officers, and the vassals soldiers; the whole being exactly arranged, and capable of entering upon any expedition without the least delay. Thus a remedy was found in some measure for the weakness of the feudal sovereigns: but though the knights tenure could accomplish this, it could not bring back the former affection and cordiality, which had subsisted between the various ranks of people. On the contrary, by uniting them more firmly to one another by legal ties, it rendered matters rather worse. The oppression originating from the operation of the feudal incidents, still continued with unremitting violence. The grants of knights tenure were attended with the same oaths of homage and fealty; the same incidents of relief, wardship, marriage, aid, and escheat, with the feudal tenures. The princes promised to abate somewhat of their rigour in demanding the feudal perquisites, but did not keep their word. Laws were occasionally promulgated, and for some time had an effect; but palliatives soon became ineffectual, and a new state of weakness began to commence. The two remarkable eras in the feudal history are, the time before the invention of knight-service. (See KNIGHT), and that during which it continued. Fiefs were in a state of fluctuation from the destruction of the Roman empire till the ninth century; but they were rendered perpetual in France about A. D. 877, and were generally become so in every country in Europe about the beginning of the tenth. Du Cange, *voce Militia*, gives us an example of a knight-fee in A. D. 880. By the year 987, when Hugh Capet was raised to the throne of France, knight-service was become general all over Europe, and was introduced into England after having made its appearance in other countries. Dr. Stuart informs us, that it appears from the records of Malcom IV. in 1153, that knight service was known in Scotland, and that it was a novelty at that time. He thinks it even probable, that it was known in the time of David I. In England, however, there have been several doubts and inquiries among the learned concerning the introduction of the feudal laws. Many are of opinion, that they were introduced by William the Conqueror; and, consequently, that they were entirely unknown to the Anglo-Saxons: but others think, that they existed among the latter in the same form under which they were continued by the Normans. Dr. Stuart is of opinion, that the Saxons who settled in England could not be strangers to fiefs. He supposes the conformity of manners, which undoubtedly prevailed between the Saxons and other Barbarians, a sufficient proof that the hereditary grant of land, as well as the fluctuating state of feudal tenures which preceded it, were known to the former. Collateral proofs are derived from the spirit and tenure of the Anglo-Saxon laws, but especially from the grants of hereditary estates on condition of military service. The condition of the fiefs under the Anglo-Saxons was very different from what it was afterwards. In their times we find no mention made of those oppressions of which so much notice has already been taken; and this may easily be accounted for from the alteration of the feudal spirit in different ages. During the time that a warm and generous affection subsisted between the feudal superiors and vassals, the incidents were marks of generosity on the one part, and gratitude on the other; but as soon as a variance had taken place, by reason of the interested disposition which the introduction of luxury produced, the same incidents became sources of the most flagrant oppression. This was remarkably the case in the time of William the Conqueror; and, during the reign of king John, matters were come to such a crisis, that the people every where complained loudly, and demanded the restoration of the laws of Edward the Confessor. "What these laws of Edward the Confessor were (says Mr. Hume,) which the English every reign during a century and an half desired so passionately to have restored, is much disputed by antiquarians; and our ignorance of them seems one of the greatest defects of the English history." Dr. Stuart has offered an explanation, in a conjecture, that "by the laws or customs of the confessor, that condition of felicity was expressed which had been enjoyed during the fortunate state of the feudal association. The cordiality, equality, and independence, which then prevailed among all ranks in society, continued to be remembered in less prosperous times, and occasioned an ardent desire for the revival of those laws and usages which were the sources of so much happiness

happiness." Besides the great distinction between the state of fiefs under the Anglo-Saxons and under the Normans, they were no less distinguished by the introduction of knight-service. Hitherto the refinement of the English had been obstructed by the invasion of the Danes, and the insular situation of the kingdom; but after the Norman conquest the fiefs were made perpetual. Still, however, the knight-fee and knight-service were altogether unknown. William, the sixth duke of Normandy, was well acquainted with every thing relating to fiefs; for that duchy had experienced all the variety incidental to them from the time of its being granted to Rollo by Charles the Simple A. D. 912, to 1066, when William conquered England. On this event, a number of forfeitures took place among those who had followed the fortune of Harold II. Their estates were to be disposed of at the pleasure of the conqueror; and it was natural to suppose that he would follow the method practised in his own country. Hence the origin of knight-service in England. A grant of land, to any person whatever, was estimated at a certain number of knights fees; and each of these required the service of a knight. The grants of lands were even renewed to the old tenants under this tenure; so that by degrees the whole military people in the kingdom acquiesced in it. To accomplish this, Domesday Book is supposed to have been compiled, which contained an exact account of all the landed property of the kingdom. Hence it is to be concluded, not that William introduced fiefs into England, as some have imagined, but that he brought them to their ultimate state of perfection by the introduction of knight-service. This is evident from the laws enacted during his reign. In these it is not only mentioned that knight-service was enacted, but it was done expressly with the consent of the common council of the nation; which at that time was equivalent to an act of parliament. The invention of knight-service proved generally agreeable; for as only a few of the Anglo-Saxon fiefs were hereditary, the advancement of the rest to perpetuity, under the tenure of knight-service, must have been accounted an acquisition of some importance; as not only augmenting the grandeur and dignity of the sovereign, but securing the independence of the subject, and improving his property. In the happy state of the feudal association, there was indeed no necessity for the knight's fee; but when the discordance and oppression so often mentioned began to take place, it became then necessary to point out particularly every duty of the vassal, as well as of the lord; and this was fully done by the invention of knight-service. The nobles possessed duchies, baronies, and earldoms; which extensive possessions were divided into as many fees, each of them to furnish a knight for the service of the king, or of the superior: so that every feudal state could command a numerous army and militia to support and defend it in case of any emergency. The knights were also bound to assemble in complete armour whenever the superior thought proper to call, and to hold themselves in readiness whenever the king or superior found it convenient to take the field; so that thus the militia might be marched at the shortest notice to defend or support the honour of the nation. The knights were usually armed with a helmet, sword, lance, and shield; and each was obliged to keep a horse. This last requisite was owing to the contempt into which the infantry had fallen, through the prevalence of tournaments and luxuries of various kinds, though it was by means of the infantry that the barbarians had originally distinguished themselves in their wars with the Romans, and become able to cope with these celebrated warriors. All proprietors of fees or tenants by knight service fought on foot: the cavalry were distinguished by the name of battle; and the success of every encounter was supposed to depend on them alone. They only were completely armed; the infantry, being furnished by the villages under the jurisdiction of the barons, had at first only bows and slings; though afterwards they were found worthy of much greater attention. While the feudal association remained in perfection, the superior could at any time command the military service of his vassals; but in the subsequent degeneracy this service could neither be depended upon when wanted, nor was it of the same advantage when obtained as formerly. The invention of knight-service tended in a great degree to remedy this inconvenience. Those who were possessed of knights fees were now obliged to remain 40 days in the field at their own expense; and this without exception, from the great crown vassals to the smallest feudatories; but if longer service was required, the prince was obliged to pay his troops. In those times, however,

when the fate of nations was frequently decided by a single battle, a continuance in the field for 40 days was sufficient for ordinary occasions. Thus matters seemed once more to be restored nearly to their former state. It was now, as much as ever, the interest of the nation to act with unanimity in its defence, not only against foreign enemies, but against the tyranny of the prince over his subjects, or of one part of the subjects over the other. New inconveniences, however, soon began to take place, owing to the gradual improvements in life and the refinement of manners. From the first institution of military service, a fine had been accepted instead of actual appearance in the field. In the times of barbarity, however, when men accounted rapine and bloodshed their only glory, there were but few who made an offer of this compensation; but as wealth and luxury increased, and the manners of the people became softer, a general unwillingness of following the army into the field became also prevalent. A new tenure, called *escuage*, was therefore introduced; by which the vassal was only obliged to pay his superior a sum of money annually instead of attending him into the field. See *ESCUAGE*, and *KNIGHT-SERVICE*. Hence originated taxes and their misapplication; for as the king was lord paramount of the whole kingdom, it thence happened, that the whole *escuage* money collected throughout the nation centered in him. The princes then, instead of recruiting their armies, frequently filled their coffers with the money, or dissipated it otherwise, hiring mercenaries to defend their territories when threatened with danger. These being composed of the dregs of the people, and disbanded at the end of every campaign, filled all Europe with a disorderly banditti, who frequently proved very dangerous to society. To avoid such inconveniences, standing armies were introduced, and taxations began to be raised in every European kingdom. New inconveniences however arose. The sovereigns in most of these kingdoms, having acquired the right of taxation, as well as the command of the military power, became completely despotic: but in England the sovereign was deprived of this right by *Magna Charta*, which was extorted from him, so that, though allowed to command his armies, he could only pay them by the voluntary contributions of the people, or their submitting to such taxations as were virtually imposed by themselves. The author of *A View of Society in Europe*, has traced the remote sources of the feudal laws in an elegant and spirited manner. (Book I. Chap. II. Sect. I.) Tacitus informs us, that the individuals of each of the German nations cultivated by turns a track of land proportionable to their number, for the use of the whole; after which each individual received such an allotment of the cultivated track as his dignity required. These nations had not altered their political principles at the time they overran the Roman empire; and hence the provinces of it were then divided after the same manner. The most considerable allotment was bestowed on the king, as the most dignified person in the community, and this allotment was styled his domain; while the shares of citizens and warriors, which were likewise in proportion to the merit or dignity of each, constituted what was called *allodiality*. But as it often happened that all the land was not exhausted by these partitions, what remained was considered as the property of the community, and in the barbaric codes was called the lands of the *fisc*. In such German nations as had thus obtained a settlement, it was necessary that there should be a more close connection betwixt the sovereign and the chiefs, as well as between the chiefs and people, than in others. This was effected by means of the lands of the *fisc*; for of these the sovereign took possession, dealing them out to the chiefs under the burthen of appearing in arms whenever he should please to call; while the chiefs in like manner dealt out lands to those called their retainers, who were also obliged to supply them with military assistance in cases of necessity. Hence a political system was founded, which had a prodigious effect on society in all those countries where it prevailed. The intention and tendency of this system was to render the nation independent both at home and abroad; for while the people were all armed in their common defence, individuals were also properly guarded against the attacks of despotism. The power of the chiefs, who formed a regular nobility, was a counterpoise to that of the sovereign; while the number of the retainers and vassals, constituting the greatness and power of the nobility, was a proper barrier against aristocratical oppression; for a chief who oppressed his vassals evidently acted against his own interest.

FEOFFMENT, in law, [from *feoffare*, to give one a feud,] is.

still directed and governed by the feudal rules; insomuch that the principal rule relating to the extent and effect of the feudal grant, *tenor est qui legem dat feudo*, is the maxim of the law with relation to feoffments, *modus legem dat donationi*. And therefore, as in pure feudal donations, the lord, from whom the feud moved, must expressly limit and declare the continuance or quantity of estate which he meant to confer, *ne quis plus donasse præsumatur, quam in donatione expresserit*; so, if one grants by feoffment lands or tenements to another, and limits or expresses no estate, the grantee (due ceremonies of law being performed) hath barely an estate for life. For, as the personal abilities of the feoffee were originally presumed to be the immediate or principal inducements to the feoffment, the feoffee's estate ought to be confined to his person and subsist only for his life; unless the feoffer, by express provision in the creation and constitution of the estate, hath given it a longer continuance. These express provisions are indeed generally made; for this was for ages the only conveyance, whereby an estate was created in fee simple, by giving the land to the feoffee, to hold to him and his heirs for ever; though it serves equally well to convey any other estate of freehold. But by the mere words of the deed the feoffment is by no means perfected: a very material ceremony remains to be performed, called livery of seizing; without which the feoffee has but a mere estate at will. See SEISIN.

FEOFFOR, and **FEOFFEE**. Feoffor is he who infeoffs or makes a feoffment to another of lands or tenements in fee simple; and feoffee is the person infeoffed, or to whom the feoffment is made. See FEOFFMENT.

FER DE FOURCHETTE, in heraldry, a cross having at each end a forked iron, like that formerly used by soldiers to rest their muskets on.

FER DE MOULIN, **MILRIND**, or **INKE DE MOULIN**, in heraldry, is a bearing supposed to represent the iron ink, or ink of a mill, which sustains the moving wheel.

FERABAD, or **FERABAT**, a town of Persia, in the province of Mezanderan, 12 miles from the Caspian sea, seated among the mountains which bound its S. coast.

FERABAD, or **FERABAT**, a town of Persia, one mile and a half from Ispahan, extending nearly three miles along the banks of Zenderoad.

FERÆ, in natural history, an order of quadrupeds, of which the distinguishing characters are, fore-teeth conic, usually six in each jaw; tusks longer; grinders with conic projections; feet with claws; claws subulate; food carcasses and preying on other animals: this order comprehends the following genera:

Canis,	Phoca,
Didelphis,	Sorex,
Erinaceus,	Talpa,
Felis,	Viverra,
Mustela,	Ursus,

which see.

FERÆ NATURÆ. Animals of a wild nature are those in which a man has not an absolute but only a qualified and limited property which sometimes subsists, and at other times does not subsist. And this qualified property is obtained either by the art and industry of man, or the impotence of the animals themselves, or by special privilege. A qualified property may subsist in animals *feræ naturæ*, by the art and industry of man, either by his reclaiming and making them tame, or by so confining them that they cannot escape and use their natural liberty; such as deer in a park, hares or conies in an enclosed warren, doves in a dovehouse, pheasants or partridges in a mew, hawks that are fed and commanded by the owner, and fish in a private pond or in trunks. These are no longer the property of a man than while they continue in his keeping or actual possession; but if at any time they regain their natural liberty, his property instantly ceases, unless they have *animus revertendi*, which is only to be known by their usual custom of returning. A man may have a qualified property in animals *feræ naturæ*, by special privilege; that is, he may have the privilege of hunting, taking, and killing them, in exclusion of other persons: under which head may be considered all those animals which come under the denomination of game. Here a man may have a transient property in these animals, so long as they continue within his liberty, and may restrain any strangers from taking them therein; but the instant they depart into another liberty, this qualified property ceases. 2 Black. 391. Larceny cannot be committed

of things *feræ naturæ*, while at their natural liberty; but if they are made fit for food, and reduced to tameness, and known by the taker to be so, it may be larceny to take them. 1 Haw. 94. See GAME.

FERALIA, in antiquity, a festival observed among the Romans on Feb. 21, or, according to Ovid, on the 17th Feb. in honour of the manes of their deceased friends and relations. Varro derives the word from *inferi*, the shades, or from *fero*, to carry; on account of a repast carried to the sepulchres of such as the last offices were that day rendered to. Festus derives it from *ferio*, on account of the victims sacrificed. Vossius observes, that the Romans called death *fera*, cruel, and that the word *feralia* might arise thence.

FERCALA, or **FORCULA**, a town of Africa, in Biledulgerid, 50 miles W. of Segilmessa. Lon. 4. 30. W. Lat. 31. 40. N.

FERDINAND V. king of Spain, who married Isabella of Castile, whereby that kingdom was united to the Spanish crown. This illustrious pair laid the foundation of the glory and power of Spain. The conquest of Granada, and the discovery of America by Christopher Columbus, make their reign a celebrated era in history. He died in 1516, aged 63.

FERDINAND NARONKA, an island of South America, on the coast of Brasil. Lon. 32. 43. W. Lat. 3. 56. S.

FERE, a town of France, in the department of Aisne, and late province of Picardy, famous for its powder-mill and school of artillery. It is seated at the conflux of the Serre and Oise, 75 miles N.E. of Paris.

FERENTARI, in Roman antiquity, were auxiliary troops, lightly armed; their weapons being a sword, bow, arrows, and a sling.

FERENTINO, or **FIORENTINO** (the ancient Ferentinum), a city of Italy, in the Campania of Rome, 44 miles S. E. of Rome.

FERENTINUM, in ancient geography, a town of the Hernici in Latium, which the Romans, after subduing that nation, allowed to be governed by its own laws: now called Ferentino.

FERETRIUS, a surname of Jupiter, from *ferendo*, because he had assisted the Romans, or *feriendo*, because he had conquered their enemies under Romulus. He had a temple at Rome, built by Romulus, to which the spolia opima were always carried.

FERETRUM, among the Romans, the bier used in carrying out the bodies of the dead, which duty was performed by the nearest male relations of the deceased: thus sons carried out their parents, brothers their sisters, &c.

FERGUSON, JAMES, an eminent experimental philosopher and mechanic, born in Scotland, of poor parents. At the earliest age his extraordinary genius began to exert itself. He first learned to read by overhearing his father teach his elder brother: and he had made this acquisition before any one suspected it. He soon discovered a peculiar genius for mechanics, on seeing his father use a lever. He pursued this study a considerable length, even whilst very young; and made a watch in wood-work, from having once seen one. As he had no instructor, nor any help from books, every thing he learned had all the merit of an original discovery; and such he believed it to be. As soon as his age would permit, he went to service; in which he met with hardships, which rendered his constitution feeble through life. Whilst he was servant to a farmer (whose goodness he acknowledges in the modest and humble account of himself, which he prefixed to his last publication), he frequently contemplated the stars; and began the study of astronomy, by laying down, from his own observations only, a celestial globe. His kind master, observing these marks of his ingenuity, procured him the countenance and assistance of his superiors. By their help and instructions, he went on gaining farther knowledge, and was sent to Edinburgh. There he began to take portraits; an employment by which he supported himself and family for several years, both in Scotland and England, whilst he was pursuing more serious studies. In 1743 he came to London, where he published some astronomical tables and calculations, and gave lectures in experimental philosophy, which he repeated with success throughout the kingdom. In 1754 he published a brief description of the solar system, with an astronomical account of the year of our Saviour's Crucifixion, 8vo.; also an Idea of the Material Universe, deduced from a Survey of the Solar System. But his greatest work is his "Astronomy explained upon Sir Isaac Newton's Principles, and made easy to those who have

have not studied Mathematics." It first appeared in 1756, 4to. and has been several times reprinted in 8vo. On the accession of the present king, to whom he had read lectures, Mr. Ferguson obtained a pension of fifty pounds a year. In 1763 he was elected a fellow of the Royal Society, without paying the admission fee, or the annual subscriptions: the same year appeared his *Astronomical Tables and Precepts*, 8vo. In 1767 he published *Tables and Tracts relative to several Arts and Sciences*, 8vo. Besides these works he was the author of *Select Mechanical Exercises*; the *Young Gentleman and Lady's Astronomy*; an *Easy Introduction to Astronomy*; an *Introduction to Electricity*; the *Art of Drawing in Perspective made easy*; and several tracts of papers in the *Philosophical Transactions*. He was a man of the clearest judgement, and the most unwearied application to study; benevolent, meek, and innocent in his manners as a child: humble, courteous, and communicative; instead of pedantry, philosophy seemed to produce in him only diffidence and urbanity,—a love for mankind and for his Creator. He died in 1776, aged 66. His friends had generally considered him as possessing very little wealth, however he left behind about the sum of six thousand pounds.

FERIÆ, in Roman antiquity, holidays, or days upon which they abstain from work. Proclamation was generally made by the herald, by command of the *Rex Sacrorum*, or *Flamines*, that all should abstain from business; and whoever transgressed the order was severely fined.—The *feriæ* were of two kinds, public and private.

i. **FERIÆ PRIVATE**, the **PRIVATE FERIÆ**, were holidays observed by particular persons or families on account of birth-days, funerals, &c. These belonged to, and were one division of, the *dies festi*. See **FESTI**.

ii. **FERIÆ PUBLICÆ**, the **PUBLIC FERIÆ**, were of four kinds, viz.

1. **FERIÆ CONCEPTIVÆ** were moveable feasts, the days for the celebration of which were fixed by the magistrates or priests; of this sort were the *Feriæ Latinæ*, *Paganalia*, *Compitalia*, &c. which happened every year, but the days for keeping them were left to the discretion of the magistrates or priests. Of these the

FERIÆ LATINÆ were feasts at which a white bull was sacrificed, and the Latin and Roman towns provided each a set quantity of meat, wine, and fruits; and during the celebration, the Romans and Latins swore eternal friendship to each other, taking home a piece of the victim to every town. The festival was instituted by *Tarquinius II.* when he overcame the *Tuscans*, and made a league with the *Latins*, proposing to build a common temple to *Jupiter Latiæ*, at which both nations might meet and offer sacrifices for their common safety. At first the solemnity lasted but one day, but it was at different times extended to ten. It was held on the *Alban mount*, and celebrated with chariot races at the *capitol*, where the victor was treated with a large draught of wormwood drink.

2. **FERIÆ IMPERATIVÆ** were fixed and instituted by the mere command of consuls, praetors, or dictators, upon the gaining of some victory or other fortunate event.

3. **FERIÆ NUNDINÆ**. See **NUNDINÆ**.

4. **FERIÆ STATIVÆ** were kept as public feasts by the whole city upon certain moveable days appointed in their calendar;—such were the *Compitalia*, *Carmentalia*, *Lupercalia*, &c. See **AGONALIA**, **CARMENTALIA**, &c.

FERIÆ, in the *Romish breviary*, is applied to the days of the week; thus Monday is the *feria secunda*, Tuesday the *feria tertia*. The occasion of this was, that the first Christians used to keep the Easter-week holy. They have also extraordinary *feriæ*, viz. the three last days of passion-week, the two following Easter-days, and the second *feria* of rogation.

FERINA, the ancient city of *Thala* in *Africa*, taken and destroyed by *Metellus* in the war with *Jugurtha*. It was visited by *Mr. Bruce* in his late travels through *Africa*, who expected to have found many magnificent ruins in the place, but was disappointed. The only remarkable objects he met with were the baths, which are excessively warm.

FERMANAGH, a county of *Ireland*, in the province of *Ulster*; bounded by *Cavan* on the S. *Tyrone* on the N. and N.E. by *Tyrconnel* on the N.W. *Leitrim* on the S.W. and *Monaghan* on the W. It is 36 miles long and 24 broad. A great part of it is taken up with bogs, and the great lake, called *Lough Earne*.

FERMENT, in chemistry, any body which being applied to another, produces fermentation. Ferments are either matters already in the act of fermentation, or that soon run into this act. Of the first kind are the flowers of wine, yeast, fermenting beer, or fermenting wine, &c. and of the second are the new expressed vegetable juices of summer fruit. Among distillers ferments are all those bodies, which, when added to the liquor, only correct some fault therein, and by removing some obstacle to fermentation, forward it by secondary means; as also such as, being added in time of fermentation, make the liquor yield a larger proportion of spirit, and give it a finer flavour.

FERMENTATION, a sensible internal motion of the constituent particles of a moist, fluid, mixed, or compound body; by the continuance of which motion these particles are gradually removed from their former situation or combination, and again, after some visible separation is made, joined together in a different order and arrangement; so that a new compound is formed, having qualities very sensibly different from those of the original fluid. Fermentation, properly so called, is confined to the vegetable and animal kingdoms; for the effervescences between the acids and alkalies, however much they may resemble the fermentation of vinous liquors, are nevertheless exceedingly different. It is divided into three kinds; or rather, there are three different stages of it, viz. the vinous, the acetous, and the putrefactive. Of the first, vegetables alone are susceptible: the flesh of young animals is in some slight degree susceptible of the second. The fact related by *M. Grosier*, respecting the lamb, wine, and mutton spirit of the Chinese, seem to shew that animal substances are also capable of the vinous fermentation; unless we suppose that the flesh of these animals had been previously mixed with rice or some other vegetable substance. But animal substances are particularly susceptible of the third, which vegetables do not so easily fall into without previously undergoing the first and second. The produce of the first stage is wine, or some other vinous liquor; of the second, vinegar; and of the third, ammonia. See **BARM**, **BREWING**, **CHEMISTRY**, **VINEGAR**, &c. Fermentation is one of the most obscure processes in nature and no attempt has been made to solve it with any degree of probability. All that we know with regard to it is, that the liquor, however clear and transparent at first, no sooner begins to ferment than it becomes turbid; deposits a sediment, emits a great quantity of fixed air, and throws up a scum to the top, acquiring at the same time some degree of heat. The heat of the vinous stage, however, is but moderate; seldom or never exceeding that of the human body. The heat of the acetous is considerably greater; and that of the putrefactive is the greatest of all, insomuch that putrefying substances, when heaped together in great quantities, will sometimes break forth into actual flame. The spontaneous decomposition of bodies is retarded by extreme cold, by the sudden drying of the parts, or by preservation in closed vessels. The two first circumstances necessarily retard the chemical effects by depriving the parts of that fluidity which is almost indispensably necessary in chemical processes. It will easily be understood that the third condition will retard the spontaneous decomposition of bodies; when it is considered that the atmosphere itself is the solvent, or at least the receptacle of many of the component parts of bodies, with which it is disposed to unite. In well-closed vessels the parts of organized bodies, which are disposed to fly off in the elastic state, are prevented from escaping; and such parts as might form new combinations, by absorbing either the contents or the component parts of the atmosphere, are prevented for want of a free communication. The three conditions for the accomplishment of fermentation are, therefore, fluidity or moisture, moderate heat, or a due temperature, and the access of the air; the fermentation will likewise be modified according to the various component parts of bodies. In the vinous fermentation, the vegetable matter being held in solution by a considerable quantity of water, and a small quantity of yeast being added, the fluid becomes turbid and frothy; oxygen is absorbed, bubbles of carbonic acid gas are disengaged, which rise to the surface and break. The disengagement becomes more and more abundant; matcillage is separated, part of which subsides to the bottom; and part being expanded into froth by the elastic fluid forms yeast. During the course of several days, these effects gradually come to their height, and diminish again very slowly; and thus we obtain wine, brandy, cyder, beer, &c. from grapes, apples, pears, and other

other fruit, from every species of corn, as well as from saccharine and mealy roots. Their productions, however, so far differ from each other, that wine contains a greater proportion of spirituous, and less of mucilaginous particles, than beer; and that distilled spirits are deprived of all earthy and viscous ingredients. But, as all fermentable bodies, beside the inflammable spirit, possess a portion of acid and saline particles, which are not disengaged during the first, or vinous stage of fermentation, another separation of constituent parts takes place, immediately after the former is effected, without any farther discharge of air-bubbles, or intestine commotion of the fluid; though a volatile elastic vapour is observed to escape: thus, the spirituous parts, unless they have been previously drawn off by distillation, are communicated to the atmosphere, and this stage is termed the acetous fermentation; because its productions are the different sorts of vinegar obtained from wine, beer, fruit, corn, &c. Although, in most of the fermentable substances, these two stages naturally exceed each other; yet, by improper treatment, the acetous fermentation sometimes appears before the vinous can possibly commence, especially where the process is mismanaged by too great a heat; or, in those bodies which possess little or no inflammable matter in their elements. On the contrary, such vegetables as originally contain a sufficient proportion of aerial and fiery constituents, will easily ferment, by the simple means of warmth and water. But, if those elementary ingredients be in a manner deprived of their activity, by too many crude and viscid particles being combined with them, it will then be necessary to make certain additions, partly natural, and partly artificial, in order to dispose them more readily to ferment. These means, or additions, are such as have either already undergone fermentation: or are easily disposed to ferment: of the former kind are yeast and leaven; of the latter, honey, sugar, especially in a state of molasses, and other sweet substances, which, however, but slowly promote fermentation; nay, if they be previously diluted or dissolved in too hot water, and in that state added to the fermentable materials, they will entirely check that process. There are, besides, other means of promoting it; for instance, the dried leaves of the vine in a state of powder; cream of tartar, especially after it has been repeatedly moistened with strong vinegar, and afterwards dried; the crumb of bread prepared in a similar manner, and reduced to powder, &c. If fluidity, warmth, and fresh air, forward the fermentative process, the contrary of these, namely, dryness, cold, and exclusion of air, inevitably tend to prevent it. There are, however, cases in which it may become necessary to impede its progress; and we may then safely resort to the means above alluded to. But a certain degree of heat, such as we have before stated, appears to be indispensably necessary to conduct that process with success: an undue continuance, or the least increase of heat, proves detrimental, while an appropriate temperature, in a remarkable degree promotes fermentation. These different points of heat should be accurately noted and settled by the thermometer, or other certain methods; though, for common, or all economical purposes, they may be limited to what is in general termed a tepid and a fervid heat: the former is the bane of all vinous fermentation; the latter, or imperceptible warmth, is the great promoter of it. And if, notwithstanding a due attention to a proper temperature and all other circumstances, the liquor will not work of itself, it should then be assisted by such substances as are called ferments, and of which we have already given some account. In the Memoirs of the Philosophical Society at Manchester, Mr. Henry states the result of some experiments, in which he produced a fermentation both in bread and wort, and even in punch and whey. Conjecturing, therefore, yeast to be simply a quantity of fixed air detained among the mucilaginous parts of the fermenting liquor, he boiled some wheaten flour and water to the consistence of a thin jelly, which he put in the middle of Dr. Nooth's machine for communicating fixed air to water. A considerable portion of gas was absorbed; and the next day the mass was in a state of fermentation. The third day it bore so great a resemblance to yeast, that an experiment was made on some paste for bread; for which purpose it answered tolerably well, after being baked four or five hours. Mr. Henry made another experiment with some wort only; part of which was impregnated with air in the same manner as the flour and water, and when poured into the remainder, a brisk fermentation ensued in 24 hours; a strong head of yeast began to collect on the sur-

face, which on the third day was fit for tuning. In the course of the experiment, good bread was made with the yeast taken off the surface. The dispute which has arisen concerning Mr. Henry's mode of producing fermentation, may be easily decided by a comparative trial. Let two gallons of wort be put into a separate vessel; and kept in a moderate heat for a certain time: let also two other gallons be impregnated, either wholly or in part, according to Mr. Henry's method, be put into a similar vessel, and deposited in the same place. If the fermentation commence in the liquor impregnated with fixed air sooner than in the other, the air may be rationally conjectured to induce such fermentation. At all events, Mr. Henry's experiments, with respect to bread, are certainly decisive, and those relative to liquors may thus be easily ascertained; an object of the utmost importance to the public.

FERMENTED LIQUORS, are those obtained by the process described in the preceding article. See also **BEER**, **BREWING**, **CYDER**, **WINE**, &c. All liquors which have undergone the vinous fermentation, are considered as great antidotes to putrefaction: hence the total abstinence from them is assigned as one of the chief causes why the Turks are more liable to the plague, and other contagious diseases, than those nations among whom beer or wine is the common beverage. It has farther been remarked, and perhaps with justice, that since the custom of brewing and distilling liquors has prevailed in Europe, many of those cutaneous as well as putrid diseases, with which our forefathers were afflicted, have been less severe, and less frequent than they occurred in former ages. On the other hand, it is certain that all fermented liquors contain a considerable portion of air, which appears to combine the spirituous with the viscous parts, and which must necessarily be disengaged, before they are carried through the different organs of secretion. The development and discharge of these aerial particles, however, is not effected without considerable efforts: hence it may be safely asserted, that fermented liquors are less conducive to a sound and vigorous digestion of food than plain water. Yet, with respect to their influence on the human mind, it cannot be denied that such liquors in general have the effect of enlivening and exhilarating the spirits, especially of those who are naturally deficient in mental energy, or possess a weak and debilitated frame. Some writers, however, are of opinion, that they also have a strong tendency to corrupt the morals of mankind; an effect which they evidently produce, even in temperate climates, when taken to excess.

FERMO, a city of Italy, in the marquisate of Ancona, on the coast of the Adriatic, 17 miles S. E. of Macerata. Lon. 13. 50. E. Lat. 43. 6. N.

FERMOSA, or **BENIN**, a river of Africa, which runs into the Atlantic, near Loubo, on the coast of Benin.

FERN, in botany, **FILIX**. See **FILICES**. Fern is very common in dry and barren places. It is one of the worst weeds for land, and very hard to destroy where it has a deep soil to root in. In some grounds, the roots are found to the depth of eight feet. One of the most effectual ways to destroy it is often mowing the grass; and, if the field is ploughed up, plentiful dunging is good; but the most certain remedy is urine. However, fern, cut while the sap is in it, and left to rot upon the ground, is a very good manure. In some places of the north, the inhabitants mow it green, burn it, and make the ashes up into balls with water; which, when dried in the sun, they use to wash linens with, and find to be nearly as good as soap for that purpose.

FERNANDO DA NORONHA, a mountainous, but fertile island in the Atlantic, three miles long, near the coast of Brasil. Lon. 32. 33. W. Lat. 3. 56. S.

FERNANDO PO, or **FERNAND PAO**, an island of Africa, in the Atlantic, near the coast of Benin, 60 miles in circuit. It is fertile in rice, manioc, sugar-canes, fruits, and tobacco. Lon. 10. 45. E. Lat. 3. 20. N.

FERNEL, or **FERNELIUS**, **JOHN**, physician to Henry II. of France; was born in Picardy, about the end of the 15th century. Being sent to Paris to study rhetoric and philosophy, he applied himself in a most intense manner. All other pleasure was insipid to him. He cared neither for play, walking, entertainments, nor even for conversation. He read Cicero, Plato, and Aristotle. The reading of Cicero procured him this advantage, that the lectures he afterwards read on philosophical subjects were as eloquent as those of the other masters were barbarous. He also applied

applied himself earnestly to the mathematics. This continual study drew upon him a long fit of sickness, which obliged him to leave Paris. On his recovery, he returned and studied physic, and at the same time taught philosophy in the college of St. Barbara. After taking the degree of M. D. he improved himself in the mathematics; as far as the business of his profession would allow him. Henry II. dauphin, offered him the place of first physician to him; but Fernel preferring his studies to the hurry of a court, declined the employment. When Henry came to the throne, he renewed his offers, which Fernel still declined, but was at last prevailed on to accept of the office. He died in 1558, leaving behind him several works, as, *De Venæ Sectione*, a treatise on Physiology, *De abditis Rerum Causis*, seven books of Pathology, a book on Remedies, &c. which have been repeatedly printed, with his life prefixed, written by William Plantius, his disciple.

FERNS, a town of Ireland, in Wexford, 15 miles N. of Wexford.

FEROE ISLANDS. See **FERRO**.

FEROL, a sea-port of Peru, with a good harbour, 70 miles S. E. of Truxillo.

FERONIA, in ancient geography, a town of Italy, with a wood, sacred to the goddess Feronia.

FERONIA, the goddess of woods and orchards, so named from the town, where was a wood and temple consecrated to her.

FERONIA, in botany, a genus of the decandria monogynia class and order. Calyx five-parted; petals five; berry globular, covered with a hard, rough, woody shell, one-celled; seeds numerous. One species; viz. *F. elephantum*, elephant apple-tree, found in the East Indies.

FERRANDINA, or **FERRENDINA**, a town of Naples, 25 miles S. W. of Matera.

FERRARA, an ancient and large city of Italy, capital of the duchy of Ferrara, 24 miles N. E. of Bologna, and 38 N. W. of Ravenna.

FERRARA, or the **FERRARESE**, a duchy and province of Italy, in the late pope's territory, bounded on the N. by the state of Venice, on the W. by the duchies of Mantua and Mirandola, on the S. by the Bolognese and Romagna, of which it was formerly a part, and on the E. by the Adriatic. It is 50 miles long, and 43 broad along the coast; but grows gradually narrower towards the Mantuan. It is almost surrounded by the branches of the Po.

FERRARIA, in botany, a genus of the gynandria trigynia class and order. Natural order Ensata. One-styled; spathes one-flowered; petals six, waved and curled; stigmas cowed; capsule three-celled, inferior. There are two species, natives of the Cape of Good Hope.

FERREOLA, in botany, a genus of the diœcia hexandria class and order. Calyx one-leafed, three-cleft; corolla one-petaled, three-cleft; male, filaments six, inserted into a semi-globose receptacle; female, germ oval; berry round, smooth, two-seeded. There is but one species; viz. *F. buxifolia*.

FERRET, in zoology. See **MUSTELA**.

FERRET ISLAND, a small island on the E. coast of Labrador, Lon. 55. 40. W. Lat. 53. 40. N.

FERRETS, among glass-makers, the iron with which the workmen try the melted metal, to see if it be fit to work. The word is also used for those irons which make the rings at the mouth of the bottles.

FERRO, or **HIERRO**, the most westerly of the Canary Islands, near the African coast. The first meridian was formerly reckoned in most maps from its western extremity; but now, the geographers of almost every kingdom make their respective capitals the first meridian, as we do London. It affords very little water, except what is supplied in a very surprising manner by a tree which grows in it. Lon. 17. 46. W. Lat. 27. 47. N.

FERRO, **FARO**, **FARRO**, or **FEROE ISLANDS**, a cluster of islands in the Northern ocean, between 5° and 8° Lon. W. and between 61° and 63° Lat. N. They belong to Denmark. There are 17 which are habitable; each of which is a lofty mountain arising out of the waves, divided from the others, by deep and rapid currents.

FERROL, a sea-port town of Spain, in the province of Galicia, 21 miles N. E. of Corunna, Lon. 8. 46. W. Lat. 43. 28. N.

FERRUGINOUS, any thing partaking of iron, or that contains particles of that metal. See **IRON**. It is particularly applied to certain mineral springs, whose waters are impregnated with the particles of iron, generally termed chalybeates.

FERRUGO, **RUST**. See **IRON** and **RUST**.

FERRUM, **IRON**. See **IRON**.

FERRY is a liberty by prescription, or by the king's grant, to have a boat for passage, on a frith or river, for carrying passengers, horses, &c. over it for a reasonable toll.

FERTILITY, that quality which denominates a thing fruitful or prolific. Nothing can produce fertility in either sex, but what promotes perfect health; and therefore, all means and medicines, all nostrums and specifics to procure fertility, different from those which procure good blood and spirits, are errant quackery. To increase the fertility of vegetables, says Lord Bacon, we must not only increase the vigour of the earth and of the plant, but also preserve what would otherwise be lost: whence he infers, that there is much saved by setting, in comparison of sowing. Evelyn's *Sylva*, the *Philosophical Transactions*, the *French Memoirs*, and the works of the latest and best writers on Agriculture, may be consulted on this subject.

FERULA, [from *ferire*, Lat. to strike,] a little wooden pallet or slice, reputed the schoolmaster's sceptre, wherewith he chastises his pupils by striking them on the palm of the hand.

FERULA has also been used to denote the prelate's crosier and staff.

FERULA, in the eastern empire, was the emperor's sceptre, as is seen on divers medals; it consists of a long stem, or shank, and a flat square head. The use of the ferula is very ancient among the Greeks, who used to call their princes *ναβηκοφοροι*, *q. d.* "ferula-bearers."

FERULA, in the ancient eastern church, signified a place separated from the church; wherein the penitents, or the catechumens of the second order, called *auscultantes*, *αυσκουταντοι*, were kept as not being allowed to enter the church; whence the name of the place, the persons therein being under penance or discipline: sub *ferula* erant ecclesiæ.

FERULA, **FENNEL-GIANT**, in botany, a genus of the digynia order, and pentandria class of plants; natural order, Umbellata. Fruit oval, compressed, plane, with three striæ on each side. There are nine species; all herbaceous perennials, rising from three to ten or twelve feet high, with yellow flowers. The drug assafetida is obtained from a species of ferula, though not peculiarly; being also produced by some other plants. See Plate LXV.

FESCAN, or **FESCHAMP**, a town of France, in the department of Lower Seine, 28 miles N. W. of Rouen.

FESCENNIA, or **FESCENNIUM**, in ancient geography, a town of Etruria, above Falerii, near the Tiber, where the Fescennine verses were first invented: now called Galese.

FESCENNINE VERSES, in antiquity, were a kind of satirical verses, full of wanton and obscene expressions, sung or rehearsed by the company, with many indecent gestures and dances, at the solemnization of a marriage among the Romans. (Hor. ep. i. lib. v. 145.) The word is borrowed, according to Macrobius, from *fascinum*, a charm; the people supposing songs proper to drive away witches, or prevent their effect; but its more probable origin is from Fescennia.

FESCHAMP. See **FESCAN**.

FESCUE, [*veese*, Dutch; *festu*, Fr.] a small wire by which those who teach to read point out the letters.

FESSE, in heraldry. The fesse, so called of the Latin word *fascia*, a band or girdle, possessing the third part of the escutcheon over the middle: it is one of the nine honourable ordinaries, consisting of a line drawn directly across the shield, from side to side, and containing the third part of it, between the honour-point and the nombril. See **HERALDRY**.

FESSE, **PARTY PER**, implies a parting across the middle of the shield, from side to side, through the fesse point.

FESSE POINT, is the exact centre of the escutcheon. See **POINT** and **HERALDRY**.

FESSE WAYS, or **IN FESSE**, denotes any thing borne after the manner of a fesse; that is, in a rank across the middle of the shield.

FESTENBERG, a town of Silesia, in the principality of Oels, 14 miles N. W. of Wurtemberg.

FESTI DIES, in Roman antiquity, certain days in the year, devoted to the honour of the gods.

FESTINO, in logic, the third mood of the second figure of the syllogism, the first proportion whereof is an universal negative, the second a particular affirmative, and the third a particular negative; as in the following example:

FES No bad man can be happy.

TI Some rich men are bad men.

NO Ergo, some rich men are not happy.

FESTOON, [*feston*, French,] an ornament of carved work in the form of a wreath or garland of flowers, or leaves twisted together, thickest at the middle and suspended by the two extremes, where it hangs down perpendicularly.

FESTOONS are now chiefly used in friezes, and other vacant places which want to be filled up and adorned; being done in imitation of the long clusters of flowers, which the ancients placed on the doors of their temples and houses on festival occasions.

FESTUCA, or **FESCUE**, in botany, a genus of the digynia order, and triandria class of plants; natural order, Gramina. Calyx bivalved; spicula or partial spike oblong, roundish; glumes acuminate. There are 26 species; of which, the

F. FLUITANS, **FLOATING FESCUE**, so called from its growing in wet ditches and ponds, is remarkable for the uses made of its seeds, which are small, but very sweet and nourishing. They are collected in several parts of Germany and Poland, under the name of manna seeds; and are used at the tables of the great, in soups and gruels, on account of their nutritious quality and grateful flavour. When ground to meal, they make bread very little inferior to that in common use. The bran, separated in preparing the meal, is given to horses that have worms. Geese are also very fond of these seeds. Mr. Lightfoot recommends this as a proper grass to be sown in wet meadows.

FETE, a French word, signifying a feast, festival, or holiday, half adopted into the English language, but which, with many others, it stands in no need of.

FETHARD, a borough of Ireland, in Tipperary, 8 miles S. E. of Cashel, and 86 S. S. W. of Dublin.

FETHARD, a town of Wexford, on the coast, 81 miles S. of Dublin. Lon. 6. 42. W. Lat. 52. 10. N.

FETLOCK, in the manege, a tuft of hair growing behind the pastern joint of many horses; for those of a low size have scarce any such tuft.

FETU, or **AFFETU**, a small kingdom of Africa, on the Gold Coast, E. of Commendo. It is naturally fertile, abounding in corn, fruits, trees, palm wine, oil, and cattle. The Dutch have a fort in it.

FETUS. See **FÆTUS**.

FEU, the tenure by which lands are held. See **FEE**, **FEE-FARM**, **FEU-HOLDING**, and **TENURE**.

FEUD, in our ancient customs, is used for a capital quarrel or enmity, not to be satisfied but with the death of the enemy; and thence usually called deadly feud. Feud, called also feida, and faida, in the original German signifies *guerram*, i. e. war. Lambert writes it *feeth*, and says, "it signifies *capitales inimicitias*, implacable hatred." In Scotland and the north of England, feud is particularly used for a combination of kindred, to revenge the death of any of their blood, against the killer and all his race, or any other great enemy.

FEUD, [*Feoda*,] in law, the same with Fief, or Fee. See **FEOD** and **FEODAL SYSTEM**.

FEUDAL, or **FEODAL**. See **FEODAL**.

FEUDATORY. See **FEODAL** and **TENURE**.

FEUDERSDORF, a town of Upper Saxony, in Brandenburg, 7 miles W. N. W. of Storkow.

FEU-DUTY, in Scots law, the annual rent or duty which a vassal, by the tenure of his right, becomes bound to pay to his superior.

FEVER. See **MEDICINE**. The ancients deified the diseases as well as the passions and affections of men. Virgil places them in the entrance into hell, *Æn. vi. 273*.

FEVER, in farriery. See **FARRIERY**.

FEVERFEW, in botany. See **MATRICARIA**.

FEVERFEW, **BASTARD**. See **PARTHENIUM**.

FEVERSHAM, or **FAVERSHAM**, a town of England in

Kent, seated on a branch of the Thames, 9 miles W. of Canterbury, and 47 E. of London.

FEU-HOLDING, in Scots law, that particular tenure by which a vassal is bound to pay an annual rent or feu-duty to his superior.

FEVILLEA, in botany, a genus of the pentandria order, and dicæcia class of plants; natural order, Cucurbitaceæ. Male, calyx five-cleft; corolla five-cleft; stamens five; nectary five converging filaments: female, calyx five-cleft; styles three; pome hard, three-celled, corticose. There are two species.

FEVRE, **JAMES LE**, or **JACOBUS FABER**, as he stiled himself in his Latin works, "was, says Bayle, a very little man, but a great genius, and of much learning." He was born in Picardy, and was one of those who began to expel barbarism from the university of Paris. Being suspected of Lutheranism, he retired to Meaux, and afterwards to Blois, Guienne, and Navarre, in which kingdom he enjoyed the protection and favour of Queen Margaret. Like his friend Erasmus, though he disapproved of the errors of the church of Rome, yet as he also censured some things in the conduct of the reformers, he never outwardly left it, which is said to have given him great remorse before his death. He published translations, notes, and commentaries, on Paul's epistles in 1512, and on other parts of the New Testament in 1522.

FEVRE, **TANEGUI LE**, an excellent scholar in the Greek and Roman learning, born at Caen in Normandy, in 1615. Cardinal Richelieu gave him a pension of 2000 livres to inspect all the works published at Louvre, and designed to have made him principal of a college he was about to erect at Richelieu. But the cardinal's death cut off his hopes; and Cardinal Mazarine having no great relish for learning, his pension was ill paid. Some time after, the Marquis de Franciere, governor of Langres, took him along with him to his government, where he embraced the Protestant religion; after which he was invited to Saumur, where he was chosen Greek professor. He there taught with extraordinary reputation. Young men were sent to him from all the provinces in the kingdom, and even from foreign countries, while divines and professors themselves gloried in attending his lectures. He was preparing to go to Heidelberg, whither he was invited by the Prince Palatine, when he died, aged 57. He wrote Notes on Anacreon, Lucretius, Longinus, Phædrus, Justin, Terence, Virgil, Horace, Elian, Eutropius, Aurelius Victor, Dionysius, &c. A short account of the lives of the Greek poets. Two volumes of letters; and many other works. He left a son, and two daughters, one of whom was the celebrated Madame Dacier. In his Latin works he assumed the name of Tanaquil Faber.

FEURS, an ancient town of France, in the department of Rhone and Loire, and late province of Forez; seated on the Loire, 25 miles S. W. of Lyons.

FEZ, a country of Africa, in Barbary, formerly a very extensive kingdom, but now united to the empire of Morocco. It is bounded on the E. by Algiers, on the S. by Morocco and Tasilt, on the W. by the Atlantic, and on the N. by the Mediterranean and the Straits of Gibraltar. It is divided into nine provinces. The climate is temperate, and the soil, though badly cultivated, is fertile; producing corn, lemons, oranges, figs, olives, citrons, dates, almonds, raisins, sugar-canes, cotton, and flax. The country abounds with honey, wax, salt, gums, &c. as well as with variety of wild and domestic animals. The lions are reckoned the most daring in all Africa, and the horses are the finest in Barbary. Camels, ostriches, goats, sheep, hares, &c. are numerous. The chief exports are skins, furs, wool, Morocco leather, gold dust, ostrich feathers, and the productions mentioned above; the imports, arms, ammunition, steel, iron, brass, quick-silver, spiceries, cochineal, vermilion, alum, opium, tartar, English woollen cloths, silks, muslins, calicoes, fustians, damasks, brocades, velvets, linens, paper, combs, watches, looking-glasses, and earthenwares. Though Fez is the capital, Salée is the chief port for the pirates.

FEZ, the capital of the above kingdom, is described as a very large place, surrounded with high walls, within which there are hills and valleys, only the middle being level and flat. The river, which runs through the city, is divided into two streams, from which canals are cut into every part of the town; so that the mosques, colleges, palaces, and the houses of great men, are amply supplied with water. It contains about 80,000 inhabitants; and is seated

on the Cebu, 200 miles N. N. E. of Morocco, and 160 S. of Gibraltar. Lon. 5. 5. W. Lat. 34. 4. N.

FEZZAN, a country of Africa, forming a small circular domain in the vast wilderness, bounded on the N. by Tripoli; on the E. by the deserts which divide it from Egypt; on the S. by Bornou; and on the W. by the deserts of Zaara; lying between 25° and 30° Lat. N. It is an extensive plain, surrounded by mountains, except on the W. Here, as in Upper Egypt, rain is hardly known; but the springs are so abundant, and there is such an ample store of subterranean waters supplied from the neighbouring heights, that few regions exhibit a richer vegetation.

FIANONA, a borough and castle of Maritime Austria, in the province of Istria, and district of Albona. It is four miles from Albona, and 19 E. of Rovigno.

FIASONE, or **MONTE FLASONE**, a town of Italy, on a mountain, 12 miles N. W. of Viterbo.

FIAT, [Lat. *i. e.* let it be done,] in law, a short warrant signed by a judge, for making out and allowing certain processes.

FIBRARIE, a class of fossils. See **ASBESTOS**.

FIBRE, [*fibre*, Fr. *fibra*, Lat.] in anatomy, a perfectly simple body, or at least as simple as any thing in the human structure; being fine and slender like a thread, and serving to form other parts. Some are hard, as the bony fibres; others soft, as those which form all the other parts. The fibres are divided, according to their situation, into straight, oblique, transverse, annular, and spiral; being found arranged in all these directions in different parts of the body. See **ANATOMY**.

FIBRE is also used to denote the slender filaments which compose other bodies, whether animal, vegetable, or mineral; but more especially the capillary roots of plants.

FIBRIN, is that substance which constitutes the fibrous part of the muscles of animals. If a quantity of blood, newly drawn from an animal, be allowed to remain at rest for some time, a thick red clot gradually forms in it, and subsides. Separate this clot from the rest of the blood, put it into a linen cloth, and wash it repeatedly in water till it ceases to give out any colour or taste to the liquid; the substance which remains after this process is denominated fibrin. It has been long known to physicians under the name of the fibrous part of the blood, but has not till lately been accurately described. It may be procured also from the muscles of animals. The properties of fibrin are the following: 1. It is tasteless, of a white colour, fibrous, elastic, and resembles gluten. 2. It is insoluble in water and in alcohol. 3. It is not dissolved by alkalies. 4. But acids dissolve it without difficulty. 5. With nitric acid it gives out much azotic gas. 6. When distilled it yields much carbonate of ammonia and oil. 7. It soon putrefies; when kept moist, becomes green, but does not acquire any resemblance to cheese. See **GLUTEN**.

FIBROLETE, a mineral, of the topaz family, first observed by Bournon, in the matrix of the imperfect corundum. Colour white or dirty grey; specific gravity 3,214; texture fibrous; cross fracture compact; internal lustre glossy; infusible by the blow-pipe. Usually in shapeless fragments. It is composed of

58,25 alumina

38,00 silica.

3,75 a trace of iron, and loss.

100,00

FIBROUS ROOT. See **BOTANY**.

FIBULA, [Lat.] the outer and less bone of the leg, much smaller than the tibia: it lies on the outside of the leg; and its upper end, which is not so high as the knee, receives the lateral knob of the upper end of the tibia into a small sinus, which it has in its inner side. Its lower end is received into the small sinus of the tibia, and then it extends into a large process, which forms the outer ankle. See **ANATOMY**.

FIBULA, in antiquity, was a sort of button, buckle, or clasp, used by the Greeks and Romans for keeping close or tying up some part of their cloaths. They were of various forms, and often adorned with precious stones. Men and women wore them in their hair and at their shoes.

FIBULA, in surgery, an instrument used among the ancients for closing wounds.

FICARI, a town and river of the French empire, in the island and department of Corsica. It is 12 miles W. of Bonifacio.

FICHERULOLO, or **FICHERUOLO**, a town of Italy, in the Ferrarese, on the Po. It is 13 miles W. N. W. of Ferrara.

FICHTELBERG, a mountain, or rather a ridge of mountains, in Franconia, extending nearly from Bareuth to Eger in Bohemia, 16 miles in length from E. to W. and as much in breadth from N. to S.

FICOIDES, a name given to several distinct plants, as the mysembranthemum, musca, and opuntia. See **MYSEMBRANTHEMUM**, &c.

FICTION. See **ALLEGORY**, **FABLE**, **POETRY**, &c.

FICTION OF LAW, is allowed of in several cases; but it must be framed according to the rules of law; and there ought to be equity and possibility in every legal fiction. Fictions were invented to avoid inconvenience; and it is a maxim invariably observed, that no fiction shall extend to work an injury; its proper operation being to prevent a mischief, or remedy an inconvenience, that might result from the general rule of law. 3 Black. 434.

FICUS, the **FIG-TREE**: a genus of the triëcia order, and polygamia class of plants; natural order Scabridæ. Receptacle common, turbinate, fleshy, connivent; inclosing the florets either in the same or in a distinct one. Male calyx tripartite; no corolla; three stamina: female calyx quinquepartite; no corolla; pistil one: seed one. There are 56 species, of which the following are the most remarkable.

1. **FICUS CARICA**, the **COMMON FIG-TREE**, with an upright stem branching 15 or 20 feet high, and garnished with large palmated or hand-shaped leaves. Of this there are many varieties; as, 1. The common fig-tree, with large, oblong, dark purplish blue fruit, which ripens in August either on standards or walls, and of which it carries a great quantity. 2. The brown or chestnut fig; a large, globular, chestnut-coloured fruit, having a purplish delicious pulp, ripening in July and August. 3. The Black Ischia fig; a middle-sized, shortish, flat-crowned, blackish fruit, having a bright pulp; ripening in the middle of August. 4. The green Ischia fig; a large, oblong, globular headed, greenish fruit, slightly stained by the pulp to a reddish brown colour; ripens in the end of August. 5. The brown Ischia fig; a small, pyramidal, brownish yellow fruit, having a purplish very rich pulp; ripening in August and September. 6. The Malta fig: a small flat-topped brown fruit, ripening in the middle of August or beginning of September. 7. The round brown Naples fig; a globular, middle-sized, light brown fruit, and brownish pulp; ripe in the end of August. 8. The long, brown, Naples fig; a long dark brown fruit, having a reddish pulp; ripe in September. 9. The great blue fig; a large blue fruit, having a fine red pulp. 10. The black Genoa fig; a large, pear-shaped, black-coloured fruit, with a bright red pulp; ripe in August. The carica is frequently cultivated in this country, and is the only species which does not require to be kept in a stove. It may be propagated either by suckers arising from roots by layers, or by cuttings. The suckers are to be taken off as low down as possible; trim off any ragged part at bottom, leaving the tops entire, especially if for standards; and plant them in nursery lines at two or three feet distance, or they may at once be planted where they are to remain; observing, that if they are designed for walls or espaliers, they may be headed to six or eight inches in March, the more effectually to force out lateral shoots near the bottom; but, if intended for standards, they must not be topped, but trained with a stem, not less than 15 or 18 inches for dwarf standards, a yard for half-standards, and four, five, or six feet for full standards. Then they must be suffered to branch out to form a head; observing, that, whether against walls, espaliers, or standards, the branches or shoots must never be shortened unless to procure a necessary supply of wood: for the fruit is always produced on the upper parts of the young shoots; and if these are cut off, no fruit can be expected. The best season for propagating these trees by layers is in autumn; but it may be also done any time from October to March or April. Choose the young pliable lower shoots from the fruitful branches: lay them in the usual way, covering the body of the layers three or four inches deep in the ground, keeping the top entire, and as upright as possible; and they will be rooted and fit to separate from the parent in autumn; when they may be planted either in the nursery, or where they are to remain. The time for propagating by cuttings is either at the fall of the leaf, or in March: choose well ripened shoots of the preceding summer: short, and of robust growth, from about 12 to 15 inches long;

long; having an inch or two of the two years wood at their base, the tops left entire; and plant them six or eight inches deep, in a bed or border of good earth, in rows two feet asunder. When planted in autumn, it will be eligible to protect their tops in time of hard frost, the first winter, with any kind of long loose litter. The caprifrication of the fig-tree, which for many ages was so enigmatical, is particularly worthy of attention, not only as a singular phenomenon in itself, but as it furnishes one of the most convincing proofs of the reality of the sexes of plants. The flowers of the fig-tree are situated within a pulpy receptacle, which we call the fig. Of these receptacles, in the wild fig-tree, some, as the caprificus, have male flowers only; and others, as the erinosyce, have male and female, both distinct, though placed in the same receptacle; but in the cultivated fig, these contain only female flowers; which are fecundated by means of a kind of gnat bred in the fruit of the wild fig-trees, which pierces that of the cultivated, to deposit its eggs within; at the same time diffusing within the receptacle the farina of the male flowers. Without this operation the fruit may ripen, but no effective seeds are produced. Hence the garden fig can only be propagated by layers and cuttings, in those countries where the wild fig is not known. The process of thus ripening the fruit, in the oriental countries, is not left to nature, but is managed with great art, and different degrees of dexterity, so as to reward the skilful husbandman with a much larger increase of fruit than would otherwise be produced. A tree of the same size, which, in the S. of France, where caprifrication is not practised, may produce about 25 pounds of fruit, will, by that art, in the Grecian islands, bring ten times that quantity.

2. *Ficus Caprificus*, the wild fig-tree, has male flowers only; the farina of which is used to impregnate the female flowers of the common fig-tree.

3. *Ficus Erinosyce*, another species of wild fig-tree which has male and female flowers distinct.

4. *Ficus Religiosa*, the BANIAN TREE, or INDIAN FIG, is a native of several parts of the East-Indies. It hath a woody stem, branching to a great height and vast extent, with heart-shaped entire leaves ending in acute points. Of this tree Milton has given a description equally beautiful and just, in his *Par. Lost. B. ix. l. 1100*.

FID, [*fitta*, Italian,] a pointed iron with which seamen untwist their cords.

FIDS or **FIDDS**, are likewise used at sea to splice or fasten ropes together. There are also fids of wood, made tapering in one end, but much larger than the iron ones. The pin in the heel of the topmast, which bears it upon the chess-tree, is likewise called a fidd.

FIDA, a kingdom of Africa. See **WHIDAH**.

FIDD-HAMMER, a hammer the handle of which is a fidd, or made tapering into that form.

FIDDLE. See **VIOLIN**.

FIDEI COMMISSUM, in Roman antiquity, an estate left in trust with any person, for the use of another.

FIDE-JUSSOR, in the civil law, is a surety, or one that obliges himself in the same contract with a principal, for the greater security of the creditor or stipulator.

FIDES, **FAITH** or **FIDELITY**, one of the virtues deified by the Romans, had a temple near the Capitol, founded by Numa Pompilius; but no animals were offered, or blood spilt, in her sacrifices. During the performance of her rites, her priests appeared in white vestments, with their heads and hands covered with linen, to shew that fidelity ought to be sacred.

FIDIUS, in Pagan worship, a god who presided over alliances and promises. This deity, whom the Romans borrowed from the Sabines, was also called Sanctus, Semon, and Semi pater.

FIDRIE, an island of Scotland, in the Frith of Forth.

FIECHTACH, a town of Germany in Bavaria; six miles N. of Retz.

FIEF. See **FEE**, **FEOD**, and **FEODAL SYSTEM**. It has been an object of enquiry among the learned, in what nation of barbarians fiefs had their origin. It is probable, that they took place in the different nations of Europe, nearly about the same time, on the same principles, and were continued by similarity of manners, conquests, &c. so that we cannot ascribe the prevalence of them to imitation. In France, we find fiefs mentioned as early as the age of Childebert I. They were introduced into Italy by the

Lombards; among whom the customs and laws relating to fiefs seem very early to have made rapid advances. Giannone Hist. of Naples, b. iv. They were introduced into Spain before the invasion of the Moors, A. D. 710.

FIELD, in agriculture, a piece of ground used for tillage or pasture.

FIELD, in heraldry, is the whole surface of the shield, or, continent, so called, because it contains those achievements anciently acquired in the field of battle. It is the ground on which the colours, bearing, metals, furs, charges, &c. are represented. Among the modern heralds, field is less frequently used in blazoning than shield or escutcheon. See **SHIELD** and **HERALDRY**.

FIELD, RICHARD, D. D. an eminent divine of the church of England, born at Hempstead in Hertfordshire, in 1561, and admitted at Magdalen college, Oxford, in 1577. In 1598 he was appointed chaplain to Q. Elizabeth, and on the accession of K. James I. was made chaplain to that monarch. In 1604, he was appointed canon of Windsor, and in 1609 dean of Gloucester. He was much esteemed by K. James, who, in his usual punning way, stiled him "a Field for God to dwell in;"—an expression improved by Fuller, who in quoting one of his works, stiled him "a Field which the Lord had blessed." He died Nov. 21, 1616, just when James was intending to appoint him bishop of Oxford. He wrote Five Books on the Church, and several other tracts on religion.

FIELD BOOK, in surveying, that wherein the angles, stations, distances, &c. are set down.

FIELD COLOURS, in war, are small flags of about a foot and a half square, which are carried along with the quarter-master general, for marking out the ground for the squadrons and battalions.

FIELDFARE, in ornithology. See **TURDUS**.

FIELD MARSHAL, a commander of an army in the field, an office now disused in the British armies, though still of high rank in other European armies. Lord Trawley, appointed in 1763, was the last British Field Marshal.

FIELDPIECE, small cannon used in battles, but not in sieges; they are from three to 12 pounds.

FIELD STAFF, a weapon carried by the gunners, about the length of a halbert, with a spear at the end; having on each side ears screwed on, like the cock of a match-lock, where the gunners screw in lighted matches when they are upon command; and then the field-staffs are said to be armed.

FIELD WORKS, in fortification, are those thrown up by an army in besieging a fortress, or by the besieged to defend the place. Such are the fortifications of camps, highways, &c.

FIELEWEER, an island of Norway, on the W. coast, 22 miles long, and four broad.

FIERENZO, St. a sea-port town of France, in the island and department of Corsica.

FIERENZUOLO, a town of Italy, in Parma, on the Larda; 12 miles S. E. of Placentia.

FIERI FACIES, in law, a judicial writ, that lies at all times within the year and day, for him that has recovered in an action of debt or damages, to the sheriff, to command him to levy the debt, or the damages of his goods, against whom the recovery was had.

FIESOLA, **FIESOLI**, or **FIEZOLI**, a town of Italy, in Tuscany, between Florence and Pratolino, anciently called Falsulæ, 3 miles N. E. of Florence.

FIFE, or **FIFESHIRE**, a county of Scotland, bounded on the W. by Clackmannan, N. by Perthshire, E. by the German ocean, and S. by the Frith of Forth. It is above 32 miles long, and from seven to 17 broad; but along the coast, from Crail to Culross, it extends about 40 miles in length. The face of the country is various. Towards the W. it is mountainous, having the Lomond hills rising to a great height; to the E. it is flat, well cultivated, and produces grain of all kinds in great plenty.

FIFE, in music, a wind instrument consisting of a small pipe.

FIFE-RAILS, in a ship, are those placed on banisters, on each side of the top of the poop, and so along with hauncers or falls. They reach down to the quarter-deck, and to the stair of the gang-way.

FIFTEENTH, an ancient tribute or tax laid upon cities, boroughs, &c. through all England, and so termed because it amounted

amounted to a fifteenth part of what each city or town had been valued at; or it was a fifteenth of every man's personal estate according to a reasonable valuation. In Doomsday book, there are certain mentioned for levying this tribute yearly; but since, any such tax cannot be levied out by parliament.

FIFTH, in music, one of the harmonical intervals or concords. See **INTERVAL**. The fifth is the second in order of the concords, the ratio of the chord that affords it is 3 : 2. See **CHORD** and **CONCORD**. It is called fifth, as containing five terms or sounds between its extremes, and four degrees, so that in the natural scale of music, it comes in the fifth place or order from the fundamental. The ancients called this fifth diapente. The imperfect and defective fifth called by the ancients semi-diapente is less than the fifth by a less semitone.

FIG, or **FIG-TREE**. See **FIGUS**. Figs are a considerable article in the materia medica, chiefly employed in emollient cataplasms and pectoral decoctions. The best are those which come from Turkey.

FIGARUOLO, an island of Maritime Austria, on the coast of Istria.

FIGEAC, a town of France, in the department of Lot, 27 miles E. of Cahors.

FIG-GNAT, in entomology. See **CULEX**.

FIGHIG, a town of Africa, in Biledulgerid, S. of Atlas, 240 miles E. S. E. of Mequinez. Lon. 1. 5. W. Lat. 32. 20. N.

FIG-TREE BAY, a bay on the N. E. coast of Jamaica.

FIG-TREE BAY, a bay on the S. W. coast of St. Kitts.

FIGUEIRO DOS VINHOS, a town of Portugal, in Estremadura, 20 miles N. of Thomar.

FIGUERA, **FIGUERAS**, or **St. FERNANDO DE FIGUERAS**, a strong town of Spain in Catalonia, which was esteemed impregnable, till the 27th Nov. 1794, when it was taken by the French, though garrisoned with 9107 men, and defended by 171 pieces of cannon. The military chest, 200,000lb. of powder, and a vast quantity of provisions, fell into the hands of the republicans. During the siege, the generals on both sides were killed; viz. citizen Dugommier on the 17th and Count de La Union on the 20th. It lies 10 miles W. of Rosas. Lon. 2. 46. E. Lat. 42. 18. N.

FIGURABILITY, [from *figurabile*,] the quality of being capable of a certain and stable form.

FIGURAL, **FIGURATE**, or **FIGURATIVE**, a term applied to whatever is expressed by obscure resemblances. The word is chiefly applied to the types and mysteries of the Mosaic law; as also to any expression which is not taken in its primary and literal sense.

FIGURAL, or **FIGURATE NUMBERS**, are such as do or may represent some geometrical figure in relation to which they are always considered, as triangular numbers, pentagonal numbers, pyramidal numbers, &c.

FIGURATE NUMBERS, are distinguished into orders according to their place in the scale of their generation, being all produced one from another, viz. by adding continually the terms of any one, the successive sums are the terms of the next order, beginning from the first order, which is that of equal units 1, 1, 1, &c.; then the 2d order consists of the successive sums of those of the first order, forming the arithmetical progression 1, 2, 3, 4, &c.; those of the 3d order the successive sums of those of the 2d, and are the triangular numbers 1, 3, 6, 10, 15, &c.; those of the 4th order are the successive sums of those of the 3d, and are the pyramidal numbers 1, 4, 10, 20, 35, &c.: and so on, as below.

Order.	Name.	Numbers.
1.	Equals.....	1, 1, 1, 1, 1, &c.
2.	Arithmetical.....	1, 2, 3, 4, 5, &c.
3.	Triangulars.....	1, 3, 6, 10, 15, &c.
4.	Pyramidals.....	1, 4, 10, 20, 35, &c.
5.	2d Pyramidals.....	1, 5, 15, 35, 70, &c.
6.	3d Pyramidals.....	1, 6, 21, 56, 126, &c.
7.	4th Pyramidals.....	1, 7, 28, 84, 210, &c.

The above are all considered as different sorts of triangular numbers, being formed from an arithmetical progression, whose common difference is 1. If n be put for the number of terms in a

series of any order, and from the expression $\frac{n}{1} \times \frac{n+1}{2} \times \frac{n+2}{3} \times \frac{n+3}{4} \times \frac{n+4}{5}$ &c. a number of factors be taken

equal to the number which denotes the order, there will be had the sum of n terms of that order, or, which is the same thing, the n th term of the succeeding order; thus if n be equal to 5, $\frac{5}{1} =$

$5, \frac{5}{1} \times \frac{5+1}{2} = 15, \frac{5}{1} \times \frac{5+1}{2} \times \frac{5+2}{3} = 35$, &c. which

are the sums of 5 terms of the 1, 2, 3, &c. orders, or the 5th term of the 2, 3, 4, &c. orders as in the above table. If the common difference of the generating arithmetical series be 2, the successive sums will be the series of square numbers; if it be 3, the series will be pentagonal numbers, or pentagons; if it be 4, the series will be hexagonal numbers, or hexagons, and so on. Thus:

Arithmetical.	1st. Sums or Polygons.	2d. Sums, or 2d Polygons.
1, 2, 3, 4,	Tri. 1, 3, 6, 10,	1, 4, 10, 20,
1, 3, 5, 7,	Sqrs. 1, 4, 9, 16,	1, 5, 14, 30,
1, 4, 7, 10,	Pent. 1, 5, 12, 22,	1, 6, 18, 40,
1, 5, 9, 13,	Hex. 1, 6, 15, 28,	1, 7, 22, 50, &c.

And the reason of the names triangles, squares, pentagons, hexagons, &c. is, that those numbers may be placed in the form of these regular figures or polygons.

FIGURE, in physics, expresses the surface or terminating extremities of any body; and considered as a property of body affecting our senses, is defined a quality which may be perceived by two of the outward senses. Thus a table is known to be square by the sight and by the touch.

FIGURES, in arithmetic, are certain characters whereby we denote any number which may be expressed by any combination of the nine digits, &c. See **ARITHMETIC**.

FIGURE, in architecture and sculpture, signifies the representation of things made in solid matter, as statues, &c.

FIGURE, in astrology, a description of the disposition of the heavens at a certain hour, in which the places of the planets and stars are marked in a figure of twelve triangles, called houses.

FIGURE, in conic sections, according to Apollonius, is the rectangle made under the latus rectum and transversum in the hyperbola and ellipsis.

FIGURE OF THE DIAMETER; the rectangle under any diameter, and its proper parameter is, in the ellipsis and hyperbola, called the figure of that diameter.

FIGURE, in fortification, the plan of any fortified place, or the interior polygon, which, when the sides and angles are equal, is called a regular, and when unequal, an irregular figure.

FIGURE, in geometry; the superficies included between one or more lines, is denominated either rectilinear, curvilinear, or mixed, according as the extremities are bounded by right lines, curve lines, or both.

FIGURE, in grammar, a deviation from the natural rules of etymology, syntax, and prosody, either for brevity, elegance, or harmony.

FIGURE, in dancing, denotes the several steps which the dancer makes in order and cadence, considered as they mark certain figures on the floor.

FIGURE, in designing and painting, denotes the lines and colours which form the representation of any animal, but more particularly of a human personage. See **PAINTING**, and **DRAWING**.

FIGURE, in logic, denotes a certain order and disposition of the middle term in any syllogism. Figures are fourfold. 1. When the middle term is the subject of the major proposition, and the predicate

predicate of the minor, we have what is called the first figure. 2. When the middle term is the predicate of both the premises, the syllogism is said to be in the second figure. If the middle term is the subject of the two premises, the syllogism is in the third figure; and lastly, by making it the predicate of the major, and subject of the minor, we obtain syllogisms in the fourth figure. Each of these figures has a determinate number of moods, including all the possible ways in which propositions differing in quantity or quality can be combined, according to any disposition of the middle term, in order to arrive at a just conclusion. See LOGIC.

FIGURE, in manufactures, is applied to the various designs represented or wrought on velvets, damasks, taffeties, sattins, and other stuffs and cloths. The most usual figures for such designs are flowers, imitated from the life; or grotesques, and compartments of pure fancy. Representations of men, beasts, birds, and landscapes, have only been introduced since the taste for the Chinese stuffs, particularly those called *sures*, began to prevail. The woof forms the figures; and the warp only serves for the ground.

FIGURE, in rhetoric and poetry, is a manner of speaking different from the ordinary and plain way, and more emphatical; expressing a passion, or containing a beauty. See ALLEGORY, APOSTROPHE, COMPARISON, HYPERBOLE, METAPHOR, ORATORY, PERSONIFICATION, POETRY, &c.

FIGURE IN WHICH THE INSTRUMENT IS CONCEIVED TO BE THE AGENT. When we survey a number of connected objects, that which makes the greatest figure employs chiefly our attention; and the emotion it raises, if lively, prompts us even to exceed nature in the conceptions we form of it. Examples:

For Neleus' son Alcides' rage had slain.
A broken neck the force of Pirus threw.

In these instances, the rage of Hercules and the force of Pirus, being the capital circumstances, are so far exalted as to be conceived the agents that produce the effects. In the first of the following instances hunger being the chief circumstance in the description, is itself imagined to be the patient.

Whose hunger has not tasted food these three days.
JANE SHORE.

—As when the force
Of subterranean wind transports a hill. PAR. LOST.

—As when the potent rod
Of Amram's son, in Egypt's evil day
Wav'd round the coast, upcall'd a pithy cloud
Of locusts. PAR. LOST.

FIGURE, IN WHICH THE PROPERTIES OF ONE OBJECT ARE EXTENDED TO ANOTHER. This figure is not dignified with a proper name, because it has been overlooked by writers. Giddy brink, jovial wine, daring wound, are examples of this figure. Here are adjectives that cannot be made to signify any quality of the substantives to which they are joined: a brink, for example, cannot be termed giddy in a sense, either proper or figurative, that can signify any of its qualities or attributes. When we examine attentively the expression, we discover, that a brink is termed giddy from producing that effect in those who stand on it: in the same manner, a wound is said to be daring, not with respect to itself, but with respect to the boldness of the person who inflicts it; and wine is said to be jovial, as inspiring mirth and jollity. Figures are highly serviceable to clear difficult truths, to make a style pleasant and pathetic, and to awaken and fix attention. But as, in order to obtain these ends, they are to be used with prudence and caution, the following directions ought to be observed. 1. Let the discourse always be founded on nature and sense, supported with strong reason and proof, and then add the ornaments and heightenings of figures; for a man of clear understanding will despise the flourish of figures without sense, and pomp of words that wants truth and substance of things. 2. Be sparing in the use of figures. A passion described in a multitude of words, and carried on to a disproportionate length, fails of the end proposed, and tires instead of pleasing. 3. Figures must not be over adorned, nor affectedly laboured, and ranged into new and scrupulous periods; for by affectation and shew of art, the orator betrays and exposes himself, and it is apparent, that he is

rather ambitious to set off his parts and wit, than to express his sincere concern and passion. This figure can never have any grace, but where the relations are of the most intimate kind.

FIGURES, in theology, mysteries represented under certain types or actions in the Old Testament. Thus manna is held a figure or type of the Lord's supper; and the death of Abel, a figure of the sufferings of Christ. See TYPE.

FIGURES, in the pagan mythology, and antiquities, signify the emblems, enigmas, fables, symbols, and hieroglyphics, of the ancients.

FIGURED, marked with figures. The term is chiefly applied to stuffs, whereon the figures of flowers, and the like, are either wrought or stamped.

FIGURED, in music, is applied either to simple notes or to harmony; to simple notes, as in these words figured bass, to express a bass whose notes carrying chords are subdivided into many other notes of less value; to harmony, when, by supposition and in a diatonic procedure, other notes than those which form the chord are employed. See MUSIC.

FIGWORT. See SCHROPHULARIA.

FILACCIANO, a town of Italy in the patrimony of St. Peter, nine miles S. of Citta Castellana.

FILACER, [*filarius*, low Lat. *filum*,] an officer in the Common Pleas, so called because he files those writs whereon he makes process.

FILAGO, in botany, a genus of the polygamia superflua order, and syngenesia class of plants; natural order, Compositæ. Receptacle naked; no pappus; calyx imbricated; female florets placed among the scales of the calyx. It has seven species.

FILAMENT, in anatomy and natural history, is used in the same sense with fibre. See FIBRE.

FILAMENTS, VEGETABLE, are substances of great use in the arts and manufactures; furnishing thread, cloth, cordage, &c. For these purposes the filamentous parts of the Cannabis and Linum, or Hemp and Flax, are employed. See these articles, and COTTON. But different vegetables have been employed in different countries for the same uses. Putrefaction destroys the pulpy or fleshy matter, and leaves the tough filaments entire. By curiously putrefying the leaf of a plant in water, we may obtain the fine flexible fibres, which constituted the basis of the ribs and minute veins, and which now form as it were a skeleton of the leaf. Alkaline lixiviation, in some degree, produce similar effects to putrefaction. Sieur de Flacourt, in his history of Madagascar, relates, that different kinds of cloth are prepared in that island from the filaments of the bark of certain trees boiled in strong lie; that some of these cloths are very fine, and approach to the softness of silk, but in durability come short of cotton: that others are coarser and stronger, and last thrice as long as cotton; and that of these the sails and cordage of his vessel were made. The Sieur adds, that the stalks of nettles are used for similar purposes in France. And Sir Hans Sloane relates in a letter to Mr. Ray, that he has been informed by several, that muslin and calicoes, and most of the Indian linens, are made of nettles. In some Swedish provinces, a strong kind of cloth is prepared from hop stalks; and in the "Transactions of the Swedish Academy for 1750," there is an account of an experiment made on them. Of the stalks, gathered in autumn, about as many were taken, as equalled in bulk a quantity of flax that would have produced a pound after preparation. The stalks were put into water, and kept there covered during the winter. In March they were taken out, dried in a stove, and dressed as flax. The prepared filaments weighed nearly a pound, and proved fine, soft, and white: they were spun and woven into six ells of fine strong cloth. The author, Mr. Shisler, observes, that hop stalks take much longer time to rot than flax; and that, if not fully rooted, the woody part will not separate, and the cloth will neither prove white nor fine. The filaments of bean stalks have been found to furnish an excellent substitute for hemp. Hemp, flax, and all other vegetable filaments, and thread or cloth prepared from them, differ remarkably from wool, hair, silk, and other animal productions, not only in the principles into which they are resolvable by fire, but likewise in some of their more interesting properties, particularly in their disposition to imbibe colouring matters; sundry liquors, which give a beautiful and durable dye to animal substances, giving no stain at all to vegetables. See DYEING.

FILAMENTS,

FILAMENTS, among botanists, is particularly used for the stamina. See **BOTANY**.

FILANDERS, in entomology and falconry, are worms as small as thread, and about an inch long, that lie wrapt up in a thin skin or net, near the reins of an hawk, apart from either gut or gorge. This malady is known by the hawk's poverty; by her ruffling her tail; by straining the fist, or perch, with her pounces; and, lastly, by croaking in the night, when the filanders prick her. The disease proceeds from bad food; and must be remedied early, to prevent its spreading over the whole body, and destroying the bird.

FILANDERS, in falconry, are also the name of another disease in hawks, &c. consisting of filaments or strings of blood coagulated; and occasioned by a violent rupture of some vein, by which the blood extravasating, hardens into these figures, and incommodates the reins, hips, &c.

FILARIA, in natural history, a genus of the vermes intestinalis class and order. Body round, filiform, equal, and quite smooth; mouth dilated, with a roundish concave lip. There are about 18 species, divided into four sections: viz. A. infesting the mammalia; B. infesting birds; C. infesting insects in their perfect state; D. infesting the larvæ of insects. F. medinensis is found both in the East and West Indies, and is frequent in the morning dew, from which it enters the naked feet of the slaves, and creates the most troublesome itching, frequently accompanied with inflammation and fever.

FILBERT, the fruit of the corylus, or hazel. See **CORYLUS**.

FILE, in law, a record of the court; and the filing of a process of a court makes a record of it. An original writ may be filed after judgement given in the cause, issued forth before; declarations, &c. are to be filed, and affidavits must be filed, some before they are read in court, some immediately after. Before filing a record removed by certiorari, the justices of B. R. may refuse to receive it, if it appears to be for delay, &c.; and remanded back for the expedition of justice; but if the certiorari be once filed, the proceedings below cannot be revived. An indictment, &c. cannot be amended after it is filed.

FILE, in the art of war, is the depth of the battalion or squadron. The files of a battalion of foot are generally three deep; as are sometimes those of a squadron of horse. The files must be straight and parallel one to another.

FILE, a tool employed by smiths and others, for the purpose of smoothing, polishing, or cutting metals. This instrument is of iron, or forged steel, cut in little furrows, with chisels, and a mallet, in a certain direction, and of a certain depth, according to the grain or touch required. After cutting the file, it must be tempered with a composition of chimney soot, very hard and dry, diluted, and wrought up with urine, vinegar, and salt; the whole being reduced to the consistence of mustard. Tempering the files consists in rubbing them over with this composition, and covering them in loam; after which they are put into a charcoal fire, and taken out by the time they have acquired a cherry-colour, which is known by a small rod of the same steel put in along with them. Being taken out of the fire, they are thrown into cold spring-water, and when cold, they are cleaned with charcoal and a rag, and being clean and dry, are kept from rust by laying them up in wheat bran. Iron files require more heating than steel ones. Files are of different forms, sizes, cuts, and degrees of fineness, in proportion to the various uses and occasions for which they are designed; such are the common square, flat, triangular, or round files; the rough-toothed files, which are intended to cut more speedily than any other; and the fine-toothed file, which cuts more slowly, and is appropriated to finer workmanship. The best and most durable instruments of this description are manufactured at Sheffield.

FILIAL PIETY, the affectionate attachment of children to their parents; including in it love, reverence, obedience, and relief. These are duties prompted equally by nature and by gratitude, independent of the injunctions of religion. For where shall we find the person who has received from any one benefits so great or so many, as children from their parents? And it has been justly observed, that those who are undutiful to their parents, seldom prove good to any other religion.

FILICES, [from *filum*, a thread, *quasi filatim incisa*,] **FERNS**; one of the seven tribes or families of the vegetable kingdom. See

BOTANY. They constitute the first order in the class cryptogamia. In Tournefort's Method they are the sixteenth class; and in Ray's the fourth, under the name of Capillares. Haller denominates them Epiphyllasperma, that is, plants that bear their seed on the back of the leaf: others term them Acaules, because they have properly no stem. These plants in figure approach the more perfect vegetables, being furnished, like them, with roots and leaves. The roots creep, and extend themselves horizontally under the earth, throwing out a number of very slender fibres on all sides. The stem in these plants is not to be distinguished from the common foot-stalk, or rather middle rib of the leaves; so that in strict propriety the greater number of ferns may be said to be Acaules, that is, to want the stem altogether: in plants of the second section, however, the middle rib, or a stalk proceeding from the root, overtops the leaves, and forms a stem upon which the flowers are supported. The leaves are winged, or hand-shaped, in all the genera, except in adder's-tongue, pepper-grass, and some species of spleen-wort. The flowers in the greater number of genera are fastened on the back of the leaves; in some they are supported on a stem, which rises above the leaves.

FILICES also constitute a class or order of plants in the natural method. See **BOTANY**.

FILIGRANE, **FILIGREE**, or **FILLAGREE WORK**, [from *filum*, Lat. a thread, and *granum*, a grain,] a kind of enrichment on gold or silver, wrought delicately, in manner of small threads or grains, or both intermixed. In Latin it is called "filatim elaboratum opus, argenteum, aureum." There is no manufacture in any part of the world that has been more admired and celebrated, than the fine gold and silver filigree of Sumatra. And what renders it a matter of greater curiosity is the coarseness of the tools employed in the workmanship, and which, in the hands of an European, would not be thought sufficiently perfect for the most ordinary purposes.

FILING, one of the principal operations in smithery, &c. succeeding to forging. The coarser cut files are always to be succeeded by finer; and in all the kinds the rule is, to lean heavy on the file in thrusting it forward, because the teeth of the file are made to cut forwards. But in drawing the file back again for a second stroke, it is to be lightly lifted just above the work, because it cuts not coming back. See **FILE**.

FILLAGREE WORK. See **FILIGRANE**.

FILLET, or **FILET**, in architecture, a little square member, ornament, or moulding, used in divers places, and upon divers occasions, but generally as a crowning over a greater moulding. See **ARCHITECTURE**. It is the same with what the French call reglet, bande, and bandelette; and the Italians lista or listella.

FILLET, in heraldry, a kind of orle or bordure, containing only a third or fourth part of the breadth of the common bordure. It is supposed to be withdrawn inwards, and is of a different colour from the field. It runs quite round, near the edge, as a lace over a cloak. Fillet is also used for an ordinary drawn like the bar from the sinister point of the chief across the shield, in manner of a scarf; though it is sometimes likewise seen in the situation of a bend, fesse, cross, &c. According to Guillim, the fillet is a fourth part of the chief, and is placed in the chief point of the escutcheon.

FILLET, among painters, gilders, &c. a little reglet of leaf gold, drawn over certain mouldings; or on the edge of frames, pannels, &c. painted white by way of enrichment.

FILLETs, in the manege, are the loins of a horse, which begin at the place where the hinder part of the saddle rests.

FILTER, or **FILTRE**, [*filtrum*, Latin,] in chemistry, &c. a piece of woollen cloth, linen, paper, or other matter, some of which are in form of hollow inverted cones, used to filtrate or strain liquors through. The filtre has the same use and effect with regard to liquids that the sieve or searce has in dry matters. See **FILTRATION**.

FILTER, or **FILTRE**, [from *φιλεω*, of *φιλει*, I love,] is also a charm, supposed to have a virtue of inspiring love. The Greeks, when their love was without success, used several arts to procure the affections of the beloved. The Thessalian women were famous for their skill in this and other magical practices. The means whereby it was affected were of divers sorts; it was sometimes done by potions called *φιλεα*, which are often mentioned both by Greek and Latin authors. Juvenal says,

Ille

Hic magicus affert cantus, hic Thessalia vendit
 Philtra, quibus valeant mentem vexare mariti.

FILTRATION, in chemistry, as well as in domestic economy, is the process of straining or filtering liquors by means of woollen cloth, cotton, linen, paper, or other materials. It deserves to be previously remarked, that in every attempt at purifying fluids in the manner here alluded to, we can divest them only of those foreign ingredients which are mixed with them, and not of such as they hold in solution. The former may be separated from them, by proper filtration; but the latter must be disengaged, either by precipitation or distillation. Although the utility of filtration is thus limited to the noxious particles mixed with liquid bodies, such as foul water, yet it is sufficiently important to deserve some attention. The common filters are of two sorts; namely, simple pieces of paper, or cloth, through which the fluid is passed; or similar materials twisted up in the same manner as skeins or wicks; they are first wetted, then squeezed, and one end put into the vessel, which contains the liquor to be filtered; the other end is to be suspended beneath the surface of the liquor, the purest parts of which drop gradually out of the vessel, leaving behind the coarser particles. These filters, however, are not calculated for domestic use: hence different machines have been invented for the purpose of purifying turbid water. But among these various contrivances, few appear to possess the advantage of simplicity, combined with that of affording an ample supply of a fluid so essentially necessary to the preservation of health. A patent has lately been granted to Mr. James Peacock, of Finsbury-square, for a filtering machine, which is stated to be superior to any hitherto invented. It completely accomplishes the purpose of filtration, by causing the turbid fluid to ascend through a medium of fine gravel, by progressive degrees of fineness, by which means the foulest water or other fluid becomes perfectly freed from all (mixed) impurities, without any noxious mineral quality, which pumice or other common filtering stones are suspected to communicate. Should, from continual use, its operation become in any degree impeded, it may be completely cleansed with the greatest facility in the short space of one minute: an advantage possessed by none of the common machines that operate, by descent. Beside these useful properties, Mr. Peacock's filtering machine does not occupy more room than a large drip-stone with its apparatus, and yields a constant and pure stream of more than 300 gallons in 24 hours. A specimen of this machine is deposited for inspection at Guildhall, London. We shall here recommend a very simple and effectual machine for purifying water. It is on the plan of the celebrated filtering machine, erected at Paris, by means of which the foul water of the river Seine is so completely purified, as to be divested of all its laxative properties; its construction is also simple and easy. When we reflect on the method which nature pursues in the filtration of water, we find that such waters as descend from hills, though passing through sand and rocks, are seldom perfectly pure; but that those are the most limpid, which by ascending, ooze out on the side of a mountain. The cause of this difference appears to be owing to the circumstance, that if the water only descends through sand, the finest and most weighty foreign particles gradually penetrate through the sandy strata; on the contrary, when it is forced to rise through sand, all such ponderous ingredients settle at the bottom; because, from their greater specific gravity, they cannot ascend to the top. The lighter particles of fluids, consequently, in both cases remain in the upper strata of the earth or sand. From these considerations, Professor Parrot, jun. of Paris, was induced to give his filtering machine the form represented in fig. 1, Plate LXX. The principal part of the machinery consists of a square vessel, bent in the form of an inverted syphon. The curve may be circular, elliptic, or in any other direction. This vessel is filled with fine, pure sand, till nearly the height of the dotted line *x, y*, which denotes the ascent of the water to D, whence it flows into the receiver. The part marked A, B, should always project above this line, according to the size of the filtering machine. To A, B, there is attached a woollen bag, which is open at the top, and the lower part of which touches the sand. It serves the purpose of collecting the coarsest impurities, and thus preserves the sand for a longer time from becoming foul. The bag, therefore, may occasionally be removed, and rinsed in clean water. It is evident, that the water flows at A through the bag into the filtre, and rises at the place marked

D, which is considerably lower than the former. It affords a very agreeable sight to observe the most limpid fluid penetrating the uppermost stratum of sand, perfectly similar to that oozing from the purest natural spring. Professor Parrot remarks that he procured a filtering machine made of block-tin, for ascertaining by experiments the purity and quality of water, that may thus be obtained in a given time. It consisted of the following dimensions: the small diameter B, E, was eight Paris inches; the large of the whole machine, eleven inches; consequently the thickness of the vessel A, B, was one inch and a half; the breadth of it, two inches and seven-eighths. The perpendicular height of the lower side, from C, its basis, to the rim D, whence the water issues, was four inches and one-twelfth—the opposite height of the mouth A, B, eight inches and three-fourths; and the height of the sand on the side marked D, was three inches and one-sixth. Although, in experiments of this nature, much depends on the relative size and purity of the sand, which necessarily afford different results, yet Professor Parrot has, after repeated trials, deduced the following conclusions, which appear to be well-founded. 1. That the difference of the niveau, or water-level, has an essential influence on the quantity of the purified water thus obtained; 2. That a prolongation of the stratum of sand does not considerably diminish the product of the filtre, but remarkably contributes to the purity of the fluid. 3. That if the water be forced to pass through the sand with increased velocity, it will be less pure than by allowing it a proper time for its passage; and, 4. That a machine of the dimensions above described, will furnish about three quarts of water in an hour, or eighteen gallons in twenty-four hours. This quantity, however, being too large in proportion to the size of the machine, it is advisable, either to lessen the difference of the water-fall; or, which is still better, to prolong the stratum of sand, in order to reduce the filtration of the water to half the quantity above stated, and to obtain it in greater purity. Thus, a filtering apparatus eighteen inches long from A to D, two inches thick, and four broad, would afford every hour six pints of very pure water. If, therefore, so small a machine, containing a very moderate stratum of sand, and requiring only a difference of two or three inches in the height of the water, furnishes a clear and pure fluid, it follows that an apparatus on a larger scale, provided with a bed of sand from five to six feet long, and admitting of a difference from twelve to eighteen inches in the fall of the water, might be usefully employed in public wells, hydraulic machines, and even in camps, for the supply of an army. In the construction of large filtering machines, Professor Parrot justly observes, that they should not be extended in the direction A, C, D, to a greater length than is absolutely necessary; as, in this case, they will not require any considerable difference in the fall and rise of the water: on the other hand, their breadth and thickness may be accordingly increased. Thus, the diameter of such a machine would still more resemble that of a syphon, as is represented in fig. 2. This form might also be adopted for smaller machines, especially such as are designed for travellers, two of whom might be amply provided with pure water, and in a very short time, by a vessel of the following dimensions: from P to Q, eight inches long; from P to R, twelve inches high; and the whole four inches in breadth. If the form last delineated be employed on an extensive scale, there should be a trap door in the lowermost part marked R, so constructed that it may fit exactly, and admit no passage to the water: this aperture would serve only for the removal of the sand, when it is rendered foul by long use. In the smaller machines, intended for travelling, such a door is unnecessary, as they may be easily emptied of their contents through either of the orifices P, or Q. Instead of this addition to the latter, the upper room, (which in fig. 1, is circumscribed with the letters B, F, E), might serve as a reservoir of pure water, that could either be decanted, or drawn off by means of a cock applied to the centre of the machine, marked F. We think, however, this latter arrangement, which is proposed by M. Parrot, in many respects objectionable, and therefore advise the reader to make use of the more simplified construction. Hence we shall only add, that every filtering machine ought to be provided with a cloth cover, to prevent the dust from rising with the water, without impeding its filtration. The great advantages of filtering machines in the different processes of dyeing, baking, brewing, distilling, and all the domestic arts, is exceedingly evident. As no particle of real nutriment

nutriment can be assimilated to the human fluids, without being previously macerated and reduced by water (whether this fluid be introduced into the stomach, in the form of beer, wine, spirits, tea, &c.) it will be easily understood that impure water cannot fail to produce, however slowly, many dangerous, and often incurable diseases—the source of which is seldom suspected. See WATER.

FIMBRIÆ, or **FRINGES**, a name formerly given to the extremities or borders of the *tubæ Fallopianæ*; the word signifying a fringed border, which that part resembles.

FIMBRIATED, in heraldry, an ordinary with a narrow border, or hem of another tincture.

FIN, [*pinna*,] in natural history, a well known part of fishes, consisting of a membrane supported by rays, or little bony or cartilaginous ossicles. The number, situation, figure, and size, of fins, are different in different fishes. They are found from one to ten, or more; with respect to situation, they stand either on the back only, the belly only, or on both. The office of the fins has commonly been supposed to be analogous to that of wings and feathers in fowls; and to assist the fish in swimming; but later naturalists say this is a mistake. The tail is the great instrument of swimming: the fins only serve to keep the fish upright, and prevent vacillation or wavering. See **ICHTHYOLOGY**.

FINAL CAUSE is the end for which any thing is done. The final cause is the first thing in the intention of a person who does a thing; and the last in the execution. See **CAUSE**.

FINAL LETTERS, among the Hebrew grammarians, five letters so called, because they have a different figure at the end of words from what they have in any other situation.

FINALE, in geography, a sea-port town of Italy, 31 miles S. W. of Genoa.

FINALE, a marquisate of Italy, surrounded by the dominions of Genoa. It is fertile and populous.

FINALE, a town of Italy. It is 18 miles N. N. E. of Modena.

FINANCES, [from *finantz*, Germ. *z. e.* scraping, or usury; or *financia*, low Lat. pecuniary payment,] in the late French policy, denoted the revenues of the king and state: much the same with the treasury or exchequer of the English, and the *fiscus* of the Romans. In general the term is applied to the monies borrowed by government for the purpose of defraying extraordinary expences, and interest of this money is paid out of the amount of the taxes, or by taxes levied for this purpose.

FINCH, in ornithology. See **FRINGILLA**.

FINE, in metallurgy, pure and without mixture, is chiefly used in speaking of gold and silver.

FINE, [*fin*, Cimbr.] a mulct; a pecuniary punishment. The killing of an Irishman was not punished by our law as manslaughter, which is felony and capital; but by a fine or pecuniary punishment, called an *ericke*.—Davies on Ireland.

FINE, in law, has divers applications: as, 1. A formal conveyance of lands or tenements, or of any thing inheritable, being in *esse temporis finis*, in order to cut off all controversies: a final agreement between persons, concerning any lands or rents, &c. of which any suit or writ is depending between them in any court. 3. A sum of money paid for entering lands or tenements let by lease: and, 4. a pecuniary mulct for an offence committed against the king and his laws, or against the lord of the manor.

FINES FOR ALIENATION, in feudal law, one of the attendants or consequences of tenure by vassalship. Knight service, was that of fines due to the lord for every alienation, whenever the tenant had occasion to make his land over to another. This depended on the nature of the feudal connection; it not being reasonable nor allowed, that a feudatory should transfer his lord's gift to another, and substitute a new tenant to do the service in his own stead, without the consent of the lord: and, as the feudal obligation was considered as reciprocal, the lord also could not alienate his seignory without the consent of his tenant, which consent of his was called an *atornment*. This restraint upon the lord soon wore away; that upon the tenant continued longer. For, when every thing came in process of time to be bought and sold, the lords would not grant a licence to their tenants to aliene, without a fine being paid; apprehending that, if it was reasonable for the heir to pay a fine or relief on the renovation of paternal estate, it was much more reasonable that a stranger should make the same acknowledgement on his admission to a newly-purchased feud. In

England, these fines seem only to have been exacted from the king's tenants in capite, who were never able to aliene without a licence: but as to common persons, they were at liberty, by *magna charta*, and the statute of *quia emptores* (if not earlier), to aliene the whole of their estate, to be holden of the same lord as they themselves held it of before. But the king's tenants in capite, not being included under the general words of these statutes, could not aliene without a licence; for if they did, it was in ancient strictness an absolute forfeiture of the land; though some have imagined otherwise. But this severity was mitigated by stat. 1 Edw. III. c. 12, which ordained, that in such case the lands should not be forfeited, but a reasonable fine be paid to the king. Upon which statute it was settled, that one-third of the yearly value should be paid for a licence of alienation; but, if the tenant presumed to aliene without a licence, a full year's value should be paid. These fines were at last totally taken away by stat. 12 Car. II. c. 24.

FINES FOR WRITS, are paid in divers cases for original writs. Thus for every writ of plea of land, if it be not of right patent, which is for the yearly value of five marks; and all original writs in debt and trespass, where the debt or damage is 40*l.* a fine is due to the king of 6*s.* 8*d.* and more proportionably when any writ is for things of greater value.

FINECHOLARO, a small island of France, near the N. E. coast of Corsica, 7 miles N. of Bastia.

FINE-DRAWING, or **RENTING**. See **RENTING**. It is prohibited to fine-draw pieces of foreign manufacture upon those of our own, as has formerly been practised.

FINERS, or **REFINERS OF GOLD AND SILVER**, persons who purify and part those metals from coarser ones by fire and acids. They are also called *parters* in our old law-books, and sometimes *departers*.

FINERY, or **FINARY**, in the iron work, one of the forges at which iron is hammered and fashioned into what they call a bloom or square bar.

FINESSE, [French,] signifies literally the same with the English word fineness; but among us it is chiefly used to denote that kind of subtilty used for the purposes of deception. It is likewise used for that peculiar delicacy perceived in works of the mind, and the nicest and most secret and sublime parts of any science or art.

FINE-STILLING, that branch of the art of distilling, which is employed in distilling the spirit from treacle, or other preparations or recrements of sugar. It is so called by way of distinction from malt-stilling. This operation is the same with that used in making the maltspirit; a wash of the saccharine matter being made with water from treacle, &c. and fermented with yeast. It is usual to add in this case, however, a considerable portion of malt, and sometimes powdered jalap, to the fermenting backs. The malt accelerates the fermentation, and makes the spirit come out the cheaper, and the jalap prevents the rise of any musty head to the surface of the fermenting liquor, so as to leave a greater opportunity for the free access of the air, and thus to shorten the work, by turning the foamy into a hissing fermentation.

FINGAL, king of Morven, in ancient Caledonia. He flourished in the third century; and according to the Irish histories died A. D. 283, although there is some reason from Ossian's Poems for placing his death a few years later. Fingal was descended in all probability from those Celtic tribes who were the first inhabitants of Britain. Tradition, and the poems of Ossian, give him a long line of royal ancestors, such as Combal, Trenmore, Trathal, &c. who had all reigned over the same territory. Whether this territory was bounded by the Caledonian forest, or extended somewhat farther south towards the Roman province, is uncertain; but it doubtless extended over all the north and west Highlands, comprehending the Hebrides, whose petty chiefs were all subject to the king of Morven. His principal place of residence was Selma, which was probably in the neighbourhood of Glenco, supposed to be the Cona of Ossian; though some imagine it to have been in Strath-Conan in Moray. The truth seems to be, that as Fingal and his people lived by hunting, they often shifted their habitation. Hence in all parts of the Highlands we find, in the names of places, buildings, &c. such monuments as justify their several claims for the honour of Fingal's residence. Fingal acquired great fame by his prowess in arms. He made many successful incursions into the Roman province, from whence he

carried away those spoils which his son so often mentions, under the names of the wine of the stranger, and the wax of the stranger. By sea we find him frequently making voyages to Scandinavia, the Orkneys, and Ireland; called by Ossian Lochlin, Innistore, and Ullin.

FINGERS, [*digiti*, Lat.] in anatomy, the extreme part of the hand divided into five members. The names of the fingers, reckoning from the thumb, are, 1. Pollex: 2. Index: 3. Medius: 4. Annularis: 5. Auricularis. In each of these there are three bones, which make three phalanges, the upper of which are much larger than the lower. See **ANATOMY**.

FINING OF LIQUORS. See **CLARIFICATION**.

FINISH, an island on the west coast of Ireland, a mile E. of Minishland.

FINISHING, in architecture, is frequently used for crowning, acroter, &c. raised over a piece of building, to terminate, complete, or finish it.

FINISTERRE, [*Lat. finis terra, i. e. land's end*,] a department of France, bounded on the N.W. and S. by the sea, and on the E. by the departments of the north coasts and Morbihan. It comprehends the west part of the late province of Bretagne.

FINISTERRE, or **FINISTERRA**, a town of Spain in Galicia, near the Cape.

FINISTERRE, CAPE, the most western promontory of Spain and of all Europe. Lon. 9. 12. W. Lat. 42. 52. N.

FINITE, [*finitus*, Lat.] something bounded or limited, in contradistinction to infinite. See **INFINITE**. The schools distinguish finite into two kinds, viz. finite in perfection, and finite in extension. See **PERFECTION** and **EXTENSION**.

FINITE IN PERFECTION, is applied to things which have not all possible perfection, but such only as may be comprehended by the mind. Thus the world, though supposed by the Cartesians infinite in point of extension, is yet finite in point of essence or perfection. In order to arrive at an idea of a thing finite in perfection, we must first conceive the thing as having certain perfections, and then conceive some other perfections which it has not; or some perfections in a greater degree. Thus when I say that there is a finite number, I first conceive a number consisting of three units, then conceive other units beyond these three. I conceive my mind to be finite, by observing certain perfections beyond those I find in my mind.

FINITE IN EXTENSION, is applied to things which have not all possible or conceivable extension. To arrive at an idea of a thing finite in extension, we must first conceive the thing as having a certain extension, and then conceive some other extension which it has not; thus I conceive a room to be finite in extension, by having an idea of extension beyond what is contained therein.

FINITO, in music, a canon or fugue is said to be finito, when it is not perpetual, but when, at some certain place, all the parts join or unite, after having followed one another for a certain time.

FINITOR, in astronomy, the same with horizon, so called because it terminates the sight or prospect. See **HORIZON**.

FINKENSTEIN, a town of Germany, in Carinthia, 16 miles S.W. of Clagenfurt.

FINKENSTEIN, or **HABERSDORF**, a town of Prussia, in Oberland, 75 miles S.S.W. of Königsberg.

FINLAND, or **FINNLAND**, a country of Europe, bounded on the north by Lapland, on the east by Russia, on the south by a gulf to which it gives name, and on the west by the gulf of Bothnia. The land is fertile, but badly cultivated, and thinly inhabited. On a tract of more than eight thousand square leagues, hardly a million of souls are to be found. The pastures are exceedingly good, but the cattle are small. The forests of firs furnish the principal articles of commerce, in wood, charcoal, timber, and planks, which are sent to Stockholm for exportation. Game is abundant of various kinds. The lakes and rivers abound in variety of fish, and pearls are found on the coasts. At the bottom of the morasses earth is dug, from which iron is extracted. There are also some mines of lead. Along the coasts lie a great number of small rocky islands. The inhabitants are in general brave and warlike, but have suffered much from the ravages of war. The corn principally cultivated is rye, barley, and buck wheat; the poorer sort of inhabitants, for want of better food, dry even straw, braise and mix it with some meal to make bread. Finland is divided into seven provinces, Finland Proper, Aaland,

East Bothnia, Tavastia, or Tavastland, Nyland, Savolax, and Kymmenegards Lehn. The religion is Lutheranism.

FINLAND PROPER, a province of Sweden, situated on the southern part of Finland. Abo is the capital.

FINLAND, RUSSIAN. See **CARELIA**, **KEXHOLM**, and **WIBURGH**.

FINMARK, a province of Norway, bounded on the north by the northern ocean, on the east by the northern ocean and the territories of Russia, on the south by Swedish Lapland, and on the west by the northern ocean. It has neither towns nor villages, though the coast is pretty well inhabited. The inhabitants subsist chiefly by fishing, and the best salmon of any in Norway are caught in this province.

FINNI, or **FENNI**, the ancient people of Finningia, "whose ferocity (says Tacitus) was extraordinary, poverty extreme, herbs their food, skins their covering, and the ground their couch: regardless of man and of gods, they attained to a very difficult thing, not to have a single wish to form."

FINNINGIA, or **FENNINGIA**, in ancient geography, the proper reading, for Eningia in Pliny, which he makes an island, but is more truly a peninsula: now called Finland.

FINNIS BAY, a bay of Scotland, on the east coast of the island of Harris.

FINNS, the people of Finland. See **FINNI**.

FINO, a small island in the Baltic, near the east coast of Sweden. Lon. 16. 42. E. Lat. 58. 9. N.

FINOW, a town of Germany, in the late circle of Upper Saxony, and Ucker Mark of Brandenburg, 32 miles N.E. of Berlin.

FIR, or **FIR-TREE**. See **PINUS**.

FIR CLUB MOSS. See **LYCOPODIUM**.

FIRE, in chemistry, that subtle invisible substance by which bodies are expanded or enlarged in bulk, and become hot to the touch; fluids are rarefied into vapour; solid bodies become fluid, and in like manner are at last dissipated, or, if incapable of being carried off in vapour, are at length melted into glass. It is now denominated caloric, or the matter of heat. See **CALORIC**.

FIRE, in theology. See **HELL**. We read of the sacred fire in the first temple of Jerusalem, which came down from heaven: it was kept with the utmost care, and the Jews were forbidden to carry any strange fire into the temple. This fire is one of the five things which the Jews confess were wanting in the second temple.

FIRE, in the Pagan mythology. Fire was the supreme god of the Chaldeans; and the Persian Magi were worshippers of fire.

FIRE, BALLS OF. See **BALLS OF FIRE**, and **ÆROLITHS**.

FIRE, THE EXTINGUISHING OF. Though designed to be subservient to the most useful purposes, fire frequently becomes a scourge to mankind; and, unless it be timely discovered, lays whole streets and towns in ashes. Hence the securing of houses and other buildings against this devouring element, has ever formed an important object of inquiry, while it has exercised the ingenuity of intelligent men; we shall briefly state a few of the most remarkable experiments, together with the result or success which has attended them. Dr. Hales first proposed a plan of covering the floors of houses with earth. The thicker the mould is laid on the floors the greater is the security. He supposes that the depth of an inch will be amply sufficient; though he recommends to lay a deeper coat on the stairs; because fire, in general, ascends by means of stair-cases with the greatest velocity. M. Hartley made several trials in 1775 and 1776, to evince the efficacy of a method which he had invented for restraining the spreading of fire in buildings. For this purpose thin iron plates are well nailed to the tops of the joists, &c. the edges of the sides and ends being lapped over, folded together, and hammered close. Partitions, stairs, and floors, may be defended in the same manner; and plates applied to one side have been found sufficient. The plates are so thin as not to prevent the floor from being nailed on the joists, in the same manner as if this preventive were not used: they are kept from rust by being painted or varnished with oil and turpentine. The expence of this addition, when extending through a whole building, is estimated at about 5 per cent. Mr. Hartley got a patent for this invention, and parliament voted a sum of money towards defraying the expence of his numerous experiments. The same preservative may also be applied to ships, furniture, &c. Lord Mahon has likewise invented a very simple

simple and effectual mode of securing every kind of building against all danger of fire: he divides it into three parts, namely, under-flooring, extra-lathing, and inter-securing. The first part or method is either single or double. In single underflooring, a common strong lath, one quarter of an inch thick, should be nailed against each side of every joist and main timber, supporting the floor which is to be secured. Similar laths are then to be nailed on the whole length of the joists, the ends of which abut against each other. The top of each lath or fillet, ought to be an inch and a half below the top of the joists or timbers, against which they are nailed, so as to form a small ledge on every side. When these fillets are nailed on, they should be laid in a rough plaster, which should be laid on the tops of such fillets, so as to leave no vacant space between them and the joists. Short pieces of common laths are next to be nailed closely together, in a direction contrary to that of the joists; the ends of the former are to rest on the fillets, and to be well bedded in rough plaster, but not fastened with nails. They are next to be coated once with the plaster, which is to be spread over them to the tops of the joists. In double-flooring, the fillets and short pieces of laths are applied in the manner already described; the coat of rough plaster ought, however, in this method, to be somewhat more than half as thick as that in single-flooring. While the rough plaster is laying on, some additional short pieces of laths are to be inserted between the joists upon the first coat, as closely to each other as possible, and in the same direction as the first layer of laths. Over this second layer of short laths, another coat of rough plaster should be spread, which ought to be trowelled level with the tops of the joists. As soon as the plaster-work between the joists is perfectly dry, it should be inspected, in order to ascertain whether there be any small cracks, especially next to the joists. Should any occur, it will be requisite to close them, by washing them over with a brush wetted with mortar-wash, which may be prepared by mixing two measures of quick-lime and one of sand in a pail, and tempering the whole with water till it acquires the consistence of a thick jelly. Previously to laying down the flooring-boards, a small quantity of dry common sand should be strewn over the plaster work, and struck smooth with a hollow rule in the same direction as the joists are laid, so that it may lie rounding between each pair of joists. Particular attention should be paid to the plaster-work and sand, that they be perfectly dry before the boards are laid, lest the latter become infected with the dry-rot. The mode of under-flooring may be successfully applied to a wooden stair-case; but no sand is then to be laid upon the plaster-work. The methods of extra-lathing may be practised on ceiling-joists, sloping-roofs, and wooden partitions. The third method, namely, inter-securing, is similar to that of under-flooring; but no sand is afterwards to be laid over it. Inter-securing is applicable to the same parts of a building as the method of extra-lathing; but it is seldom necessary to be employed. Lord Mahon made several experiments, which shew the utility of this invention; but we can only refer the inquisitive reader to the sixty-eighth volume of the Philosophical Transactions of the Royal Society," for 1778; where he will find a satisfactory account of the manner of preparing the mortar, as well as the result of numerous trials made by the inventor. See also ARCHITECTURE and FIRE-PROOF. The most expeditious way of extinguishing fire is a matter of equal importance, as the security of buildings from that destructive agent. Hence various machines, and chemical preparations, have been invented by ingenious men, in order to promote so useful an object; one of the earliest contrivances was a barrel filled with certain ingredients, first proposed by M. Fughs, a German physician, in the year 1734; and which effectually answered the purpose for which it was designed. A similar invention was introduced into this country by a Mr. Zachary Grey, whose machines were made of wood, and contained only water; they were exhibited before several of the nobility, but it did not meet with encouragement. In the year 1761, Dr. Godfrey produced certain vessels which in every respect succeeded. They are supposed to have been an improvement on Mr. Grey's, were constructed with wood, and filled with a chemical liquor, consisting of water, oil of vitriol, and sal-ammoniac. When thrown into rooms and other places that were purposely set on fire, they burst, and by their explosion completely extinguished the flames: it is to be observed, that they were useless after the roof had fallen in. These contrivances,

however, are evidently more calculated for ships, than to be employed on land; as they would be of great service for suppressing fires in vessels at sea, and might be considered as necessary a part of their cargo as naval stores, or ammunition. In the twenty-third volume of Annals of Agriculture, Mr. William Knox, a merchant of Gothenburg, in Sweden, states that he had made a variety of experiments for extinguishing fire by means of such substances as are cheap and easily procured. He divides them into simple and compound solutions. In the former class, he proposes to add to seventy-five gallons of water nine gallons of the strongest solution of wood-ashes; or six gallons of the finest pulverized pot-ashes; or eight gallons and a half of common salt well dried, and finely beaten; or eight gallons and a half of green vitriol or coppers, thoroughly dried, and finely pulverized; or eleven gallons and a quarter of the strongest herring pickle; or nine gallons alum reduced to powder; or nineteen gallons of clay, perfectly dried, well beaten, and carefully sifted. Among the compound solutions, Mr. Knox recommends to mix seventy-five gallons of water with ten quarts of clay, ten quarts of vitriol, and ten quarts of common salt; or a similar quantity of water, with eighteen quarts of the strongest solution of wood-ashes and eighteen quarts of fine clay reduced to powder; or the same proportion of water, with fifteen quarts of red-ochre, or the residuum of aquafortis, and fifteen quarts of common salt; or, lastly, to mix fifteen quarts of the strongest herring-pickle, and fifteen quarts of red-ochre, with seventy-five gallons of water. All these different solutions, Mr. Knox remarks, are equally efficacious in extinguishing fire; but he prefers the compounds, as being the "surest and most powerful for that purpose." Another of the various inventions for extinguishing fire by chemical means, deserving of notice, is the composition prepared by M. Von Aken, and which consists of the following ingredients:

	<i>lbs.</i>
Burnt alum.....	30
Green vitriol in powder.....	40
Cinabrese, or red-ochre, pulverized.....	20
Potters, or other clay, finely pounded and sifted.....	200
Water.....	630

With 40 measures of this liquor an artificial fire, which would have required the labour of twenty men, and 1500 measures of common water, was extinguished, under the direction of the inventor, by three persons. The price of this compound solution is estimated at one halfpenny per pound.

FIRE, WATER ENGINES FOR EXTINGUISHING. These are either forcing or lifting pumps; and as they are made to move with great velocity, their execution principally depends on the length of their levers, and the force with which they are worked. Various engines have been contrived, from which we have selected the following, as they are the most ingenious, and at the same time calculated to produce the greatest effects. In the year 1785, the silver medal and twenty guineas were conferred by the "Society for the Encouragement of Arts," &c. on Mr. Furst, as a reward for his contrivance to increase the effect of engines in extinguishing fires; of which the following is a short description: from a platform rises an upright pole or mast, of such height as may be judged necessary; a gaff slides upon it in an ascending direction, and along both is conveyed the leather hose from the engine. The branch, or nose-pipe of the engine, projects at the extremity of the gaff; towards which an iron frame is fixed, whence two chains are suspended; and from these hang ropes, which serve to give an horizontal direction to the branch; while other ropes, that run through proper pulleys, and are thus conveyed down the mast, serve likewise to communicate a vertical motion to it. By these means, the branch or nose-pipe of the engine is conducted into the window of any room where the fire more immediately rages; and the effect of the water discharged is applied in the most efficacious manner to the extinguishing of the flames. A patent was granted in January 1790, to Mr. Joseph Braham, of Piccadilly, and to Mr. Thomas Dickenson, of Bedworth Close, in the county of Warwick, for a new improved engine on a rotative principle. The merits of this machine depend on its having two wheels or cylinders of brass, or any other metal; one of which is of a greater, and the other of a smaller diameter, in any proportion required; both are nearly of equal length, but may be increased

or decreased, according to the purpose to which the machine is applied. As soon as the larger wheel is fixed, the smaller one is placed within it, and is fastened on an axis, so as to turn in a rotative direction round its centre; the smaller wheel being thus stationed, may be occasionally fixed, and the larger one moved in the same direction round the smaller one: the former of these, however, is preferable in all cases. At each end of the larger wheel there is a flanch, to which are screwed two plates, or caps inclosing its ends, and into which the extremities of the smaller wheel are inserted, so as to render the junction water-tight: through these caps passes the axis of the inner cylinder, in order to communicate motion from without. Or the inner wheel may be applied so as to give motion, by its external end or ends, to any other engine or machine connected with it. These are the component parts of Messrs. Brahan's and Dickenson's patent engines; for a more particular account of which, we refer the reader to the 2d vol. of the Repertory of Arts and Manufactures, where he will find a minute account of the machinery, and the effects it is calculated to produce. A patent was likewise granted in December 1792, to Mr. Charles Simpkin, of Oxford-street, engine-maker; for his improvements in all kinds of machines for extinguishing fire. This invention consists in exploding or removing the valves both from that part of the cylinder, where the vacuum is made by the piston or fly, and from beneath the air-vessel; and in making use of valves, by the application of certain filtering chambers, with partitions or divisions, to preserve the effect of the valves, during the use of any improper fluid. These filtering chambers are to be placed between the drawing valves, and the strainer in common use, on the suction-pipe. The partitions in the chambers may be of fine wire-work, or of any other substitute, that will act as a first and second filtration in the chamber. The design of this invention is, to render the valves more free of access, and to prevent the necessity of opening any other parts of the engine, except the chambers containing the valves; by which means the effect of the machine is increased, and consequently the fire may be more easily extinguished. To these different contrivances we shall add the American fire engine, of which we have given an accurate engraving. It was invented by Mr. Benjamin Dearborn, who communicated it to the American Academy of Arts and Sciences, from whose Memoirs for 1794, we extract the following description. In fig. 3, Plate LXX, AB, and C D, are the edges of two planks, confined together by four bolts.—*a b*, and *c d*, are two cylindrical barrels, in each of which a piston, with a valve, is fastened to the spear *e*, and is moved up and down alternately by the motion of the arms E E. Beneath each barrel a hole is made through the plank AB, which is covered with a valve. The arms E E, are suspended on the common centre *f*; there are also arms parallel to these on the opposite side; *g g* are the ends of handles which are fastened across the ends of the arms. At *h*, a bolt goes across, from arm to arm, to which the piece *i k*, is affixed, and on which it plays; the lower end of this piece is fastened to the top of the spear *e*.—*G, l, f*, is a standard for the purpose of supporting the arms, to which there is a correspondent one on the opposite side; both are notched into the edges of the planks, where they are secured by a bolt, which passes through them at *l*, and has a nut or fore-lock on the opposite side. H I, H I, are square braces, answering the purpose of ducts, through which the water ascends from the barrels, passing through the plank at *m*. K L, K L, are irons in the form of a staple, in order to confine the braces: the lower ends of these irons meet, and are secured by a bolt passing through them, and M N, *n o*, which is a piece that goes up through a mortice in the centre of the planks. This piece is square from the lower end, till it reaches the top of the braces; whence they become cylindrical to the top, the upper end being perforated sufficiently low down, in order to communicate with the braces. O, P, is an iron ring, that surrounds the tube, and has two shanks which ascend through the head, which screws on the top at *p*, *q*:—*r, s*, is a ferule, nailed round the tube. Fig. 4, is the same engine; the arms and standards being taken off, in order to delineate more clearly the mode of securing the braces; an object which is completely effected by a wedge driven into the mortice *u*: beneath the upper plank *b*, is a hole for admitting a passage to the bolt, which secures the standards. In this figure, a side-view of the head is given, with the pipe in a perpendicular direction. The

machine is confined within a box, set on wheels, as in the common fire-engines. The whole is made of wood, excepting the spears of the pumps, and a few bolts, &c. The advantages of this machine are, that it can be made in any place where common pumps are manufactured; the interior work will not exceed one-fourth of the price of those which are constructed on the usual plan; and that they are incomparably more easy to work, than the common ones; circumstances which strongly recommended the American fire-engine to the attention of the public. The fire-engine is in all cases, a very ineffectual machine, where it cannot supply a very large quantity of water in proportion to the fire to be extinguished. On the breaking out of a fire, all constables are enjoined, by several acts of parliament, to repair to the place; to use every exertion for extinguishing the flames; and to cause the people to work, &c. By the 10 Ann. c. 14, no action shall be commenced against any person in whose house or chamber a fire shall break out accidentally; but, if such fire happen through the negligence of any servant, the latter incurs a penalty of 100*l*. to be distributed among the sufferers; and in default of payment, he is to be imprisoned for 18 months, during which time he is to be kept to hard labour. The wilful setting of fire to any house, out-house, or other building, is felony without benefit of clergy.

FIRE-ARMS are those which are charged with powder and ball; such as musquets, carbines, pistols, cannons, &c. In December 1780, a patent was granted to Mr. John Aitken, of Edinburgh, surgeon, for his invention of a new method of loading fire-arms, of whatever dimensions or forms, with two or more charges of powder and ball, and of discharging them in succession, by fire communicated through correspondent perforations, or touch-holes. This consists in lodging several charges of powder and shot in the fire-arms, whether cylindrical, conical, chambered, or otherwise; the hindmost extremity, or breech, being closed, while the anterior one, or muzzle, is open. The extension of the fire, in a posterior direction from the charge next the muzzle that is first inflamed, is intercepted by intermedia placed between the several charges, which are firmly rammed about or above the shot; and which are formed of any substance that possesses sufficient resistance, is compact, incombustible, and properly shaped. In the smaller fire-arms, namely pistols, musquets, blunderbusses, &c. the patentee chiefly employs leather, or other thick stuffs. In the larger ones, such as cannons, mortars, &c. he makes use of various pastes, as being more commodious, and more easily procured. The charges are ignited through touch-holes by the lock, or match, as occasion may demand, according to the size and condition of the tube.

FIRE-ARROW, in naval artillery, is a small iron dart furnished with springs and bars, together with a match impregnated with sulphur and powder, which is wound about its shaft. It is intended to fire the sails of the enemy, and it is for this purpose discharged from a musquetoon or swivel gun. The match being kindled by the explosion, communicates the flame to the sail against which it is directed, where the arrow is fastened by means of its bars and springs. This weapon is peculiar to hot climates, particularly the West Indies, where the sails being extremely dry by reason of the great heats, they instantly take fire, and of course set fire to the rigging, masts, and vessel.

FIRE-BALL, in artillery, a composition of powder, sulphur, salt-petre, pitch, &c. about the bigness of a hand-grenade, coated over with flax, and primed with the slow composition of a fuze. This is to be thrown into the enemy's works in the night-time, to discover where they are; or to fire houses, galleries, or blinds of the besiegers; but they are then armed with spikes or hooks of iron, that they roll not off, but stick or hang where they are desired to have any effect. See BALL.

FIRE-EATER. A great number of mountebanks have attracted the attention and wonder of the public by eating fire, walking on fire, washing their hands in melted lead, and the like tricks. The most celebrated of these was our countryman Richardson, much talked of abroad. His secret, as related in the Journal des Scavans, of 1680, consisted in a pure spirit of sulphur, wherewith he rubbed his hands, and the parts that were to touch the fire; which burning and cauterizing the epidermis, hardened and enabled the skin to resist the fire. Indeed this is no new thing: Amb. Pare assures us that he had tried it on himself: that after washing the hands in urine, and with an unguentum aureum, one

may safely wash them in melted lead. He adds, that by washing his hands in the juice of onions, he could bear a hot shovel on them while it melted lead.

FIRE-COCKS, are contrivances for admitting water into pipes or reservoirs; churchwardens in London, and within the bills of mortality, are enjoined to fix them at proper distances in streets, together with painted characters on the opposite wall, pointing out such distance. They are also ordered to deposit in every house thus marked, an instrument or key for opening a plug, and likewise a large engine, and an hand-engine, under the penalty of ten pounds.

FIRE-ENGINE. See **STEAM-ENGINE.**

FIRE-ESCAPE, a contrivance for the purpose of rescuing persons in imminent danger from fire. In the Annual Register for 1775, an account is given of a machine for saving persons and effects from the flames. It consists, 1. Of a pole of fir, which may be of any convenient length, being about five inches in diameter at the bottom, and at the top or smallest end, about three inches. At the distance of three feet from the top, is a mortice through the pole, to which a pulley is fixed, that is nearly of the same diameter as that part of the pole. 2. A rope about three-fourths of an inch in diameter, and twice the length of the pole, at one end of which is a spring-hook, to pass through the handle of the basket, when used; it is put through the mortice over the pulley, and drawn tight on each side, nearly to the bottom of the pole, where it is secured till wanted. 3. A basket which ought to be of strong wicker-work, three and a half feet long, two and half feet wide, rounded off at the corners; and four feet deep, rounding every way at the bottom. To the top of the basket is fixed a strong iron curve, or handle, with an eye or ring in the middle: a small cord about the length of the pole, is likewise fastened to one side of the basket, near the top. These being the principal parts, there are also several straps, &c. for securing the poles from sliding; of which the reader will find a minute account in the volume before quoted. This contrivance can be raised, and two or more persons may be taken out of the upper windows of a house, and let down safely in the street, within the space of thirty-five seconds, or in little more than half a minute. We cannot on this occasion, omit to point out the great utility of those fringed ropes which should be fastened to the foot of a bedstead, and extend to a sufficient length, to descend by them, in case of fire, through a window: they are sold by several rope-manufacturers in town, generally at two shillings per yard.

FIRE-PLACE, a contrivance for communicating heat to rooms, and also for answering various purposes of art and manufacture. See **FURNACE** and **STOVE**. In the construction of fire-places for domestic purposes, the chief object is the saving of fuel: with this intention, several ingenious artists have invented different kinds of grates, more or less adapted to that useful end. The fire-places in general use are, 1. The large open ones, which were commonly adopted in former times, and are still retained in the country, and in kitchens: they require a wide funnel, consume a great quantity of fuel, and generally smoke, unless the door, or a window, be left open. 2. The modern fire-places generally adopted in towns, are constructed with low breasts and hearths, narrowed by jambs. These being more contracted than the antiquated chimnies, easily keep the room free from smoke; but the funnel necessarily occasions a considerable draught of air, which rushing in at every crevice, renders the situation of those who are exposed to it very uncomfortable, and even dangerous: for it is unquestionable, that most of the diseases that proceed from colds may be justly attributed to the strong draught of chimnies, by which, in severe weather, persons are scorched before, while they are freezing behind. Such fire-places, therefore, are of little service in heating rooms, as the surrounding air, which is warmed by the direct rays of the fire, does not remain in the apartment, but is continually collected in the chimney, by the current of cold air which surrounds it, and by which it is in a short time carried off. Nor is this the only inconvenience attendant on such improper contrivances; for the greatest part of the fire is lost, in consequence of its being absorbed by the back, jambs, and hearth, which are dark and obscure, and reflect very little, so that the heat flies directly up the chimney. 3. To remedy this inconvenience, an ingenious Frenchman, named Gauger, in the year 1709, proposed seven different constructions of a new kind of chimnies, in which there are hollow cavities, formed by means of iron plates

inserted in the back, jambs, and hearth; through these the heat passes and warms the air in those cavities, which is thus continually communicated to the room. Although many advantages arise from this arrangement, yet the expence necessarily incurred, must ever be an insuperable obstacle to its general adoption. 4. Another kind of fire-place is the Holland iron-stove, which has a flue proceeding from the top, and a small iron door that opens into the apartment. They serve to warm a room, lessen the consumption of fuel, and to produce a constant change of air; but, as the fire is too much confined, it is neither sufficiently cheerful, nor calculated for culinary purposes, and is therefore employed chiefly in work-shops. 5. The German stove consists of five iron plates, which are screwed closely together in such a manner, that the fuel may be put into it from another room, and even from the outside of the house. This stove warms rooms with little fuel, and is not attended with any danger from the irruption of cold air; but it admits of no change or draught of air in the room, and the fire is likewise concealed. Such are the inconveniences attending the fire-places in general use; and, though we by no means wish to depreciate the inventions of Count Rumford, yet we are of opinion that the Pennsylvania fire-place, which was originally contrived by Dr. Franklin, is eminently adapted to domestic purposes, both for its economy in the consumption of fuel, and on account of its efficacious mode of imparting heat. From these considerations, we have been induced to present the reader with some account of this machine, which consists: 1. Of a bottom plate or hearth-piece, as shewn in the figure, with a rising moulding in front, for a fender. See Plate LXX. fig. 5. At the sides are attached two perforated ears, F, G, for receiving two screw-rods; a long air-hole *aa*, through which the outward air passes into the air-box; and three smoke-holes represented by the dark squares in BC, through which the smoke descends and passes away; besides, double ledges for receiving between them the lower edges of the other plates. 2. A back plate without holes, and furnished with a pair of ledges to receive. 3. The two side plates, each of which has a pair of ledges to receive the side-edges of the front plate, with a shoulder on which it rests two pair of ledges to receive the side edges of the two middle plates which form the air-box, and an oblong air-hole near the top, through which the air warmed in the box is discharged into the room, and a wing or bracket as H, and a small hole as R, for the axis of the register to turn in. See fig. 6, which represents one of these plates. 4. An air-box, composed of the two middle plates DE and FG, fig. 7 and 8. The first has five thin ledges or partitions cast on it, the edges of which are received into so many pair of ledges cast in the other: the tops of all the cavities formed by these thin deep ledges are also covered by a ledge of the same form and depth cast with them; so that when the plates are put together, and the joints luted, there is no communication between the air-box and the smoke. In the winding passages of this box, fresh air is warmed as it passes into the room. 5. A front plate, which is arched on the under side, and ornamented with foliages, &c. 6. A top plate, with a pair of ears M, N, fig. 9, answerable to those in the bottom plate, and perforated for the same purpose. It has also a pair of ledges running round the under side to receive the top edges of the front, back, and side plates. The air-box does not reach up to the top plate by $2\frac{1}{2}$ inches. All these plates are of cast iron; and when they are all in their proper places, they are bound firmly together by a pair of slender rods of wrought iron with screws, and the machine appears as in fig. 9. There are also two thin plates of wrought iron, viz, 7. The shutter, which is of such a length and breadth as to close well the opening of the fire-place, and serves to blow up the fire, and to secure it in the night. It is raised or depressed by means of two brass knobs, and slides in a groove left between the foremost ledge of the side plates and the face of the front plate. 8. The register, which is placed between the back plate and air box, and furnished with a key; so that it may be turned on its axis, and made to lie in any position between level and upright. The operation of this machine, and the method of fixing it, may be understood by observing the profile of the chimney and fire-places in fig. 10. M is the mantle piece or breast of the chimney; C the funnel; B the false back, made of brick work in the chimney, four inches or more from the true back, from the top of which a closing is made over to the breast of the chimney, that no air may pass into the chimney except that which goes under the false back, and up behind it; T

the true back of the chimney; E the top of the fire-place; F the front of it; A the place where the fire is made; D the air-box; K the hole in the side plate, through which the warmed air is discharged out of the air-box into the room; H the hollow, formed by removing some bricks from the hearth under the bottom plate filled with fresh air, entering at the passage I, and ascending into the air-box through the air-hole in the bottom plate near G, the partition in the hollow, designed to keep the air and smoke apart; P the passage under the false back, and part of the hearth for the smoke. The arrows shew the course of the smoke. The fire being made at A, the flame and smoke will ascend, strike the top T, and give it a considerable heat; the smoke will turn over the air-box, and descend between it and the back plate to the holes near G in the bottom plate, heating in its passages all the plates of the machine; it will then proceed under and behind the false back, and rise into the chimney. The air of the room contiguous to the several plates, and warmed by them, becomes specifically lighter than the other air in the room, and is obliged to rise; but being prevented by the closure over the fire-place from going up the chimney, is forced out into the room, and rising by the mantle-piece to the ceiling, is again driven down gradually by the steam of newly warmed air that follows: and thus the whole room becomes in a little time equally warmed. The air also, warmed under the bottom plate and in the air-box, rises and comes out of the holes in the side plates, thus warming and continually changing the air of the room. In the closing of the chimney a square opening for a trap door should be left for the sweeper to go up: the door may be made of slate or tin, and so placed, that by turning up against the back of the chimney when open, it closes the vacancy behind the false back, and shoots the soot that falls in sweeping out upon the hearth. It will also be convenient to have a small hole, about five or six inches square, cut near the ceiling through into the funnel, and provided with a shutter; by occasionally opening which, the heated air of the room and smoke of tobacco, &c. may be carried off without incommoding the company. For a further account of the manner of fixing and using this fire-place, see Franklin's Letters and Papers on Philosophical Subjects, p. 284—318, edit. 1769.

FIRE-PLACES, COUNT RUMFORD'S IMPROVEMENTS OF. The ingenious Count Rumford has lately published a valuable Essay on the most beneficial form in which common fire-places may be constructed; so as not only to prevent smoking, but also to improve them in all other respects. See **SMOKING**.

FIRE-POTS, in the military art, small earthen pots, into which is put a charged grenade, and over that powder enough to cover the grenade; then the pot is covered with a piece of parchment, and two pieces of match across lighted: this piece being thrown by a handle of matches where it is designed, it breaks and fires the powder, and burns all that is near it, and likewise fires the powder in the grenade, which ought to have no fuse, that its operations may be the quicker.

FIRE-REEDS, reeds used in fire-ships. They are made up in small bundles of about a foot in circumference, cut even at both ends, and tied together in two places. They are distinguished into two kinds, viz. the long and short; the former of which are four feet, and the latter two feet five inches in length. One part of them are singly dipped, i. e. at one end; the rest are dipped at both ends in a kettle of melted composition. After being immersed about seven or eight inches in this preparation, and then drained, they are sprinkled over with pulverised sulphur upon a tanned hide.

FIRE-SHIP, in the navy, a vessel charged with artificial fire-works, which having the wind of an enemy's ship, grapples her, and sets her on fire.

FIRE-STONE. See **PYRITES**.

FIRE-WORKS, preparations made of gun-powder, sulphur, and other inflammable and combustible ingredients, used on occasion of public rejoicings and other solemnities. The invention of fire-works is by M. Mahudel attributed to the Florentines and people of Sienna; who found out likewise the method of adding decorations to them of statues, with fire issuing from their eyes and mouths. The art of preparing and managing these is called pyrotechny. See **PYROTECHNY**.

FIRING, in the military art, denotes the discharge of the fire-arms; and its object is to do the utmost execution to the enemy.

The present method of firing by platoons is said to have been invented by Gustavus Adolphus; and first used about 1618: the reason for this method is, that a constant fire may be always kept up. There are three different ways of platoon firing: viz. standing, advancing, and retreating. But previous to every kind of firing, each regiment or battalion must be told off in grand divisions, subdivisions, and platoons, exclusively of the grenadiers, which form two subdivisions or four platoons of themselves. In firing standing, either by divisions or platoons, the 1st fire is from the division or platoon on the right; the 2d fire from the left; the 3d from the right again; and so on alternately, till the firing comes to the centre platoon, which is generally called the colour platoon, and does not fire, remaining as a reserve for the colours. Firing advancing is performed in the same manner, with this addition, that before either division or platoon fires, it advances three paces forward. Firing retreating varies from either of the former methods; for before either division or platoon fires, if they are marching from the enemy, it must go to the right about, and after firing, to the left about again, and continue the retreat as slow and orderly as possible. In hedge-firing the men are drawn up two deep, and in that order both ranks are to fire standing. Oblique firing is either to the right and left, or from the right and left to the centre, according to the situation of the object. The Prussians have a particular contrivance for this purpose; if they are to level to the right, the rear ranks of every platoon make two quick but small paces to the left, and the body of each soldier turns one-eighth of a circle, and vice versa. Parapet firing depends on the nature of the parapet over which the men are to fire, and also upon that of the attack made to possess it. This method of firing is sometimes performed by single ranks stepping on the banquette and firing: each man instantly handing his arms to the centre rank of the same file, and taking his back in the room of it; and the centre rank giving it to the rear to load, and forwarding the arms of the rear to the front rank; by which means the front rank men can fire six or seven rounds in a minute with exactness. Parapet firing may also be executed two deep, when the banquette is three feet broad, or in field works, where no banquettes are made. Square firing is performed by a regiment or body of men drawn up in a hollow square, in which case each front is generally divided into four divisions or firings, and the flanks of the square being the weakest part, are covered by four platoons of grenadiers. The first fire is from the right division of each face; the 2d from the left division of each face, &c. and the grenadiers make the last fire. Street-firing is practised in two ways; either by making the division or platoon that has fired to wheel by half rank to the right and left outwards from the centre, and to march in that order by half divisions down the flanks on each side of the column, and to draw up in the rear, and go on with their priming and loading; or, to make the division or platoon, after firing, to face to the right and left outwards from the centre, and one half rank to follow the other; and in that order to march in one centre file down on each side of the column into the rear, and there draw up as before.

FIRING, in farriery. See **FARRIERY**.

FIRING IRON, an instrument used by farriers, resembling the blade of a knife, which being made red-hot is applied to a horse's skin, to discuss tumours, knots, &c. The practice is justly condemned by Osmer. See **FARRIERY**.

FIRKIN, an English measure of capacity for things liquid, being the fourth part of the barrel; it contains eight gallons of ale, soap, or herrings; and nine gallons of beer.

FIRLOT, a dry measure used in Scotland. The oat firlo contains 21½ pints of that country; the wheat firlo contains about 2,211 cubical inches; and the barley firlo, 31 standard pints. Hence it appears that the Scotch wheat firlo exceeds the English bushel by thirty-three cubical inches.

FIRMAMENT, in the ancient astronomy, the eighth heaven or sphere; being that wherein the fixed stars were supposed to be placed. It is called the eighth, with respect to the seven heavens or spheres of the planets which it surrounds. It was supposed to have two motions; a diurnal motion, given it by the primum mobile, from E. to W. about the poles of the ecliptic; and another opposite motion from W. to E.; which last it finishes, according to Tycho, in 25,412 years; according to Ptolemy, in 36,000; and according to Copernicus, in 258,000; in which time

the fixed stars return to the same precise points wherein they were at the beginning. This period is commonly called Plato's year, or the great year. In various places of Scripture firmament is used for the middle region of the air. Many of the ancients allowed, with the moderns, that the firmament is a fluid matter; though they, who gave it the denomination of firmament, must have taken it for a solid one.

FIRMAN, a passport or permit granted by the Great Mogul to foreign vessels, to trade within his territories.

FIRMNESS, in physiology, the consistence of a body, or that state wherein its sensible parts cohere in such a manner, that the motion of one part induces a motion in the rest.

FIRO, a species of *Acarus*. See *ACARUS*.

FIRST-BORN. See *PRIMOGENITURE*. This word is often used in Scripture in a figurative sense for that which is first, most excellent, most distinguished in any thing. Thus it is said of Christ (Col. i. 15,) that he is "the first-born of every creature;" and in the Revelation (i. 5,) he is called "the first-begotten of the dead;" that is, according to the commentators, Begotten of the Father before any creature was produced; and the first who rose from the dead by his own power. "The first-born of the poor," (Isa. xiv. 30,) signifies, The most miserable of all the poor; and in Job (xviii. 13,) "The first-born of death; that is, The most terrible of all deaths.

FIRST-FRUIITS, [*primitiæ*, Lat.] among the Hebrews, were oblations of part of the fruits of the harvest, offered to God as an acknowledgment of his sovereign dominion. The first of these fruits were offered in the name of the whole nation, being either two loaves of bread, or a sheaf of barley which was threshed in the court of the temple. Every private person was obliged to bring his first-fruits to the temple; and these consisted of wheat, barley, grapes, figs, apricots, olives, and dates. There was another sort of first-fruits which were paid to God. When bread was kneaded in a family, a portion of it was set apart, and given to the priest or Levite who dwelt in the place: if there was no priest or Levite there, it was cast into the oven, and consumed by the fire. These offerings made a considerable part of the revenues of the Hebrew priesthood.

FIRST-FRUIITS are frequently mentioned by ancient Christian writers as one part of the church revenue. One of the councils of Carthage enjoined, that they should consist only of grapes and corn; which shews, that this was the practice of the African church.

FIRST-FRUIITS, in the church of England, are the profits of every spiritual benefice for the first year, according to the valuation thereof in the king's books.

FIRUZABAD, a town of Persia, in the province of Faristan, 75 miles S. S. W. of the Schiras.

FISC, or **FISCUS**, [from *φισκος*, Gr. a great basket,] in the civil law, the treasury of a prince or state; or that to which all things due to the public fall. By the civil law, none but a sovereign prince has a right to have a fisc or public treasury.

FISCAL, in the civil law, something relating to the pecuniary interest of the prince or people.

FISCAL, a town of Spain in Arragon, 15 miles N. W. of Ainsa.

FISCHA, a river of Germany, in Austria, which runs into the Danube, at Fischamund.

FISCI ADVOCATI, and **FISCI PROCURATORES**, officers appointed for the management of the fisc.

FISH, in natural history, constitutes a class of animals which have no feet, but always fins; add to this, that their body is either altogether naked, or only covered with scales; and that they are aquatic animals, which live mostly, if not always, in water. See *FISCHES*.

FISH, in a ship, a plank or piece of timber, fastened to a ship's mast or yard, to strengthen it; which is done by nailing it on with iron spikes, and winding ropes hard about them.

FISHES, in heraldry, are the emblems of silence and watchfulness; and are born either upright, imbowd, extended, endorsed respecting each other, surmounting one another, fretted, &c. In blazoning fishes, those born feeding, should be termed devouring; all fishes born upright and having fins, should be blazoned hauriant; and those born transverse the escutcheon, must be termed naiant.

FISHES, BLOWING OF, is a practice similar to that of blowing flesh, poultry, and pigs, and adopted for the same deceitful pur-

poses. The method of blowing fish, especially cod and whittings, is by placing the end of a quill or tobacco-pipe at the vent, and pricking a hole with a pin under the fin which is next the gill; thereby making the fish appear to the eye large and full, which when dressed will be flabby, and little else than skin and bones. But this imposition may be discovered by placing the finger and thumb on each side of the vent, and squeezing it hard; the wind may be perceived to go out, the skin will fall in, and the fish seem lank, and of little value.

FISHES, FEEDING OF. When they are fed in large pools or ponds, either malt boiled, or fresh grains, is the best food; thus carps may be raised and fed like capons; and tenches will feed as well. The care of feeding them is best committed to a gardener or the butler, who should be always at hand. When fed in a stew, any sort of grain boiled, especially peas, and malt coarsely ground, are proper food; also the grains after brewing, while fresh and sweet; but one bushel of malt not brewed, will go as far as two of grains.

FISH, GOLD. See *CYPRINUS*.

FISH, PRESERVING OF, FOR CABINETS. Linnæus's method is, to expose them to the air; and when they acquire such a degree of putrefaction that the skin loses its cohesion to the body of the fish, it may be slid off almost like a glove: the two sides of this skin may then be dried upon paper like a plant, or one of the sides may be filled with plaster of Paris to give the subject a due plumpness. A fish may be prepared, after it has acquired this degree of putrefaction, by making a longitudinal incision on the belly, and carefully dissecting the fleshy part from the skin, which are but slightly attached to it in consequence of the putrescency. The skin is then to be filled with bottom and the antiseptic powder as directed for birds; and, lastly, to be sewed up where the incision was made. See *BIRD*.

FISH, THE RIGHT AND PROPERTY OF. It has been held, that where the lord of the manor has the soil on both sides of the river, it is good evidence that he has the right of fishing; but where the river ebbs and flows, and is an arm of the sea, there it is common to all, and he who claims a privilege to himself must prove it. In the Severn, the soil belongs to the owners of the land, on each side; and the soil of the river Thames is in the king, &c. but the fishing is common to all. 1 Mod. 105. Any person who shall unlawfully break, cut, or destroy, any head or dam of a fish-pond, or wrongfully fish therein, with intent to take or kill fish, shall on conviction at the suit of the king, or of the party, at the assizes or sessions, be imprisoned three months, and pay treble damages, and after the expiration of the three months, shall find sureties for his good behaviour for seven years, or remain in prison till he does. 5 Eliz. c. 21. If any person shall enter into any park or paddock, fenced in and enclosed, or into any garden, orchard, or yard, adjoining or belonging to any dwelling-house, in or through which park or paddock, garden, orchard, or yard, any stream of water shall run, or wherein shall be any river, stream, pond, pool, moat, stew, or other water, and by any means or device whatsoever, shall steal, take, kill, or destroy, any fish bred or kept in it, without the consent of the owner, or shall be aiding therein, or shall receive or buy any such fish, knowing them to be so stolen or taken as aforesaid, and shall be convicted thereof at the assizes, within six calendar months after the offence shall be committed, he shall be transported for seven years. And any offender, surrendering himself to a justice, or being apprehended or in custody for such offence, or on any other account, who shall make confession thereof, and a true discovery on oath of his accomplice or accomplices, so that such accomplice may be apprehended, and shall on trial give evidence, so as to convict such accomplices, shall be discharged of the offence, so by him confessed. And if any person shall take, kill, or destroy, or attempt to take, kill, or destroy, any fish in any river, or stream, pond, pool, or other water, (not in any park or paddock, or in any garden, orchard, or yard, adjoining or belonging to any dwelling-house, but in any other enclosed ground, being private property) he shall, on conviction before one justice, on the oath of one witness, forfeit 5l. to the owner of the fishery of such river, pond, or other water; and such justice, on complaint upon oath, may issue his warrant to bring the person complained of before him; and if he shall be convicted before such justice, or any other of the county or place, he shall immediately

immediately pay the said penalty of 5l. to such justice, for the use of the person, as the same is appointed to be paid unto; and in default thereof, shall be committed by such justice to the house of correction, for any time not exceeding six months, unless the forfeiture shall be sooner paid: or such owner of the fishery may, within six calendar months after the offence, bring an action for the penalty in any of the courts of record at Westminster. 5 G. III. c. 14.

FISH-PONDS, those made for the breeding or feeding of fish. Fish-ponds are no small improvement of watery and boggy lands, many of which are fit for no other use. In the making of a pond, its head should be at the lowest part of the ground, that the trench of the flood-gate or sluice, having a good fall, may not be too long in emptying. The best way of making the head secure, is to drive in two or three rows of stakes above six feet long, at about four feet distance from each other, the whole length of the pond-head, of which the first row should be rammed at least about four feet deep. If the bottom be false, the foundation may be laid with quicklime, which slacking, will make it as hard as a stone. Some lay a layer of lime, and another of earth dug out of the pond, among the piles and stakes; and when these are well covered, drive in others, as they see occasion, ramming in the earth as before, till the pond-head is of the height designed. The dam should be made sloping on each side, leaving a waste to carry off the over-abundance of water in times of floods or rains; and as to the depth of the pond, the deepest part need not exceed six feet, rising gradually in shoals towards the sides, for the fish to sun themselves, and lay their spawn. Gravelly and sandy bottoms, especially the latter, are best for breeding; and a fat soil, with a white fat water, as the washings of hills, commons, streets, sinks, &c. is best for fattening all sorts of fish. For storing a pond, carp is to be preferred for its quick growth, and great increase, as breeding five or six times a-year; but tench for its goodness. The quantity of fish to be supplied obviously depends upon the quantity of water, which should be divided, where it conveniently can, into five ponds. Number five is intended for breeding, and should be double or treble the size of any of the other ponds. Or if this be inconvenient, there may be two for this purpose. This pond may likewise be the most distant from the house. If the breeding-pond should fail to answer this purpose, it will at least serve as a conservatory for fish of small size, to be obtained elsewhere: and indeed, fresh stores in any case will be found desirable. The contents of this pond in carp and tench, or the greatest part, should be taken out annually in September or October, counted in braces, and such as are from five to seven inches long thrown into the pond called No. 4. The contents of No. 4, when grown one year from the length of five or seven inches, must be put into No. 3. The contents of No. 3, having grown one year from No. 4, must be removed into No. 2. And in like manner, the contents of No. 2, after one year, must be removed into No. 1, which is to contain only such fish as are fit for the table. It is obvious that this pond for safety and convenience, should be the nearest to the house. As No. 5 is to be the largest water, so No. 1 is to be the least; the rest of sizes between the two. The shape of No. 1 should be oblong, for the convenience of the net, and the less disturbance of the fish in taking out what are wanted from time to time. A book should be kept of the number and size of each kind in every pond. Carp are fit for the table from three to seven pounds each. Tench from one pound and a half to three pounds each. Perch from three quarters of a pound to one or two pounds, &c. It is supposed that none of the ponds have a strong current of very cold, acrid, innutritious water. One acre of water upon a loam, clay, or marl, or any of these with a mixture of gravel, has been stated to be capable of supporting 2000 pounds weight of fish; the number of fish making that weight being immaterial. Carp and tench breed most freely in ponds, or pits newly made. Tench likewise in almost any ponds, where cattle are admitted. It is evident that perch and pike should not be admitted in any degree in No. 5; but in all the other numbers, besides their own value, they are of important service, provided that they are strictly confined to a size greatly subordinate to that of the carp, or tench. For they destroy not only the accidental spawn of fish which breed, but also several animals, whose food is the same with that of carp and tench, as frogs, newts, &c. Pike above the weight of one or two pounds must

not be admitted even amongst carp of the largest size and weight. With regard to the absolute weight of fish, which any particular pond will support, this can only be determined by observation and experience; as it depends on the different degrees of nutrition in different waters. It is said, that carp and tench in waters which feed well, will before they are aged, double their weight in one year. The third part of an acre in No. 1 would probably be sufficient for the demand of any family. For, upon the calculation above given, it would support near 700 pounds of fish, which might be divided thus. Fifty brace of carp of three pounds each and upwards. Fifty brace of tench of two pounds each and upwards. Fifty brace of perch of one pound each and upwards. That is, three brace of fish, weighing at least twelve pounds, for the use of every week. Allowing one acre for No. 5, one-third of an acre for No. 1, and one acre and two-thirds for the intervening numbers, the whole water would be three acres. Upon this calculation the stock of No. 1 at 8d. per pound, would be worth 23l. 6s. 8d. per annum, and the expence annually of changing the fish from No. 5 to 4, &c. will not exceed 1l. 6s. 8d. So that the value of each acre would be at lowest 7l. 6s. 8d. annually. No. 1 being supposed to be near the house, and at no great distance from the garden, if the fish should not thrive sufficiently, which will be seen by the disproportioned size of the head, and the whiteness or paleness of the scales, they may easily be supplied with more food by loose peas from the garden, the sweeping of the granary, worms saved by the gardener in digging, and the offal of the poultry killed for the kitchen; or by letting down the water about two feet, in the spring or summer, where there is a sufficient supply, and sowing the sides with oats, barley, rye, or wheat, very lightly raked in, and then stopping the sluice again. In ponds already stocked, but not accurately regulated, it would be advisable to begin with that which has the most pike, otherwise with No. 4, or what is intended for No. 4, and throw all the fish under five inches length into No. 5, and the larger, according to their sizes, into the other numbers: and so on with Nos. 3, 2, 1. Store-fish procured elsewhere, if taken in summer, should be moved in the night in clean straw, wetted occasionally after they are packed: except perch and pike, which can only be carried in clean pond or river water. In moving fish from one pond to another, they should be first put into tubs of water already prepared for them, and afterwards carried in buckets without water. In taking pike or perch, great care must be observed to avoid raising mud in the water. In breeding-ponds, all water-fowls, as geese, ducks, &c. should be discouraged; and herons carefully destroyed. If any white fish, as roach, dace, &c. should be found, they are to be taken out; and if there is a spare piece of water for large pike they should be put into it as food for the pike. Eels may be put with advantage into any except the breeding-ponds, in lieu of perch. The most easy way of taking them is by trimmers laid overnight, baited with small fish, not with worms; otherwise they may catch the carp; or a small thief-net may be baited with white fish. Common sewers and drains from the laundry are prejudicial to fish: so are the leaves falling from trees in great quantities. The use of grains should likewise be avoided in large quantities, as having little nutriment whilst they are thus washed with water. It seems better for the use of the table, as well as more humane, to kill fish designed for food by an incision with a sharp-pointed pen-knife, or punctures made with a pin longitudinally into the brain, about half an inch or an inch, according to the size of the fish, above the eyes. As this produces an instantaneous effect, it would probably save the cruel operation of crimping or flaying fish while alive, as in the case of pike and eels. It is obvious, that this method of regulating fish will apply with its full effect in larger spaces of water: it will likewise apply in a considerable degree to smaller pieces, even where the change is but from a pond for the use of cattle to a single canal in a garden. In situations near the great inland manufactures, and near the turnpike roads leading from an easy distance to the metropolis, water may be made by this kind of management, with little trouble or expence, to produce a large annual rent.

FISHER, JOHN, an English prelate, was born at Beverly, in Yorkshire, in 1459, and educated at Cambridge. He became confessor to Margaret, countess of Richmond, mother to Henry VII. who by his advice founded St. John's and Christ's colleges, Cambridge. He was afterwards chosen chancellor of that university.

university, and was a liberal encourager of learning. In 1504 he was made bishop of Rochester, from which he would never remove to a better see. He was a zealous opponent of the Reformation, and of the king's divorce from Queen Catherine. Great efforts were made to bring him to acknowledge the king's supremacy, which proving ineffectual, he was sent to the Tower. While in confinement the pope made him a cardinal, which so enraged the king, that he caused him to be tried for high treason, condemned, and beheaded in 1535. He was a man of considerable learning, strict integrity, and fervent piety. He wrote a commentary on the Penitential Psalms: a Defence of the King's Book against Luther; a Funeral Sermon for the Lady Margaret, &c.

FISHERMEN. There shall be a master, wardens, and assistants of the fishmongers' company in London chosen yearly, at the next court of the lord mayor and aldermen after the 10th of June, who are constituted a court of assistants; and they shall meet once a month at their common hall to regulate abuses in fishery, register the names of fishermen, and mark their botes, &c.

FISHERY, a place where great numbers of fish are caught. The principal fisheries for salmon, herring, mackarel, pilchards, &c. are along the coasts of England, Scotland, and Ireland; for cod, on the banks of Newfoundland; for whales, about Greenland; and for pearls, in the East and West Indies.

FISHERY, FREE, in law, or an exclusive right of fishing in a public river, is a royal franchise; and is considered as such in all countries where the feudal polity has prevailed: though the making of such grants, and by that means appropriating, what it seems unnatural to restrain, the use of running water, was prohibited for the future by Magna Charta; and the rivers that were fenced in King John's time were directed to be laid open, as well as the forests to be disforested. This opening was extended by the second and third charters of Henry III. to those also that were fenced under Richard I.; so that a franchise of free fishery ought now to be as old at least as the reign of Henry II. This differs, as judge Blackstone observes, from a several of piscary, because he that has a several fishery must also be the owner of the soil, which in a free fishery is not requisite. It differs also from a common fishery, in that the free fishery is an exclusive right, the common is not so; and therefore, in a free fishery, a man has a property in the fish before they are caught; in a common piscary, not till afterwards. Some indeed have considered a free fishery not as a royal franchise, but merely as a private grant of a liberty to fish in the several fishery of the grantor. But the considering of such right as originally a flower of prerogative, till restrained by Magna Charta, and derived by royal grant (previous to the reign of Richard I.) to such as now claim it by prescription, may remove some difficulties in respect to this matter with which our law-books are embarrassed.

FISHERY, denotes also the commerce of fish, more particularly the catching of them for sale. Were we to enter into a very minute consideration of the fisheries established in this kingdom, this article would swell beyond its proper bounds; since fisheries, however, if successful, are not only objects of great commercial importance, but also contribute materially to our naval strength, by becoming permanent nurseries for seamen, we shall take notice of some of the most considerable of the British fisheries, and the institutions set on foot for their support. The situation of the British coasts is the most advantageous in the world for catching fish: the Scottish islands, particularly those to the north and west, lie most commodious for carrying on the fishing trade to perfection. Of these advantages the Scots seem indeed to have been abundantly sensible; for their traffic in herrings is even noticed in history so early as the ninth century. The frequent laws which were enacted in the reigns of James III. IV. and V. discover a steady determined zeal for the benefit of the country, and the full restoration of these fisheries which the Dutch had found means to engross. The Scottish fisheries were, however, more particularly indebted to the zealous encouragement of James V. and VI.; the former having planned, and the latter carried into execution, various projects for their extension. The well-meant effort of James VI. were impeded, and at last wholly suspended, by the disputes which prevailed in the kingdom at that period concerning the succession. Nevertheless the plan was resumed by Charles I. who "ordained an association of the three kingdoms, for a general fish-

ing within the seas and coasts of his majesty's said kingdoms; and for the government of the said association, ordained, that there should be a standing committee chosen and nominated by his majesty and his successors from time to time," &c. Several persons of distinction embarked in the design, which the king honoured with his patronage, and encouraged by his bounty. He also ordered Lent to be more strictly observed; prohibited the importation of fish taken by foreigners; and agreed to purchase from the company his naval stores, and the fish for his fleets. Thus the scheme for establishing a fishery in the Hebrides began to assume a favourable aspect; but all the hopes of the adventurers were frustrated by the breaking out of the civil wars, and the very tragical death of their benefactor. In 1661, Charles II. the duke of York, lord Clarendon, and other persons of rank and fortune, resumed the business of the fisheries with greater vigour than any of their predecessors. For this purpose the most salutary laws were enacted by the parliaments of England and Scotland; in virtue of which, all materials used in, or depending upon, the fisheries, were exempted from all duties, excises, or imposts whatever. In England, the company were authorised to set up a lottery and to have a voluntary collection in all parish churches. Houses of entertainment, as taverns, inns, ale-houses, were to take one or more barrels of herrings, at the stated price of 30s. per barrel: also 2s. 6d. per barrel Dutch was to be paid to the company on all imported fish taken by foreigners. Some families were also invited, or permitted, to settle at Sornaway: the herrings cured by the royal English company gave general satisfaction, and, as mentioned above, brought a high price for those days. Every circumstance attending this new establishment seemed the result of a judicious plan and thorough knowledge of the business, when the necessities of the king obliged him to withdraw his subscription of bounty; which gave such umbrage to the parties concerned, that they soon after dissolved. In 1677, a new royal company was established in England, at the head of which were the duke of York, the earl of Derby, &c. Besides all the privileges which former companies had enjoyed, the king granted this new company a perpetuity, with power to purchase lands; and also 20*l.* to be paid them annually out of the customs of the port of London, for every dogger or buss they should build and send out for seven years to come. A stock of 10,980*l.* was immediately advanced, and afterward 1600*l.* more. This small capital was soon exhausted in purchasing and fitting out busses, with other incidental expences. The company made, however, a successful beginning; and one of their busses or doggers actually took and brought home 32,000 cod-fish; other vessels had also a favourable fishery. Such flattering beginnings might have excited fresh subscriptions, when an unforeseen event ruined the whole beyond the possibility of recovery. Most of the busses had been built in Holland, and manned with Dutchmen; on which pretence the French, who were then at war with Holland, seized six out of seven vessels, with their cargoes and fishing-tackle: and the company being now in debt, sold in 1680 the remaining stores, &c. A number of gentlemen and merchants raised a new subscription of 60,000*l.* under the privileges and immunities of the former charter. This attempt also came to nothing, owing to the death of the king, and the troubles of the subsequent reign. Soon after the revolution this business was again resumed upon a more extensive scale; the proposed capital being 300,000*l.* of which 100,000*l.* was to have been raised by the surviving patentees or their successors, and 20,000*l.* by new subscribers. Copies of the letters patent, the constitution of the company, and terms of subscription, were lodged at sundry places in London and Westminster for the perusal of the public, while the subscription was filling. It is probable that king William's partiality to the Dutch fisheries, the succeeding war, or both of these circumstances, frustrated this new attempt; of which we have no further account in the annals of that reign or since. The Scottish parliament had also during the last three reigns, passed various acts for erecting companies and promoting the fisheries; but the intestine commotions of that country, and the great exertions which were made for the Darien establishment, enfeebled all other attempts, whether collectively or by individuals, within that kingdom. In 1749, his late majesty, having, at the opening of the parliament, warmly recommended the improvement of the fisheries, the house of commons appointed a committee to inquire into the state of herring and white fisheries, and to consider of the most probable means of

extending the same. All ranks of men were elevated with an idea of the boundless riches that would flow into the kingdom from this source. A subscription of 500,000*l.* was immediately filled in the city, by a body of men who were incorporated for twenty-one years by the name of The Society of the Free British Fishery. Every encouragement was held out by government, both to the society and to individuals, who might embark in this national business. A bounty of 36*s.* per ton was to be paid annually out of the customs for fourteen years, to the owners of all decked vessels or busses, from twenty to eighty tons burden, which should be built after the commencement of the act, for the use of, and fitted out and employed in, the said fisheries, whether by the society or any other persons. At the same time numerous pamphlets and newspaper-essays came forth; all pretending to elucidate the subject, and to convince the public with what facility the herring-fisheries might be transferred from Dutch to British hands. This proved however, a more arduous task than had been foreseen by superficial speculators. The Dutch were frugal in their expenditures and living; perfect masters of the arts of fishing and curing, which they had carried to the greatest height and perfection. They were in full possession of the European markets; and their fish, whether deserving or otherwise, had the reputation of superior qualities to all others taken in our seas. With such advantages the Dutch not only maintained their ground against this formidable company, but had also the pleasure of seeing the capital gradually sinking, without having procured an adequate return to the adventurers; notwithstanding various aids and efforts of government from time to time in their favour, particularly in 1757, when an advance of 20*s.* per ton was added to the bounty. In 1786 the public attention was again called to the state of the British fisheries, by the suggestions of Mr. Dempster in the house of commons, and by different publications that appeared upon the subject: in consequence of which, the minister suffered a committee to be named, to inquire into this great source of national wealth. To that committee it appeared that the best way of improving the fisheries was, to encourage the inhabitants living nearest to the seat of them to become fishers. And it being found that the north-western coast of the kingdom, though abounding with fish and fine harbours, was utterly destitute of towns, an act was passed for incorporating certain persons therein named, by the style of "The British Society for extending the fisheries, and improving the sea-coasts of this kingdom;" and to enable them to subscribe a joint stock, and therewith to purchase lands, and build thereon free towns, villages, and fishing-stations, in the Highlands, and islands in that part of Great Britain called Scotland, and for other purposes. The Isle of Mull, Loch-Broom, the Isles of Sky and of Canay, have already been marked as proper situations for some of these towns. The progress of such an undertaking from its nature must be slow, but still slower when carried on with a limited capital arising from the subscriptions of a few public-spirited individuals. But it is not to be doubted that it will ultimately tend to the increase of our fisheries, and to the improvement of the Highland part of this kingdom. Its tendency is also to lessen the emigration of a brave and industrious race of inhabitants, too many of whom have already removed with their families to America.

ANCHOVY-FISHERY. The anchovy is caught in the months of May, June, and July, on the coasts of Catalonia, Provence, &c. at which season it constantly repairs up the straits of Gibraltar into the Mediterranean. Collins says they are also found in plenty on the western coasts of England and Wales. The fishing for them is chiefly in the night-time; when a light being put on the stern of their little fishing-vessels, the anchovies flock round, and are caught in the nets. But then it is asserted to have been found by experience, that anchovies taken thus by fire, are neither so good, so firm, nor so proper for keeping, as those that are taken without fire. When the fishery is over, they cut off the heads, take out their gall and guts, and then lay them in barrels, and salt them. The common way of eating anchovies is with oil, vinegar, &c. in order to which they are first boned, and the tails, fins, &c. slipped off. Being put on the fire, they dissolve almost in any liquor. Or they are made into sauce by mincing them with pepper, &c. Some also pickle anchovies in small delft or earthen pots, made on purpose, of two or three pounds weight, more or less, which they cover with plaister to keep them the better. Anchovies should be chosen small, fresh pickled, white on the out-

side and red within. If genuine, they have round backs; for those which are flat or large are often nothing but sardines. Besides these qualities, the pickle, on opening the pots or barrels, should be of a good taste, and not have lost its flavour.

COD-FISHERY. There are two kinds of cod-fish; the one green or white cod; the other dried or cured cod; though it is all the same fish differently prepared; the former being sometimes salted and barrelled, then taken out for use; and the latter having lain for a competent time in salt, and then dried in the sun or smoke. The chief fisheries for green cod are in the bay of Canada, on the great bank of Newfoundland, and on the isle of St. Peter, and the isle of Sable; to which places vessels resort from many parts both of Europe and America. They are from 100 to 150 tons burthen, and will catch between 30,000 and 40,000 cod each. The most essential part of the fishery is, to have a master to know how to cut up the cod, one who is skilled to take off the head properly, and above all a good salter, on which the preserving of them, and consequently the success of the voyage, depend. The best season is from the beginning of February to the end of April; the fish, which in the winter retire to the deepest water, coming then on the banks, and fattening extremely. What are caught from March to June keep well; but those taken in July, August, and September, when it is warm on the banks, are apt to spoil soon. Each fisher takes but one at a time, yet the most expert will take from 350 to 400 in a day; but that is the most, the weight of the fish and the great coldness on the bank fatiguing very much. As soon as the cod are caught, the heads are taken off; they are opened, gutted, and salted; and the salter stows them in the bottom of the hold, head to tail, in beds a fathom or two square; putting layers of salt and fish alternately, but never mixing fish caught on different days. When they have lain thus three or four days to drain off the water, they are placed in another part of the ship, and salted again, where they remain till the vessel is loaded. Sometimes they are cut in thick pieces, and put in barrels for the greater convenience of carriage. The principal fishery for dry cod is, from Cape Rose to the Bay des Exports, along the coast of Placentia, in which compass there are several commodious ports for the fish to be dried in. These, though of the same kind with the fresh cod, are much smaller, and therefore fitter to keep, as the salt penetrates more easily into them. The fishery of both is much alike; only this latter is most expensive, as it takes up more time and employs more hands, and yet scarcely half so much salt is spent in this as in the other. The bait is herring, of which great quantities are taken on the coast of Placentia. When several vessels meet and intend to fish in the same port, he whose shallow first touches ground, becomes entitled to the quality and privileges of admiral: he has the choice of his station, and the refusal of all the wood on the coast at his arrival. As fast as the masters arrive, they unrig all their vessels, leaving nothing but the shrouds to sustain the masts; and in the mean time the mates provide a tent on shore covered with branches of trees, with sails over them, with a scaffold of great trunks of pines, twelve, fifteen, sixteen, and often twenty feet high, commonly from forty to sixty feet long, and about one-third as much in breadth. While the scaffold is preparing, the crew are fishing; and as fast as they catch, they bring their fish ashore, and open and salt them upon moveable benches; but the main salting is performed on the scaffold. When the fish have taken salt, they wash and hang them to drain on rails; when drained, they are laid on a sort of stages, which are small pieces of wood laid across, and covered with branches of trees, having the leaves stripped off for the passage of the air. On these stages they are disposed a fish thick, head against tail, with the back uppermost, and are turned carefully every twenty-four hours. When they begin to dry, they are laid in heaps ten or twelve thick, in order to retain their warmth; and every day the heaps are enlarged, till they become double their first bulk; then two heaps are joined together, which they turn every day as before; lastly, they are salted again, beginning with those first salted; and being laid in huge piles, they remain in that situation till they are carried on board the ships, where they are laid on the branches of trees disposed for that purpose, upon the ballast, and round the ship, with mats to prevent their contracting any moisture. The cod supplies four kinds of commodities, viz. the sounds, the tongues, the roes, and the oil which is extracted from its liver. The first are salted at the fishery, together with the fish, and put

in barrels of from 600 to 700 pounds. The tongues are cured in like manner, and brought in barrels of from 400 to 500 pounds. The roes are also salted in barrels, and serve to cast into the sea to draw fish together, and particularly pilchards. The oil comes in barrels of from 400 to 520 pounds, and is used in dressing leather. In Scotland they catch a small kind of cod on the coast of Buchan, and all along the Murray Frith on both sides; as also in the Frith of Forth, Clyde, &c. which is much esteemed. They salt and dry them in the sun upon rocks, and sometimes in the chimney.

HERRING-FISHERY. Our great stations for this fishery are off the Shetland and Western isles, and off the coast of Norfolk, in which the Dutch also share. See the article *CLUPEA*. There are two seasons for herring fishing: the first from June to the end of August; the second in autumn, when the fogs become very favourable for this kind of fishing. The Dutch begin their herring-fishing on the 24th of June, and employ a vast number of vessels called busses, between fifty-four and sixty tons burthen each, and carrying three or four small guns. They never stir out of port without a convoy, unless there are enough to make about eighteen or twenty cannon among them, in which case they are allowed to go in company. Before they go out they make a verbal agreement, which has the same force as if it was in writing. The regulations of the admiralty of Holland have been partly followed by the French and other nations, and partly improved and augmented with new ones; as, that no fisher shall cast his net within 100 fathoms of another boat: that while the nets are cast, a light shall be kept on the hind part of the vessel: that when a boat is by any accident obliged to leave off fishing the light shall be cast into the sea: that when the greater part of a fleet leaves off fishing, and casts anchor, the rest shall do the same, &c. In the late king's reign very vigorous efforts were made, and bounties allowed, for the encouragement of the British herring fisheries: the first was of 30s. per ton to every buss of 70 tons and upwards. This bounty was afterwards raised to 50s. per ton, to be paid to such adventurers as were entitled to it by claiming it at the place of rendezvous. The busses are from twenty to ninety tons burthen, but the best size is eighty. A vessel of eighty tons ought to take ten lasts, or 120 barrels of herrings, to clear expences, the price of the fish to be admitted to be a guinea a barrel. A ship of this size ought to have eighteen men, and three boats; one of twenty tons should have six men, and every five tons above require an additional hand. To every ton are 250 yards of net; so a vessel of eighty tons carries 20,000 square yards; each net is twelve yards long, and ten deep; and every boat takes out from twenty to thirty nets, and puts them together so as to form a long train; they are sunk at each end of the train by a stone, which weighs it down to the full extent: the top is supported by buoys made of sheep skin, with a hollow stick at the mouth, fastened tight; through this the skin is blown up, and then stopped with a peg, to prevent the escape of the air. Sometimes these buoys are placed at the top of the nets; at other times the nets are suffered to sink deeper, by lengthening the cords fastened to them, every cord being for that purpose ten or twelve fathoms long. But the best fisheries are generally in more shallow water. Of the Scots fishery in the western isles, the following account is given by Mr. Pennant: "The fishing is always performed in the night, unless by accident. The busses remain at anchor, and send out their boats a little before sun-set; which continue out, in winter and summer, till day-light; often taking up and emptying their nets, which they do ten or twelve times in the night, in case of good success. During winter it is a most dangerous and fatiguing employ, by reason of the greatness and frequency of the gales in these seas; and in such gales are the most successful captures; but by the providence of Heaven, the fishers are seldom lost, and what is wonderful, few are visited with illness. They go out well prepared with a warm great coat, boots, and skin aprons, and a good provision of beef and spirits. The same good fortune attends the busses, which in the tempestuous season, and in the darkest nights, are continually shifting in these narrow seas from harbour to harbour. Sometimes eighty barrels of herrings are taken in a night by the boats of a single vessel. It once happened, in Loch-Slappon, in Skie, that a buss of eighty tons might have taken 200 barrels in one night, with 10,000 square yards of net; but the master was obliged to desist, for want of a sufficient number of hands to preserve the capture. The herrings are preserved by salting after

the entrails are taken out. The last is an operation performed by the country people, who get three-halfpence per barrel for their trouble, and sometimes, even in winter, can gain fifteen-pence a-day. This employs both women and children; but the salting is only entrusted to the crew of the busses. The fish are laid on their backs in the barrels, and layers of salt between them. The entrails are not lost, for they are boiled into an oil; 8000 fish will yield ten gallons, valued at one shilling the gallon. A vessel of eighty tons takes out 244 barrels of salt; a drawback is allowed for each barrel used by foreign or Irish exportation of the fish; but there is a duty per barrel for the home consumption, and the same for those sent to Ireland. The barrels are made of oak staves, chiefly from Virginia; the hoops from several parts of our own island, and are either of oak, birch, betel, or willow; the last from Holland, liable to a duty. The barrels cost about 6s. each; they hold from 500 to 800 fish, according to the size of the fish; and are made to contain thirty-two gallons. The barrels are inspected by proper officers: a cooper examines if they are statutable and good; if faulty he destroys them, and obliges the maker to stand to the loss." Herrings are cured either white (*i. e.* pickled), or red. Of the first, those done by the Dutch are most esteemed, being distinguished into four sorts, according to their sizes, and the best are those that are fat, fleshy, firm, and white, salted the same day they are taken with good salt and well barrelled. The British-cured herrings are little inferior, if not equal, to the Dutch; for in spite of all their endeavours to conceal the secret, their method of curing, lasting, or casking the herrings, has been discovered, and is as follows. After they have hauled in their nets, which they drag in the stern of their vessel backwards and forwards in traversing the coast, they throw them upon the ship's deck, which is cleared of every thing for that purpose: the crew is separated into divisions, and each division has a peculiar task; one part opens and guts the herrings, leaving the melts and roes; another cures and salts them, by lining or rubbing their inside with salt; the next packs them, and between each row and division they sprinkle handfuls of salt; lastly, the cooper puts the finishing hand to all, by heading the casks very tight and stowing them in the hold. Red herrings must lie 24 hours in the brine, inasmuch as they are to take all their salt there; and when they are taken out, they are spitted, that is, strung by the head on little wooden spits, and then hung in a chimney made for that purpose. After which, a fire of brush wood, which yields much smoke but no flame, being made under them, they remain there till sufficiently smoked and dried, and are afterwards barrelled up for keeping.

LOBSTER FISHERY. Lobsters are taken along the British channel, and on the coast of Norway, whence they are brought to London for sale; and also in the frith of Edinburgh, and on the coast of Northumberland. See the article *CANCER*. By 10 and 11 W. III. c. 24, no lobster is to be taken under eight inches in length, from the peak of the nose to the end of the middle fin of the tail; and by 9 G. II. cap. 33, no lobsters are to be taken on the coast of Scotland from the first of June to the first of September.

MACKREL FISHERY. The mackrel is a summer fish of passage, found in large shoals, in different parts of the ocean, not far north; but especially on the French and English coasts. The fishing is usually in the months of April, May, and June, and even July, according to the place. See *SCOMBER*. They enter the English channel in April, and proceed up to the straits of Dover as the summer advances; so that by June they are on the coasts of Cornwall, Sussex, Normandy, Picardy, &c. where the fish is most considerable. They are an excellent food fresh; and not to be despised when well prepared, pickled, and put up in barrels; a method of preserving them chiefly used in Cornwall. The fish is taken in two ways; either with a line or nets: the latter is the more considerable, and is usually performed in the night-time. The rules observed in the fishing for mackrel are much the same with those already mentioned in the fishery of herrings. There are two ways of pickling them: the first is by opening and gutting them, and filling the belly with salt, crammed in as hard as possible with a stick; which done they range them in strata or rows, at the bottom of the vessel, strewing salt between the layers. In the second way they put them immediately into tubs full of brine, made of fresh water and salt, and leave them to steep, till they have imbibed salt enough to make them keep; after which they

are taken out, and barrelled up, taking care to press them close down. Mackerel are not cured or exported as merchandize, except a few by the Yarmouth and Leostoff merchants, but are generally consumed at home; especially in the city of London and the sea-ports between the Thames and Yarmouth east, and the Land's-end in Cornwall west.

OYSTER-FISHERY. This fishery is principally carried on at Colchester, in Essex; Feversham and Milton, in Kent; the Isle of Wight; the Swales of the Medway; and Tenby on the coast of Wales. From Feversham, and the adjacent parts, the Dutch have sometimes loaded a hundred large hoys with oysters in a year. They are also taken in large quantities near Portsmouth, and in all the creeks and rivers between Southampton and Chichester: many of which are carried about by sea to London and to Colchester, to be fed in the pits about Wavenhoe and other places. See *OSTREA*.

PILCHARD-FISHERY. The chief pilchard-fisheries are along the coasts of Dalmatia, on the coast of Bretagne, and along the coasts of Cornwall and Devonshire. That of Dalmatia is very plentiful; that on the coast of Bretagne employs annually about 300 ships. Of the pilchard-fishery on the coast of Cornwall, the following account is given by Dr. Borlase: "It employs a great number of men on the sea, training them to naval affairs; employs men, women, and children, at land, in salting, pressing, washing, and cleaning; in making boats, nets, ropes, casks, and all the trades depending on their construction and sale. The poor are fed with the offals of the captures, the land with the refuse of the fish and salt; the merchant finds the gains of commission and honest commerce, the fishermen the gains of the fish. Ships are often freighted hither with salt, and into foreign countries with the fish, carrying off at the same time part of our tin. Of the usual produce of the great number of hogsheds exported each year for ten years from 1747 to 1756 inclusive, from the four ports of Fowey, Falmouth, Penzance, and St. Ives, it appears that Fowey has exported yearly 1732 hogsheds; Falmouth, 14,631 hogsheds and two-thirds; Penzance and Mount's Bay, 12,149 hogsheds and one-third; St. Ives, 1282 hogsheds; in all amounting to 29,795 hogsheds." Every hogshed for ten years last past, together with the bounty allowed for each hogshed exported, and the oil made out of each hogshed has amounted, one year with another on an average; to the price of 1*l.* 13*s.* 3*d.* so that the cash paid for pilchards exported has, at a medium, annually amounted to 49,532*l.* 10*s.*" The numbers that are taken at one shooting out of the nets are amazingly great. Mr. Pennant says, that Dr. Borlase assured him, that on the 5th of October, 1767, there were at one time inclosed in St. Ives' bay 7000 hogsheds, each hogshed containing 35,000 fish, in all 245 millions. The pilchards naturally follow the light, which contributes much to the facility of the fishery: the season is from June to September. On the coasts of France they make use of the roes of the cod-fish as a bait, which, thrown into the sea, makes them rise from the bottom, and run into the nets. On our coasts there are persons posted ashore, who, spying by the colour of the water where the shoals are, make signs to the boats to go among them to cast their nets. When taken, they are brought on shore to a warehouse, where they are laid up in broad piles, supported with backs and sides; and as they are piled they salt them with bay-salt; in which lying to soak for thirty or forty days, they run out much blood, with dirty pickle and bitter; then they wash them clean in sea-water; and when dry, barrel and press them hard down to squeeze out the oil, which issues out at a hole in the bottom of the cask.

SALMON-FISHERY. The chief salmon-fisheries in Europe are in England, Scotland, and Ireland, in the rivers and sea-coasts adjoining to the river-mouths. The most distinguished for salmon in Scotland are the river Tweed, the Clyde, the Tay, the Dee, the Don, the Spey, the Ness, the Bewly, &c. in most of which it is very common, about the height of summer, especially if the weather happens to be very hot, to catch four or five score of salmon at a draught. The chief rivers in England for salmon are, the Tyne, the Trent, the Severn, and the Thames. The fishing is performed with nets, and sometimes with a kind of locks or weirs made on purpose, which in certain places have iron or wooden grates so disposed, in an angle, that being impelled by any force in a contrary direction to the course of the river, they may give way and open a little at the point of contact, and immediately shut again, closing the angle. The salmon, therefore, coming up into the rivers, are admitted

into these grates, which open, and suffer them to pass through, but shut again and prevent their return. The salmon is also caught with a spear, which they dart into him when they see him swimming near the surface of the water. It is customary likewise to catch them with a candle and lantern, or wisp of straw set on fire: for the fish naturally following the light, are struck with the spear, or taken in a net spread for that purpose, and lifted with a sudden jerk from the bottom. The capture of salmon in the Tweed, about the month of July, is prodigious. In a good fishery, often a boat-load, and sometimes near two, are taken in a tide: some few years ago there were above 700 fish taken at one haul, but from 50 to 100 is very frequent. The coopers in Berwick then begin to salt the salmon thoroughly in pipes and other large vessels, and afterwards barrel them to send abroad; having then far more than the London markets can take off their hands. Most of the salmon taken before April, or the setting in of the warm weather, used to be sent fresh to London in baskets but are now conveyed in large square boxes with ice. It is also sent up boiled, pickled, and kitted. At the beginning of the season, when a ship is on the point of sailing, a fresh clean salmon will sell from a shilling to eighteen pence a pound; and most of the time that this part of the trade is carried on, the prices are from five to nine shillings per stone; the value rising and falling according to the plenty of fish, or the prospect of a fair or foul wind. Some fish are sent in this manner to London the latter end of September, when the weather grows cool; but then the fish are full of large roes, grow very thin-bellied, and are not esteemed so palatable. The season for fishing in the Tweed begins January 10, and ends October 10; yet the corporation of Berwick (who are conservators of the river) indulge the fishermen with a fortnight past that time, on account of the change of the style. There are on the river 41 considerable fisheries, extending upwards, about 14 miles from the mouth (the others above being of no great value,) which are rented for near 5400*l.* per annum; the expence attending the servants' wages, nets, boats, &c. amounts to 5000*l.* more; which together makes up the sum 10,400*l.* Now, in consequence, the produce must defray all, and no less than 20 times that sum of fish will effect it; so that 208,000 salmon must be caught there one year with another. Scotland possesses great numbers of fine fisheries on both sides of that kingdom. The Scotch in early times had most severe laws against the killing of this fish: for the third offence was made capital, by a law of James IV. Before that, the offender had power to redeem his life. They were thought in the time of Henry VI. a present worthy of a crowned head; for in that reign the queen of Scotland sent to the duchess of Clarence 10 casks of salted salmon, which Henry directed to pass duty-free. The salmon are cured in the same manner as at Berwick, and a great quantity is sent to London in the spring; but after that time, the adventurers begin to barrel and export them to foreign countries; but we believe that commerce is far less lucrative than it was in former times, partly owing to the great increase of the Newfoundland fishery, and partly to the general relaxation of the discipline of abstinence in the Romish church. Ireland (particularly the north) abounds with this fish; the most considerable fishery is at Cranna, on the river Ban, about a mile and a half from Coleraine. When I made the tour of that hospitable kingdom, says Mr. Pennant, in 1754, it was rented by a gentleman for 620*l.* a year; who assured me that the tenant, his predecessor, gave 1600*l.* per annum, and was a much greater gainer by the bargain, for the reasons before-mentioned, and on account of the number of poachers who destroy the fish in the fence-months. The mouth of the river faces the north; and is finely situated to receive the fish that roam along the coast in search of an inlet into some fresh water, as they do all along that end of the kingdom which opposes itself to the northern ocean. We have seen near Ballicastle, nets placed in the sea at the foot of the promontories that jut into it, which the salmon strike into as they are wandering close to shore; and numbers are taken by that method. In the Bann they fish with nets 18 score yards long, and are continually drawing night and day the whole season, which we think lasts about four months, two sets of 16 men each alternately relieving one another. The best drawing is when the tide is coming in; we were told, that in a single draught there were once 840 fish taken. A few miles higher up the river is a weir, where a considerable number of fish that escape the nets are taken. We were lately informed, that in the year 1760, about 320 tons were taken in the Cranna fishery." With regard to the manner of

of curing salmon when the fish are taken, they are opened along the back, the guts and gills, and the greatest part of the bones removed, so as to make the inside as smooth as possible. They then salt the fish in large tubs for the purpose, where they lie a considerable time soaking in brine; and about October, they pack them close up in barrels, and send them to London or up the Mediterranean. They have also in Scotland a great deal of salmon salted in the common way, which after soaking in brine a competent time is well pressed, and then dried in smoke: this is called kipper, and is chiefly made for home consumption; and if properly cured and prepared, is reckoned very delicious.

STURGEON-FISHERY. The greatest sturgeon-fishery is in the mouth of the Volga, on the Caspian sea; where the Muscovites employ a great number of hands, and catch them in a kind of inclosure formed by huge stakes representing the letter Z repeated several times. These fisheries are open on the side next the sea, and close on the other, by which means the fish ascending in its season up the river, is embarrassed in these narrow angular retreats, and is easily killed with a harping-iron. Sturgeons, when fresh, eat deliciously; and in order to make them keep, they are salted or pickled in large pieces, and put in cags of from 30 to 50 pounds. But the great object of this fishery is the roe, of which the Muscovites are extremely fond, and of which is made the caviar, or kavia, so much esteemed by the Italians. See **KAVIA**.

TUNNY-FISHERY. The tunny (a species of Scomber, which see) was a fish well-known to the ancients, and made a great article of commerce; and there are still very considerable tunny-fisheries on the coasts of Sicily, as well as several other parts of the Mediterranean. The nets are spread over a large space of sea by means of cables fastened to anchors, and are divided into several compartments. The entrance is always directed, according to the season, towards that part of the sea from which the fish are known to come. A man placed upon the summit of a rock high above the water, gives the signal of the fish being arrived; for he can discern from that elevation what passes under the waters infinitely better than any person nearer the surface. As soon as notice is given that the shoal of fish has penetrated as far as the inner compartment, or the chamber of death, the passage is drawn close, and the slaughter begins. The undertakers of these fisheries pay an acknowledgement to the king, or the lord upon whose land they fix the main stay or foot of the tonnara; they make the best bargain they can; and till success has crowned their endeavours, obtain this leave for a small consideration; but the rent is afterwards raised in proportion to their capture. The tunny enters the Mediterranean about the vernal equinox, travelling in a triangular phalanx, so as to cut the waters with its point, and to present an extensive base for the tides and currents to act against and impel forwards. These fish repair to the warm seas of Greece to spawn, steering their course thither along the European shores, but as they return, approach the African coast; the young fry is placed in the van of the squadron as they travel. They come back from the east in May, and abound on the coast of Sicily and Calabria about that time. In autumn they steer northward, and frequent the neighbourhood of Amalsi and Naples; but during the whole season stragglers are occasionally caught. When taken in May, the usual time of their appearance in the Calabrian bays, they are full of spawn, and their flesh is then esteemed unwholesome, apt to occasion head-achs and flatulency; the milts and roes are particularly so at that season. To prevent these bad effects, the natives fry them in oil, and afterwards salt them. The quantity of this fish consumed annually in the two Sicilies almost exceeds the bounds of calculation. From the beginning of May to the end of October it is eaten fresh, and all the rest of the year it is in use salted. The most delicate part is the muzzel. The belly salted was called tarantallum, and accounted a great delicacy by the Romans; its present name is surra. The rest of the body is cut into slices, and put into tubs.

TURBOT-FISHERY. Turbots grow to a large size, viz. from 23 to 30 pounds. They are taken chiefly off the north coast of England, and others off the Dutch coast. The large turbot (as well as several other kinds of flat fish) are taken by the hook and line, for they lie in deep water; the method of taking them in weirs or staked nets being very precarious. When the fishermen go out to sea, each person is provided with three lines, which are coiled

on a flat oblong piece of wicker-work; the hooks being baited, and placed regularly in the centre of the coil. Each line is furnished with 14 score of hooks, at the distance of six feet two inches from each other. The hooks are fastened to the lines upon sneads of twisted horsehair 27 inches in length. When fishing, there are always three men in each coble, and consequently nine of these lines are fastened together, and used as one line, extending in length near three miles, and furnished with 2520 hooks. An anchor and a buoy are fixed at the first end of the line, and one more of each at the end of each man's lines; in all four anchors, which are commonly perforated stones, and four buoys made of leather or cork. The line is always laid across the current. The tides of flood and ebb continue an equal time upon our coast, and, when undisturbed by winds, run each way about six hours; they are so rapid that the fishermen can only shoot and haul their lines at the turn of the tide, and therefore the lines always remain upon the ground about six hours; during which the myxine glutinosa of Linnæus will frequently penetrate the fish that are on the hooks, and entirely devour them, leaving only the skin and bones. The same rapidity of tides prevents their using hand-lines: and therefore two of the people commonly wrap themselves in the sail, and sleep, while the other keeps a strict look-out, for fear of being run down by ships, and to observe the weather. For storms often rise so suddenly, that it is with extreme difficulty they can sometimes escape to the shore, leaving their lines behind. Besides the coble, the fishermen have also a five-men boat, which is forty feet long and fifteen broad, and twenty-five tons burden; it is so called, though navigated by six men and a boy, because one of the men is commonly hired to cook, &c. and does not share in the profits with the other five. This boat is decked at each end, but open in the middle, and has two large lug-sails. All our able fishermen go in these boats to the herring-fishery at Yarmouth in the end of September, and return about the middle of November. The boats are then laid up till the beginning of Lent, at which time they go off in them to the edge of the Dogger, and other places, to fish for turbot, cod, ling, skates, &c. They always take two cobbles on board; and when they come upon their ground, anchor the boat, throw out the cobbles, and fish in the same manner as those who do go from the shore in a coble; with this difference only, that here each man is provided with double the quantity of lines, and instead of waiting the return of the tide in the coble, they return to their boat and bait their other lines; thus hawling one set and shooting another every turn of tide. They commonly run into harbour twice a week to deliver their fish. The best bait is fresh herring cut in pieces of a proper size: the five-men boats are always furnished with nets for taking them. Next to herrings are the lesser lampreys. The next baits in esteem are small haddocks cut in pieces, sand-worms, and limpets, here called fiddlers; and when none of these can be had, they use bullock's liver. The hooks are two inches and a half long in the shank, and near an inch wide between the shank and the point. The line is made of small cording, and is always tanned before it is used. Turbots are extremely delicate in their choice of baits; for if a piece of herring or haddock has been twelve hours out of the sea, and then used as bait, they will not touch it.

FISHERY, WHALE. For the natural history of the whale, the importance of the whale-fishery to Britain, and other particulars, see the article **BALÆNA**. We shall here only remark, that the legislature, justly considering that trade as of great national importance, bestowed on it at different periods very considerable encouragement. In particular, every British vessel of 200 tons or upwards, bound to the Greenland seas on the whale-fishery, if found to be duly qualified according to the act, obtained a licence from the commissioners of the customs to proceed on such voyage; and on the ship's return, the master and mate making oath that they proceeded on such voyage and no other, and used all their endeavours to take whales, &c. and that all the whale-fins, blubber, oil, &c. imported in their ship, were taken by their crew in those seas, there was allowed 40s. for every ton, according to the admeasurement of the ship. It was afterwards found, however, that so great a bounty was neither necessary to the success of the trade, nor expedient with regard to the public. In 1786, therefore, the act, conferring the said emoluments being upon the point of expiring, the subject was brought under the consideration of parliament; and it was proposed to continue the former measures, but

but with a reduction of the bounty from 40s. to 30s. In proposing this alteration, it was stated, "that the sums which this country had paid in bounties for the Greenland fishery amounted to 1,265,461l.; that in the last year we had paid 94,858l.; and that, from the consequent reduction of the price of the fish, the public at present paid 60 per cent. upon every cargo. In the Greenland fishery there were employed 6000 seamen, and these seamen cost government 13l. 10s. per man per annum, though we were never able to obtain more than 500 of that number to serve on board our ships of war. Besides, the vast encouragement given to the trade had occasioned such a glut in the market, that it was found necessary to export considerable quantities; and thus we paid a large share of the purchase-money for foreign nations, as well as for our own people, besides supplying them with the materials of

several important manufactures." This proposition was opposed by several members, but was finally carried; and the propriety of the measure became very soon apparent. At that time (1786) the number of ships employed from England in the whale-fishery to Davis's Straights and the Greenland seas amounted to 139, besides 15 from Scotland. The proposed alteration took place the next year (1787); and notwithstanding the diminution of the bounty, the trade increased; the number of ships employed the same year from England amounting to 217, and the next year (1788) to 222. The whale-fishery has of late years been considerably indebted to the introduction of a new kind of harpoon, called the gun-harpoon, which the Society for the Encouragement of Arts, have exerted themselves to bring into general use.

FISHING.

FISHING, in general, the art of catching fish, whether by means of nets or spears, or of the line and hook. That which is performed by the net, spear, or harpoon, for fish that go in shoals, has been explained in the preceding articles. That performed by the rod, line, and hook, is usually termed angling; see that article: and for the particular manner of angling for the different kinds of fish, see their respective names, and the following articles:

1. The barbel, so called on account of the barb or beard that is under his chaps (see *CYPRINUS*), though a coarse fish, gives considerable exercise to the angler's ingenuity. They swim together in great shoals, and are at their worst in April, at which time they spawn, but soon come in season: the places whither they chiefly resort, are such as are weedy and gravelly rising grounds, in which this fish is said to dig and root with his nose like a swine. In the summer he frequents the strongest and swiftest currents of waters; as deep bridges, weirs, &c. and is apt to settle himself amongst the piles, hollow places, and moss weeds, and will remain there immoveable: but in winter he retires into deep waters, and helps the female to make a hole in the sands to hide her spawn in, to kinder its being devoured by other fish. He is a very curious and cunning fish; for if his baits are not sweet, clean, well scoured, and kept in sweet moss, he will not bite; but if those are well-ordered and carefully kept, he will bite with great eagerness. The best bait for him is the spawn of a salmon, trout, or any other fish; or a piece of chandler's greaves which has been boiled and washed; he will also take a large lob-worm; and if you would have good sport with him, bait the places where you intend to fish with it a night or two before with tallow-chandler's greaves; and the earlier in the morning, or the later in the evening, that you fish, the better it will be. Your rod and line must be both strong and long, with a running plummet on the line; and let a little bit of lead be placed a foot or more above the hook, to keep the bullet from falling on it: so the bait will be at the bottom, where they always bite; and when the fish takes the bait, your plummet will lie and not choke him. By the bending of your rod you may know when he bites, as also with your hand you will feel him make a strong snatch; then strike, and you will rarely fail, if you play him well; but if you manage him not dexterously he will break your line. The best time for fishing is about nine in the morning, and the most proper season is the latter part of May, June, July, and the beginning of August.

2. The bleak is an eager fish, caught with all sorts of worms bred on trees or plants; as also with flies, paste, sheep's blood, &c. Bleak may be angled for with half a score of hooks at once, if they can be all fastened on: he will also in the evening take a natural or artificial fly. If the day is warm or clear, there is no fly so good for him as the small fly at the top of the water, which he will take at any time of the day, especially in the evening. But if the day be cold and cloudy, gentles and caddis are the best; about two feet under water. But the best method is with a drab-

ble, thus: tie eight or ten small hooks across a line, two inches above one another; the biggest hook the lowermost, (whereby you may sometimes take a better fish,) and bait them with gentles, flies, or some small red worms, by which means you may take half a dozen or more at a time; but when you have them they are not worth catching, except as a bait for a pike, trout, &c.

3. For the bream observe the following directions, which will also apply to carp, tench, or perch fishing. Procure about a quart of large red worms: put them into fresh moss well washed and dried every three or four days, feeding them with fat mould and chopped fennel, and they will be thoroughly scoured in about three weeks.

Let your lines be silk, and silk-worm gut at the bottom; let the floats be either swan-quills or goose-quills. Let your plumb be a piece of lead in the shape of a spear, with a small ring at the point of it; fasten the lead to the line, and the line-hook to the lead; about ten or twelve inches space between lead and hook will be enough; and take care the lead be heavy enough to sink the float. Having baited your hook well with a strong worm, the worm will draw the hook up and down in the bottom, which will provoke the bream to bite the more eagerly. It will be best to fit up three or four rods and lines in this manner, and set them as will be directed, and this will afford you much the better sport. Find the exact depth of the water if possible, that your float may swim on its surface directly over the lead; then provide the following ground-bait. Take about a peck of sweet gross-ground-malt, and having boiled it a very little, strain it hard through a bag, and carry it to the water-side where you have sounded; and into the place where you suppose the fish resort, there throw in the malt by handfuls squeezed hard together, or rather mixed with a little clay, that the stream may not separate it before it comes to the bottom; and be sure to throw it in at least a yard above the place where you intend the hook shall lie, otherwise the stream will carry it down too far. Do this about nine o'clock at night, keeping some of the malt in the bag, and go to the place about three the next morning, but approach very warily, lest you should be seen by any of the fish; for it is said that they have their sentinels watching on the top of the water, while the rest are feeding below. Having baited your hook so that the worm may crawl to and fro, the better to allure the fish to bite, cast it in at the place where you find the fish to stay most, which is generally in the broadest and deepest part of the river, so that it may rest about the midst of your ground-bait. Cast in your second line so that it may rest a yard above that, and a third about a yard below it. Let your rods lie on the bank with some stones to keep them down at the great ends; and then withdraw yourself, yet not so far but that you can have your eye upon all the floats; and when you see one bitten and carried away, do not be too hasty to run in, but give time to the fish to tire himself, and then touch him gently. When you perceive the float sink, creep to the water-side,

and give it as much line as you can. If it is a bream or carp, he will run to the other side. Strike him gently, and hold your rod at a bend a little while, but do not pull, for then you will spoil all; but you must tire them before they can be landed, for they are very shy. If there are any carp in the river, it is an even chance that you take one or more of them; but if there are any pike or perch, they will be sure to visit the ground-bait, though they will not touch it, being drawn together by the great resort of the small fish, and until you remove them, it is in vain to think of taking the bream or carp. In this case, bait one of your hooks with a small bleak, roach, or gudgeon, about two feet deep from your float, with a little red worm at the point of your hook, and if a pike is there he will be sure to snap at it. This sport is good till nine o'clock in the morning, and in a gloomy day till night; but do not frequent the place too much, lest the fish grow shy.

4. The carp. A person who angles for carp, must arm himself with abundance of patience, because of their extraordinary subtilty and shyness; they always choose to lie in the deepest places either of ponds or rivers, where there is but a small running stream. Further, observe, that they will seldom bite in cold weather; and you cannot be too early or too late at the sport in hot weather; yet if he bite you need not fear his hold, for he is one of those leather-mouthed fish that have their teeth in the throat. Neither must you forget, in angling for him, to have a strong rod and line; and since he is so very wary, it will be proper to entice him, by baiting the ground with a coarse paste. He seldom refuses the red worm in March, the caddis in June, or the grasshopper in July, April, and September. This fish, however, does not only delight in worms, but also in sweet paste, of which there is great variety; the best is made of honey and sugar mixed up with flour, some veal minced fine, and a little cotton or white wool to make it adhere to the hook. Some of it ought to be thrown into the water a few hours before you begin to angle; neither will small pellets thrown into the water two or three days before be worse for this purpose, especially if chickens' guts, garbage, or blood mixed with bran and cow-dung, are also thrown in. If you fish with gentles, anoint them with honey. Honey and crumbs of wheat-bread, mixed together, make also a very good paste; or pellets of wheat-bread alone will answer very well. In taking a carp either in a pond or river, if the angler intends to add profit to his pleasure, he must take a peck of ale-grains, and a good quantity of any blood to mix with the grains; baiting the ground with it where he intends to angle. This food will wonderfully attract the scale-fish, as carp, tench, roach, dace, and bream. Let him angle in a morning, plumbing his ground, and angling for carp with a strong line: the bait must be either paste or a knotted red worm: and by this means he will have sport enough.

5. The pike is a very long-lived creature, and if we may credit Sir Francis Bacon, or Gesner, that famous naturalist, he outlives all other fish; and is a tyrant of the fresh-waters, as the salmon is the king thereof. The larger the pike, the courser the food, the smaller being ever best; contrary to the nature of eels, which improve their goodness by their bulk and age. He is a melancholic fish, because he never swims in shoals, but rests himself alone; and he is as bold as any fish whatever, if we may believe report, which informs us a pike hath been known to fight with an otter for a carp he had taken, and was carrying out of the water. Another bit a mule by the lip as he was drinking, and stuck thereunto so fast, that by that means the owner of the mule took him. Another bit a maid by the foot as she was washing. He will frequently devour his own kind; from whence we suppose he may obtain the name of a fresh-water wolf. As the pike is in nature like the hawk, a bird of prey, so he is like her in generation, neither of them breeding but once a year: the pike spawns between February and March. The best pikes are found in rivers, the worst in meres or ponds. His common food is either pickerel weed, frogs, or what fish he can procure. This pickerel weed some say, both feeds and breeds them. There are two ways of fishing for the pike; first by the ledger, secondly by the walking-bait. The ledger-bait is fixed in one certain place, whilst the angler may be absent; and this must be a living bait, either fish or frog. Of fish the best are a dace, roach, or perch: for frogs, the yellowest are the best. How to keep them alive on your hook, your own ingenuity will inform you. When you intend to use the ledger-bait, if it be a fish, stick your hook through his up-

per lip; and then fastening it to a strong line at least twelve or fourteen yards in length; tie the other end of the line either to some stake in the ground, or to some bough of a tree near the pike's usual haunt, or where you think it is likely he may come. Then wind your line on a forked stick, (big enough to keep the bait from drawing it under water) all except about half a yard or somewhat more; and your stick having a small cleft at the end, fasten your line therein; but so, that when the pike comes, he may easily draw it forth, and have line enough to go to his hold and pouch. If your bait be a frog, put the arming-wire in at his mouth, and out at his gills; and then with a fine needle, and silk sow the upper part of his leg with one stitch only to your arming-wire, or tie his leg above the upper joint to the wire; but as gently as you can, lest you hurt him. Excellent sport is made with living baits tied about the bodies of two or three couple of ducks, driven over a place where store of pikes have frequented. The pike is often observed to strike so violently at the living bait, that being hung he hath drawn the duck clear under water. The like may be done with such baits tied to bladders, suffering them to float down the river, whilst you mind your sport walking on its banks. The next way of angling for a pike is with a trowl with a winch to wind it up withal. As this fish is very strong, so in proportion must be your tackle; and your rod must not be very slender, where must be placed a ring for your line to run through. Your line must be composed of silk two yards and a quarter next the hook, which must be double, and strongly armed with a wire about seven inches: the rest of your line may be strong shoemakers-thread. Upon the shank of the hook fasten some smooth lead; and having placed your hook in the mouth of a minnow, dace, or roach; with your lead sink your bait with his head downward. Having so done, cast your bait up and down: if you feel him at the hook, give him length enough to run away with the bait and pouch it; which when you think he hath done, strike him with a smart jerk, and so continue your sport with him as long as you shall think fit. A pike will bite at all bait, excepting the fly, and bites best about three in the afternoon in clear water with a gentle gale, from the middle of summer to the end of autumn; he then bites best in still places or a gentle stream: but in winter he bites all the day long. In the latter end, and beginning of the spring, he bites most eagerly early in the morning, and late in the evening.

6. Salmon and trout fishing are nearly alike. The trout is caught with a worm, a minnow, or a fly; but the only elegant sport of this kind is that with the artificial fly.

7. The gudgeon is a small fish, of very delicious taste. It spawns three or four times in the summer season, and feeds in streams, slighting all kinds of flies, but is easily taken with a small red worm, fishing near the ground; and being a leather-mouthed fish, will not easily get off the hook when struck. The gudgeon may be either fished with a float, the hook being on the ground, or by hand, with a running line on the ground without cork or float. He will bite well at wasps, gentles, and cadworms; and a person may fish with two or three hooks at the same time. Before you angle for gudgeons, stir up the sand or gravel with a long pole, which will make them gather to the place, and bite the faster.

8. The tench is a fine fresh-water fish, having very small scales, but large smooth fins, with a red circle about the eyes, and a little barb hanging at each corner of the mouth. It takes more delight among weeds in ponds than in clear rivers, and loves to feed in foul water. His slime is said to have a healing quality for wounded fish, upon which he is called the fishes' physician. When carp, pike, &c. are hurt, it is said they find relief by rubbing themselves against the tench. The season for catching this fish is June, July, and August, very early and late, or even all night, in the still part of the rivers. The bait is a large red worm, at which he bites eagerly, especially if dipped in tar. He delights in all sorts of paste made of strong-scented oils, or tar, or a paste of brown-bread and honey; nor does he refuse the cadworm, lobworm, flagworm, green gentles, cod bait, or soft boiled bread-grain.

9. Smelts are caught at high-tide during the summer and autumn months, with a hook and line, about Limehouse and Poplar. They fish with about ten hooks on the same line, at different depths, each baited with a small piece of smelt, and sometimes two or three are caught at once.

An Epitome of the whole ART of FISHING, wherein are shewn at one view, the Harbours, Seasons, and Depths, for catching all sorts of Fish usually angled for; also the various Baits for each, so digested as to contain the Essence of all the Treatises ever written on the subject, exempt from the superfluities, which tend more to perplex than instruct.

Names.	Where found.	Seasons.	Time to angle.	Depth from ground.	Proper Baits.			
					Flies No.	Pastes. No.	Worms. No.	Fish & Insects. No. 8
Bream.....	rough str. river or mid. pond.	April to Mich.	sun-rise to 9 3 to sun-set	touch ground	—	1 3	1 to 7	—
Barbel.....	gravel-banks in currents under bridges	April to Aug.	very early or late	ditto	—	2	2 6 7	—
Bleak.....	sandy bottom, deep rivers, ships' sterns	May to Oct.	all day	6 inches from bottom	1 2	2	2 3 8	—
Carp.....	still deep mud-bottom, pond or river	May to Aug.	sun-rise to 9 3 to sun-set	3 inches from bottom hot weather, mid-water	—	1 3 4	1 2 3 4 7	—
Chub or Chevin.....	ditto	May to Dec.	ditto	ditto	1 to 5	2	1 2 4 5	7 8
Dace.....	sandy bottom, deep rivers, ships' sterns	May to Oct.	all day	6 to 12 inches from bottom	ditto	3 4	1 to 5 & 8	—
Gudgeon...	gravel shoals	May to Oct.	ditto	near, or on ground	—	ditto	2 8	—
Pike.....	near clay-banks	all the year	ditto	mid-water	wh. stro. and snap	line float hook fixt	—	1 2 3 4 5 6 7
Perch....	river in stream } gravel or weedy pond deepest part } bottom	May to Aug.	S.-rise to 10 2 to sun-set	ditto	2	1	3 5 7 8	1 6
Pope.....	deep holes in rivers	Aug. to May	mid-day	6 inches from bottom	5	—	all	—
Roach.....	sandy bottom, deep rivers, ships' sterns	May to Oct.	all day	ditto	1 2 4 5	3 4	ditto	8
Salmon.....	deep rivers	Mar. to Sept.	8 to 9, 3 to 6	mid-way to the bottom	all large	—	1 5 6 7	1
Smelts.....	ships' sterns and docks	Apr. to Oct.	all day	mid-way to the bottom variable	all small	—	1 2 5	bits of smelts
Trout.....	purling stream, and eddies of stony-bottom river	Mar. to Mich.	ditto	cold weather, 6 inches to 9 hot weath. top to mid-wat.	1 to 5	—	1 2 5 to 8	1 8
Tench.....	mud-bottom, river or pond	all the year	sun-rise to 9 3 to sun-set	cold wea. 3 inch from bot. hot weather, mid-water	—	1 3 4	1 3 4 to 7	—
Umber or Grayling }	clay-bottom, swift stream	all the year	all day	cold weather, 6 to 9 inch. hot weath. top to mid-wat.	1 to 5	—	all	1 8

Description of proper Baits for the several sorts of Fish referred to in the foregoing Table.

Flies. 1. Stone-fly, found under hollow stones at the side of rivers, is of a brown colour, with yellow streaks on the back and belly, has large wings, and is in season from April to July. 2. Green drake, found among stones by river-sides, has a yellow body ribbed with green, is long and slender, with wings like a butterfly, his tail turns on his back, and from May to Midsummer is very useful. 3. Oak-fly found in the body of an old oak, or ash, with its head downwards, is of a brown colour, and excellent from May to September. 4. Palmer-fly or worm, rather a hairy caterpillar, found on leaves of plants, and when it comes to a fly is excellent for trout. 5. Ant-fly, found in ant-hills from June to September. 6. The May-fly is to be found playing by the river-side, especially against rain. See EPHEMERA. 7. The black-fly is to be found upon every hawthorn after the buds are fallen off. Almost the only sport in fishing that may be called so, is fly-fishing. The fly is either natural or artificial.

I. Natural flies are innumerable. The most usual for this purpose are mentioned in the above lines. There are two ways to fish with natural flies; either on the surface of the water, or a little underneath it. In angling for chevin, roach, or dace, move not your natural fly swiftly, when you see the fish make at it; but rather let it glide freely towards him with the stream: but if it be in a still or slow water, draw the fly slowly sideways by him, which will make him eagerly pursue it.

II. The artificial fly is best used when the waters are so troubled by the winds, that the natural fly cannot be seen nor rest upon them. Of artificial flies there are reckoned no less than twelve sorts, of which the following are the principal: 1. For March, the dun-fly, made of dun-wool, and the feathers of the partridge's wing, or the body made of black-wool, and the fea-

thers of a black drake. 2. For April, the stone-fly, the body made of black wool, with a little yellow under the wings and tail. 3. For the beginning of May, the ruddy fly, made of red wool, and bound about with black silk, with the feathers of a black capon hanging dangling on his sides next his tail. 4. For June, the greenish fly, the body made of black wool, with a yellow list on either side, the wings taken off the wings of the buzzard, bound with black broken hemp. 5. The moorish fly, the body made of dusky wool, and the wings made of the blackish mail of a drake. 6. The tawny fly, good till the middle of June, the body made of tawny wool, the wings made contrary one against the other, of the whitish mail of a white drake. 7. For July, the wasp-fly, the body made of black wool, cast about with yellow silk, and the wings of drakes' feathers. 8. The steel-fly, good in the middle of July, the body made with greenish wool, cast about with the feathers of a peacock's tail, and the wings made of those of the buzzard. 9. For August, the drake-fly, the body made with black wool cast about with black silk, his wings of the mail of a black drake with a black head. The May-fly is also excellently imitated by the tackle-makers.

The best rules for artificial fly-fishing are. 1. To fish in a river somewhat disturbed with rain: or in a cloudy day, when the waters are moved by a gentle breeze; the south wind is best; and if the wind blows high, yet not so but that you may conveniently guard your tackle, the fish will rise in plain deeps: but if the wind is small, the best angling is in swift streams. 2. Keep as far from the water-side as may be; fish down the stream with the sun at your back, and do not disturb the water with your line. 3. Ever angle in clear rivers with a small fly and slender wings; but in muddy places use a larger. 4. When after rain the water becomes brownish, use an orange fly; in a clear day, a light-coloured fly; a dark fly for dark waters, &c. 5. Let the line be at least

least twice as long as the rod, unless the river is encumbered with trees. 6. For every sort of fly, have several of the same, differing in colour, to suit with the different complexions of several waters and weathers. 7. Have a nimble eye and active hand, to strike presently with the rising of the fish, or else he will be apt to throw out the hook. 8. Let the fly fall first into the water, and not the line, which will scare the fish. 9. In slow rivers, or still places, cast the fly across the river, and let it sink a little in the water, and draw it gently back with the current. Salmon-flies should be made with their wings standing one behind the other, whether two or four. This fish delights in the gaudiest colours that can be; chiefly in the wings, which must be long, as well as the tail. The best wing is the hackle of the golden pheasant.

PASTES.—1. Take the blood of a sheep, and mix it with honey and flour to a proper consistence. 2. Take old cheese grated, a little butter sufficient to work it, and colour it with saffron; in winter use rusty bacon instead of butter. 3. Crumbs of bread chewed or worked with honey or sugar, moistened with gum-water. 4. Bread chewed, and worked in the hand till it becomes stiff, which with a little cotton wool to make it stick on the hook is the best of all.

WORMS.—1. The earth-bob, found in sandy ground after ploughing; it is white, with a red head, and bigger than a gentle; another is found in heathy ground with a blue head. Keep them in an earthen vessel well covered, and a sufficient quantity of the mould they harbour in. They are excellent from April to November. 2. Gentles, to be had from putrid flesh; let them lie in wheat-bran a few days before used. 3. Flag-worms, found in the roots of flags: they are of a pale yellow colour, are longer and thinner than a gentle, and must be scoured like them. 4. Cow-dung, bog, or clap-bait, found under cow-dung from May to Mi-

chaelmas; it is like a gentle, but larger. Keep it in its native earth like the earth-bob. 5. Cadis-worm, or cod-bait, found under loose stones in shallow rivers: they are always covered with a case of sticks or small gravel, and when drawn out of their case are yellow, bigger than a gentle, with a black or blue head, and are in season from April to July. Keep them in flannel bags. 6. Lob-worm, found in gardens: it is very large, and has a red head, a streak down the back, and a flat broad tail. 7. Marsh-worms, found in marshy ground; keep them in moss ten days before you use them: their colour is a blueish red; are a good bait from March to Michaelmas. 8. Brandling or red worms, found in rotten dunghills and tanners' bark; they are red or rather striped worms, very good for all small fish, have sometimes a yellow tail, or a smaller sort are called tag-tails or gilt-tails, they have not the annular stripe of the brandling.

FISH AND INSECTS.—1. Minnow. 2. Gudgeon. 3. Roach. 4. Dace. 5. Smelt. 6. Yellow frog. 7. Snail slit. 8. Grass-hopper. Floats, are little appendages to the line, used for fishing at bottom, and serving to keep the hook and bait suspended at the proper depth, to discover when the fish have hold of them, &c. Of these there are many kinds: some made of quills, which are the best for slow waters; but for strong streams sound cork, without flaws or holes, bored through with a hot iron, into which is put a quill of a fit proportion, is preferable; the cork should be shaped to a pyramidal form, and made smooth. The fishing-hook, in general, ought to be long in the shank, somewhat thick in the circumference, the point even and straight; the bend should be in the shank. For setting the hook on, use strong but small silk, laying the hair on the inside of the hook; for if it is on the outside, the silk will fret and cut it asunder.

FISHING-LINE, a line made either of hair twisted, or silk; or the Indian grass. The best colours are the sorrel, white, and grey; the two last for clear waters, the first for muddy ones. The pale watery green colour is given artificially, by steeping the hair in a liquor made of alum, soot, and the juice of walnut leaves, boiled together.

FISHING-ROD, a long slender rod or wand, to which the line is fastened, for angling. Of these there are several sorts; as, 1. A troller, or trolling rod, which has a ring at the end of the rod, for the line to go through when it runs off a reel. 2. A whipper, or whipping rod; a top-rod, that is weak in the middle, and top heavy, but all slender and fine. 3. A dropper; which is a strong rod and very light. 4. A snapper, or snap-rod; which is a strong pole, peculiarly used for the pike. 5. A bottom-rod; being the same as the dropper, but somewhat more pliable. 6. A sniggling or procking stick; a forked stick, having a short strong line, with a needle, baited with a lobe worm: this is only for eels in their holes.

FISH-RIVER, GREAT, a river of Africa, which divides Caffraria from the country of the Hottentots, and falls into the Indian Ocean, in Lat. 30. 30. S.

FISMES, a town of France, in the department of Marne, on the Vesle, 15 miles N. W. of Rheims.

FISSATO, a town of Africa, in Tripoli, 90 miles W. of Tripoli. Lon. 12. 0. E. Lat. 33. 50. N.

FISSURE OF A BONE, in surgery, is when it is divided either transversely or longitudinally, not quite through, but cracked after the manner of glass, by any external force. See **SURGERY**.

FISSURES IN THE EARTH, certain interruptions, that in an horizontal or parallel manner divide the several strata of which the body of our terrestrial globe is composed.

FISTELLA, or **FEEZA**, a fortified town of Morocco, in the province of Tedela, 125 miles N. E. of Morocco.

FISTULA, in the ancient music, an instrument of the wind kind, resembling our flute or flageolet. The principal wind instruments of the ancients, were the tibia and the fistula.

FISTULA, in farriery. See **FARRIERY**.

FISTULA, in surgery, a deep, narrow ulcer, generally arising from abscesses. It differs from a sinus, in being callous, the latter not. See **SURGERY**.

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FISTULARIA, the **TOBACCO-PIPE FISH**, in natural history; a genus of fishes of the order abdominales. Snout cylindrical; jaws distant from the eyes; gill-membrane with seven rays; body tapering from the jaws to the tail. There are three species. *F. tabacaria*, or the slender fistularia, grows to the length of three feet, and is found on the coasts of Brazil, by the inhabitants of which it is eaten, though not much esteemed. It lives principally upon smaller fishes, insects, and worms. The two other species are natives of the Indian seas.

FIT. See **PAROXYSM**.

FITCHI, a kingdom of Japan, E. of the isle of Nippon.

FITCH, in husbandry, is more generally known by the name of chick-pea. See **CICER**. Fitches are cultivated either for feeding cattle, or improving the land. They make a wholesome and nourishing food, whether given in the straw or threshed out. When sown only to improve the soil, they are ploughed in just as they begin to blossom, by which means a tough stiff clay soil is much enriched.

FITCHET, FITCHEW, or FITCHAT, in zoology. See **MUSTELA**.

FITCHY, [from *fishé*, Fr. *i. e.* fixed,] in heraldry, a term applied to a cross when the lower branch ends in a sharp point. The reason of it Mackenzie supposes to be, that the Christians were wont to carry crosses with them wherever they went; and when they stopped on their journey at any place, they fixed those portable crosses in the ground for devotion's sake.

FITZ, [Norman, from *filz*, a son, Fr.] a son. Only used in law and genealogy: as Fitz-herbert, the son of Herbert; Fitz-thomas, the son of Thomas; Fitzroy, the son of the king. It is commonly used of illegitimate children.

FITZHERBERT, Sir ANTHONY, a very learned lawyer in the reign of king Henry VIII. descended of an ancient family, and born at Norbury in Derbyshire. He was made a judge of the court of common pleas in 1523; and distinguished himself by many valuable works, as well as by such an honourable discharge of the duties of his office, as made him esteemed an oracle of the law. His writings are, *The Grand Abridgment: The Office and Authority of Justices of Peace: The Office of Sheriffs, Bailiffs of Liberties, Escheators, Constables, Coroners, &c.: Of the Diversity of Courts: The New Natura Brevium: Of the Surveying of Lands: and The Book of Husbandry*. He died in 1538.

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FITZSTEPHEN,

FITZSTEPHEN, WILLIAM, a learned monk of Canterbury, of Norman extraction, but born of respectable parents in London, in the 12th century. Being attached to Archbishop Becket, he was present at the time of his murder. See **BECKET**. In 1174, he wrote in Latin, "The Life of Saint Thomas, Archbishop and Martyr;" in which, as Becket was a native of the metropolis, he introduces a description of London, with a detail of the manners and usages of the citizens, which is deservedly considered as a great curiosity, being the earliest professed account of London extant. He died in 1191.

FIVE CHURCHES, a town of Hungary, 85 miles S. of Buda.

FIVE ISLAND HARBOUR, a bay on the W. coast of Antigua. Lon. 61. 35. W. Lat. 17. 13. N.

FIVE-LEAVED GRASS. See **POTENTILLA**.

FIVELGO, or **FIVELINGO**, a district of Groningen, in Holland and the department of the Eems.

FIUME, or **ST. VEIT**, a populous sea-port of Carniola, on the Adriatic, 38 miles S. of Capo di Istria.

FIUME FREDDO, a town of Naples, in the province of Calabria Citra, 11 miles W. S. W. of Cosenza.

FIXATION, in chemistry, the rendering of any volatile substance fixed, so as not to fly off upon being exposed to a great heat. See **FIXED BODIES**.

FIXED-AIR, an aerial fluid which is disengaged from all substances liable to undergo the vinous fermentation, as well as by mixing alkaline salts and earths with acids. It is a gas which is essentially different in its properties from atmospheric air, as the former is unfit to support either the respiration of animals, or the burning of a candle; being likewise specifically heavier than the common air we breathe. From its acid properties, it has been variously denominated aerial acid, cretaceous acid, or carbonic acid: and from its noxious qualities, it has received the name of mephetic gas. The appellation of fixed air has been applied to it from its readily losing its elastic property, and fixing itself in various bodies, especially those which are of a calcareous nature. Fixed air was first discovered by Dr. Black, who, in consequence of various experiments, found that chalk, and the other earths reducible to quick-lime by calcination, consist of an alkaline earth, which is soluble by itself in water; but which, when combined with a large quantity of fixed-air, becomes insoluble; losing the properties of quick-lime, and assuming the appearance those earths naturally have, when not reduced to a calcareous state. It is now generally called carbonic acid gas, which see.

FIXED BODIES, are those which bear a considerable degree of heat without evaporating, or losing any of their weight. Among these, the most fixed are diamonds, gold, &c. See **DIAMOND**, **GOLD**, &c.

FIXED STARS are such as constantly retain the same position and distance with respect to each other; by which they are distinguished from erratic or wandering stars, which are continually shifting their situation and distances. The fixed stars are what we properly and absolutely call stars; the others are either planets or comets. See **ASTRONOMY**.

FLACCUS, CAIUS VALERIUS, an ancient Latin poet, of whom we have very imperfect accounts remaining. He wrote a poem on the Argonautic expedition; of which, however, he did not live to finish the eighth book, dying at about 30 years of age. John Baptista Pius, an Italian poet, completed the eighth book of the Argonautics; and added two more, from the fourth of Apollonius; which supplement was first added to Aldus's edition in 1523.

FLACOURTIA, in botany, a genus of the class and order diccya polyanthia. Male calyx five-parted; corolla none; stamina very numerous. Female calyx many-leaved; corolla none; germen superior. Styles from 5 to 9. Berry many-celled. There is one species, a small tree of Madagascar, bearing an eatable fruit in some degree resembling a plum.

FLADSTRAND, a sea-port of Denmark, on the E. coast of N. Jutland, in the diocese of Aalborg, 30 miles N. N. E. of Aalborg. Lon. 10. 19. E. Lat. 57. 33. N.

FLADUNGEN, a town of Germany, in the bishopric of Wurzburg, 30 miles N. of Wurzburg.

FLAG, in the army, a small banner of distinction, stuck in the baggage-waggon, to distinguish the baggage of one brigade from another, and of one battalion from another; that they may be mar-

shalled by the waggon-master general according to the rank of their brigades, to avoid the confusion that might otherwise arise.

FLAG, in the marine, a certain banner or standard, by which an admiral is distinguished at sea from the inferior ships of his squadron; also the colours by which one nation is distinguished from another. See **PLATE LXXI**. In the British navy, flags are either red, white, or blue; and are displayed from the top of the main-mast, fore-mast, or mizen-mast, according to the rank of the admiral. When a flag is displayed from the flag-staff on the main-mast, the officer distinguished thereby is known to be an admiral; when from the fore-mast, a vice-admiral; and when from the mizen-mast, a rear-admiral. The first flag in Great Britain is the royal standard, which is only to be hoisted when the king or queen is on board the vessel: the second is that of the anchor of hope, which characterises the lord high admiral, or lords commissioners of the admiralty: and the third is the union flag, in which the crosses of St. George and St. Andrew are blended. This last is appropriated to the admiral of the fleet, who is the first military officer under the lord high-admiral. The next flag after the union is that of the white squadron, at the main-mast head; and the last, which characterises an admiral, is the blue, at the same mast-head. For a vice-admiral, the first flag is the red, the second the white, the third the blue, at the flag staff on the fore-mast. The same order proceeds with regard to the rear-admirals, whose flags are hoisted on the top of the mizen-mast: the lowest flag in our navy is accordingly the blue on the mizen-mast. Besides the national flag, merchant-ships frequently bear less flags on the mizen-mast, with the arms of the city where the master ordinarily resides: and on the fore-mast, with the arms of the place where the person who freights them lives.

FLAG, TO HANG OUT THE WHITE, is to ask quarter; or it shews, when a vessel is arrived on a coast, that it has no hostile intention, but comes to trade, or the like. The red flag is a sign of defiance, and battle.

FLAG, TO HEAVE OUT THE, is to put out or put abroad the flag.

FLAG, TO LOWER, OR STRIKE THE, in the marine, is to pull it down upon the cap, or to take it in, out of respect, or submission, due from all ships or fleets inferior to those any way justly their superiors. To lower or strike the flag in an engagement is a sign of yielding. The way of leading a ship in triumph is to tie the flags to the shrouds, or the gallery, in the hind part of the ship, and let them hang down towards the water, and to tow the vessels by the stern. Livy relates, that this was the way the Romans used those of Carthage.

FLAG-OFFICERS, those who command the several squadrons of a fleet, such as the admirals, vice-admirals, and rear-admirals. The flag-officers in our pay are the admiral, vice-admiral, and rear-admiral, of the white, red, and blue.

FLAG-SHIP, a ship commanded by a general or flag-officer, who has a right to carry a flag, in contradistinction to the secondary vessels under its command.

FLAG-STAVES, are staves set on the heads of the top-gallant-masts, serving to let fly, or unfurl, the flag.

FLAG, in botany, see **IRIS**, and **ACORUS**.

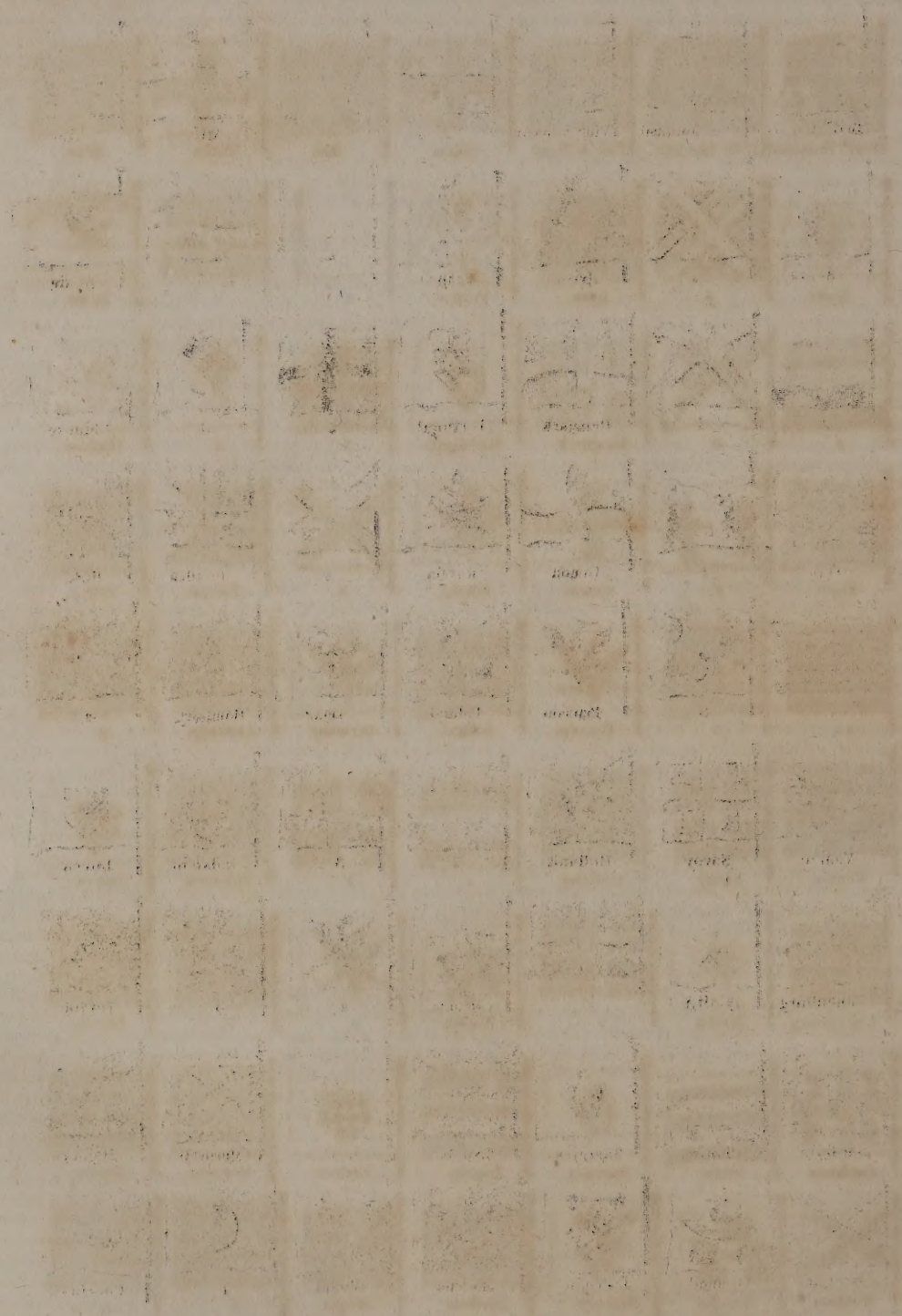
FLAGELLANTES, a sect of wild fanatics who chastised and disciplined themselves with whips in public. This sect rose in Italy, in 1260. Its author was one Rainier a hermit; and it was propagated through almost all the countries of Europe. It was probably no more than the effect of an indiscreet zeal, founded on erroneous ideas of the Deity. A great number of persons of all ages and sexes made processions, walking two by two with their shoulders bare, which they whipped till the blood ran down, to obtain mercy from God, and appease his indignation against the wickedness of the age. They were then called the devout; and having established a superior, he was called the general of the devotion.

FLAGELLARIA, a genus of the hexandria monogynia class and order of plants: petals none; perianthium divided into six segments; fruit a roundish berry, containing a single seed. There are two species, shrubs of the East Indies.

FLAGEOLET, or **FLAJEOLET**, a little flute, used chiefly by shepherds, and country people. It is made of box, or any other hard wood, and sometimes of ivory; and has six holes be-

FLAGS.





sides that at the bottom, the mouth-piece, and that behind the neck.

FLAG-FLOWER. See *ACORUS* and *IRIS*.

FLAIL, [*flagellum*, Latin; *flegel*, German,] the instrument with which grain is beaten out of the ear; the tool of the thrasher.

FLAILS consist of the following parts: 1. The hand-staff, or piece held in the thrasher's hand. 2. The swiple, or that part which strikes out the corn. 3. The caplins, or strong double leathers, made fast to the tops of the hand-staff and swiple. 4. The middle band, being the leather thong, or fish-skin, that ties the caplins together.

FLAIR, in sea language, the seamen say, that the work doth flair over, when a ship is housed in near the water, so that the work hangs over a little too much, and thus is let out broader aloft than the due proportion will allow.

FLAKE, in the cod fishery, a sort of scaffold or platform, made of hurdles, and supported by stanchions, used for drying cod-fish in Newfoundland. These flakes are usually placed near the shores of fishing harbours.

FLAKE, in gardening, a sort of carnation, which is of two colours only, and has very large stripes, all of them going quite through the leaves.

FLAKE, **WHITE**, in painting, lead corroded by the pressing of grapes, or a ceruss prepared by the acid of grapes. It is brought here from Italy; and far surpasses, both with regard to the purity of its whiteness, and the certainty of its standing, all the ceruss or white lead made with us. It is used in oil and varnish painting, for all purposes where a very clean white is required. It should be procured in lumps, as brought over, and levigated by those who use it; as that which the colourmen sell in a prepared state is levigated and mixed up with starch, and often with white lead, and worse sophistications.

FLAMANVILLE, a sea-port of France, in the department of the Channel, 10 miles S. W. of Cherbourg.

FLAMBEAU, a kind of large taper, made of hempen wicks, by pouring melted wax on their top, and letting it run down to the bottom. This done, they lay them to dry; after which they roll them on a table, and join four of them together by means of a red-hot iron; and then pour on more wax, till the flambeau is brought to the size required. Flambeaus are of different lengths, and made either of white or yellow wax. They serve to give light in the streets at night, or on occasion of illuminations.

FLAMBOROUGH, a town of Yorkshire, seated on the N. side of the cape, chiefly inhabited by fishermen.

FLAMBOROUGH HEAD, a cape on the E. coast of Yorkshire, five miles E. of Burlington, and 206 from London. It was the Flemburg of the Saxons; so called from the flames or lights made on it to direct the landing of Ida, who in A. D. 547 joined his countrymen in Britain, with a large reinforcement from Germany, and founded the kingdom of Northumberland. Lon. 0. 4. E. Lat. 54. 9. N.

FLAME, [*flamma*, Lat.] in physiology, the small parts of an inflammable body, that are set on fire, and throw off a quantity of light in every direction, or according to Sir Isaac Newton the flame of a body is only the smoke thereof heated red hot; and the smoke is only the volatile part of the body separated by the fire. When oxygen gas is decomposed slowly, the heat is imperceptible, because the caloric is dissipated as soon as generated. When the decomposition goes on faster, the bodies concerned become sensibly warm. A quicker decomposition of the gas heats the bodies so as to render them red hot, which state is called ignition; and when the process is attended with the production of certain fluids, as hydrogen, &c. and the decomposition of oxygen air affords a sufficient development of caloric, then the fluids themselves are ignited, and decomposed, which constitutes flame, and is thence termed inflammation. When a candle is first lighted, which must be done by the application of actual flame, a degree of heat is given to the wick sufficient to destroy the affinity of its constituent parts; some of the tallow is instantly melted, volatilized, and decomposed, its hydrogen takes fire, and the candle melts. As this is destroyed by combustion another portion melts, rises and supplies its place, and undergoes a like decomposition. In this way combustion is maintained in a candle. The most brilliant flame is exhibited in oxygen gas, and in this flames of different colours may be produced: thus a mixture of nitrate of

strontia and charcoal powder, previously ignited, burns with a rose-coloured flame; one part of boracic acid, and three of charcoal mixed, will burn green: one part of nitrate of barytes and four of charcoal powder burn with a yellow flame: equal parts of nitrate of lime and charcoal powder burn orange-red. Combustion is more perfect, and the light more intense, when the air has a freer access to every part of the flame.

FLAMEN, in Roman antiquity, an order of priests, instituted by Romulus or Numa. They were originally only three, viz. the *Flamen Dialis*, *Martialis*, and *Quirinalis*. The two last, though of high authority, were much inferior to the *Flamen Dialis*. All the three were chosen by the people, and consecrated by the Pontifex Maximus. In latter times several priests of the same order were added to them, but inferior in power. The whole number at last amounted to 15: the three first of whom were senators, and called *Flamines majores*; the other 12 taken from among the people, being denominated *Flamines minores*.

FLAMINIUS, or **FLAMINO**, **MARK ANTHONY**, one of the best Latin poets in the 16th century, of Imola in Italy, son and grandson of very learned men. The pope had chosen him secretary to the council in 1545; but he refused that employment, as he favoured the new opinions, and would not employ his pen in an assembly where he knew these opinions were to be condemned. He wrote notes on the Psalms; paraphrased 30 of them in Latin verse; and wrote letters and poems which are esteemed. He died at Rome in 1550.

FLAMSTED, a town of England, in Hertfordshire, five miles from St. Alban's and Dunstable, on the Verlam, anciently called Verlamstede.

FLAMSTEED, **JOHN**, an eminent English astronomer, born in Derby in 1646. He had early read a great deal of civil and ecclesiastical history; but happening to see John De Sacrobosco's book, *De Sphæra*, he acquired a turn for astronomy, which he afterwards prosecuted with great vigour. In 1674, he wrote an ephemeris, in which he shewed the falsity of astrology; and gave a table of the moon's rising and setting, with the eclipses and apses of the moon and planets to fixed stars. This fell into the hands of Sir Jonas Moore; for whom he made a table of the moon's true southings. In 1674, Sir Jonas having informed him, that a true account of the tides would be highly acceptable to the king, he composed a small ephemeris for his use; and when Sir Jonas shewed the king and duke of York Flamsteed's telescopes and micrometer, he procured a warrant to be king's astronomer, with a salary of 100*l.* a-year. His "*Doctrine of the Sphere*" was published in 1681, in a posthumous work of Sir Jonas Moore, intitled "*A new System of the Mathematics*." In 1684, he was presented to the living of Burstow in Surry, which he enjoyed till he died in 1719. His "*Historia cœlestis Britannica*" was published at London in 1725, in three vols. He likewise composed the British Catalogue of the fixed stars, which contains twice the number that are in the catalogue of Hevelius; see *ASTRONOMY*; to each of which he annexed its longitude, latitude, right ascension, and distance from the pole, together with the variation of right ascension and declination, while the longitude increases a degree. This catalogue, together with most of his observations, were printed on a fine paper and character, at the expence of prince George of Denmark.

FLANDERS, a country of the Netherlands, formerly a considerable county, governed by its own hereditary sovereigns; but now forming part of France. It was bounded on the N. by the United Provinces; on the E. by the late Austrian provinces of Brabant and Hainault; on the S. by Hainault and Artois; and on the W. and N. W. by the German ocean; extending 60 miles in length, and 50 in breadth. It contained 30 cities, a great number of market towns, 1454 villages, and 48 abbeys; besides many colleges, monasteries, &c. The towns are situated so near each other, that the Spaniards, who followed Philip II, supposed the whole country to constitute but one great city. Since that period, it has suffered greatly from the ravages of various wars; and particularly during the present. The climate is temperate and healthy; the soil is very fertile, being watered by many rivers and canals, and producing all kinds of corn, flax, and other vegetables; and the surface is very level, there being not a single hill or rising ground in it. The pastures are excellent, and rear great numbers of fine horses, sheep, and black cattle. The Flemings were

were formerly the principal manufacturers in Europe, and either invented or improved several important arts; particularly weaving figured linens; dyeing cloths; painting in oil colours; curing herrings, &c. Silk cotton and woollen stuffs, camblets, brocades, linens, laces, and tapestry, are still manufactured in great quantities. The laces are reckoned superior to all others. The chief rivers are the Scheldt and the Lys. Before the French revolution it was divided into French, Austrian, and Dutch Flanders.

FLANK, [*flanc*, Fr.] in the manege, the side of a horse between the ribs and haunches. A well flanked horse, is one that has wide and well made ribs, and a good body.

FLANKS OF AN ARMY, are the troops encamped on the right and left, as the flanks of a battalion are the files on the right and left.

FLANK OF A BASTION, in fortification, that part which joins the face to the curtain. See **BASTION** and **FORTIFICATION**.

FLANK, OBLIQUE, or SECOND FLANK, that part of the curtain, from whence the face of the opposite bastion may be discovered.

FLANK, RETIRED, LOW FLANK, or COVERED FLANK, one of the platforms of the cazemate. These retired flanks are a great defence to the opposite bastion, and to the passage of the moat, because the besiegers cannot see nor easily dismount their guns. See **FORTIFICATION**.

FLANKED, [*flanquée*,] in heraldry, is used by the French to express our parti per saltier. Coats, however, makes it to be the same with flanch. See the article **FLANCH**.

FLANKED ANGLE, in fortification, that formed by the two faces of a bastion.

FLANKING ANGLE, or ANGLE OF THE TENAILLE, that composed of the two lines of defence, and pointing towards the curtain. See **TENAILLE** and **FORTIFICATION**.

FLANNAN ISLANDS, or SEVEN HUNTERS, a group of small islands, in the North sea, about 17 miles N. W. of the isle of Lewis.

FLANNEL, or FLANEL, [*gwlanen*, Welsh; from *gwlan*, wool, Davies,] a kind of light, porous, woollen stuff, woven on a loom with two treddles, in a manner similar to blaze. This is unquestionably one of the most useful articles of wearing apparel; and it is much to be regretted, that it is not more generally worn, as we are fully persuaded, that it would be the means of preventing many diseases. The principal objection to the wearing of flannel appears to be, that it irritates the skin, and occasions disagreeable sensations: these, however, continue only for a few days, and the subsequent advantages, thence resulting, amply compensate for such temporary uneasiness. Both young and aged, would derive from it equal advantages. We do not, however, mean to insinuate, that flannel next the skin should be universally and indiscriminately worn by infants and young persons; though it is an ill-founded assertion of its adversaries, that it has a tendency to produce eruptions; as it evidently opens the pores, promotes perspiration, and thus removes the principal cause of cutaneous diseases that originate from an obstructed and irregular state of the skin. But we are fully warranted to assert, from daily experience, that the habitual use of this beneficent texture, has essentially contributed to the recovery of numberless rickety children, not less than to the saving of others who were born of feeble and enervated parents. In short, there is every reason to believe, that a more general adoption of this salutiferous cloth might prevent many fatal inflammations of the throat, breast, lungs, &c. to which the poorer class of people are remarkably liable; and thus preserve the lives of multitudes who now become a prey to our damp and variable climate.

FLAT, in the sea-language. To flat in the fore-sail, is to hail it in by the sheet, near the ship's side as possible; which is done when a ship will not fall off from the wind.

FLATS, in music, a kind of additional notes, which, together with sharps, serve to remedy the defects of musical instruments, wherein temperament is required.

FLAT-POINT, a cape of Borneo, on the S. coast. Lon. 112. 0. E. Lat. 2. 45. S.

FLAT-POINT, a cape of Sumatra, at the S. extremity of the island. Lon. 102. 38. E. Lat. 0. 50. S.

FLATTA, a small island of Scotland, one of the Hebrides; two miles E. of Barra.

FLATTERY, CAPE, a cape on the W. coast of North America. Lon. 135. 30. E. Lat. 48. 15. N.

FLATULENCY, a very common disorder, arising from vapours generated in the stomach and intestines. It occasions distensions, disagreeable sensations, and frequently a considerable degree of pain. Sedentary persons, and those who are of a delicate constitution, especially women, are very liable to attacks of this complaint, which is generally induced by the eating of peas, beans, and other leguminous food. Animal fats, especially those of mutton and veal, if moderately used, with large draughts of liquor immediately after eating them, are apt to turn rancid on the stomach, and to be accompanied with flatulency. The drinking of turbid or feculent liquors, whether new or old, as well as excessive potations of hot tea, produce a similar effect. The habit of the patient likewise contributes towards the generation of these causes; so that in phlegmatic constitutions, where the bowels are of a dry and costive disposition, this complaint is most frequent and painful. See **MEDICINE**.

FLATUS. See **MEDICINE**.

FLAVEL, JOHN, an eminent nonconformist minister, was educated at University college, Oxford; and became minister of Deptford, and afterwards of Dartmouth in Devonshire, where he resided the greater part of his life, and was much admired. Though he was generally respected at Dartmouth; yet, in 1685, the aldermen of that town, attended by the rabble, carried about a ridiculous effigy of him, to which were affixed the Bill of Exclusion and the Covenant. He therefore thought it prudent to withdraw from the town; not knowing what treatment he might meet with from a riotous mob, headed by magistrates who were themselves among the lowest of mankind. Part of his Diary, printed with his Remains, give a high idea of his piety. He died in 1691, aged 61; and after his death, his works, consisting of many pieces of practical divinity, were printed in two vols. folio. Among these, the most famous are, 1. Navigation Spiritualized; 2. Divine Conduct, or the Mysteries of Providence; and, 3. Husbandry Spiritualized; of all which there have been many editions in 8vo.

FLAX, in botany, [*flax*, *flex*, Saxon; *vlas*, Dutch,] the fibrous plant of which the finest thread is made. The fibres of flax cleansed and combed for the spinner. See **LINUM**. This valuable plant thrives most luxuriantly on ground newly broken up; which it ameliorates, if it be sown only every sixth year. The best preparatory crops for flax are those of hemp and potatoes. In the fens of Lincolnshire, hemp is sown the first year, on a good free open soil, that has been well tilled, the soil being properly manured with pigeon's dung; the second year again hemp is cultivated without any manure; and, in the succeeding year followed by Flax. With respect to the quality of linseed, from which flax is propagated, that imported from Riga is generally supposed to be the best, and is sown broad-cast with clover, in the proportion of 2, or 2½ bushels per acre. Experience, however, has evinced, that any other seed would be equally successful, if it were properly kept for six or seven years, before it is sown; for the merchants of Riga frequently import linseed from Germany and other countries, which, after several years, they again furnish the same seed, but at an advanced price. It would farther be an useless practice, to exchange linseed among farmers living at some distance; as it has been observed that it improves, when cultivated in a different soil and climate. See also **LINSEED**. In order to prevent the depredations of birds on this valuable seed, circumspect farmers sow it after sun-set on land well pulverized, and harrow it in early the next morning, before the sun rises. Thus the seed, being moistened by the night's dew, is easily enveloped with earth, and rendered invisible to birds. Another great enemy to the prosperity of the flax-plant, is the parasitical weed called the Great Dodder (which see), or *Cuscuta Europaea*, L. Bechstein communicates the following remedy, by which it may be easily and completely extirpated. To every bushel of linseed, take two drachms of camphor reduced to powder, by adding fifteen drops of spirit of wine; and mix it well with the seed on the evening when it is to be sown. As soon as the crop attains the height of four inches, it will be requisite to weed it; an operation which ought to be performed with the greatest care, that the flax may not be trodden down. If it be allowed to grow longer, the stalks will be so much bent and broken, that they never regain their former straightness. When the weeds are carefully eradicated they

they should be carried off the field, and on no account be suffered to lie in the furrows, because they often strike root again, and thus injure the growth of the flax. This plant becomes ripe when it is in full blossom; but, if it be intended to stand for seed, it will not attain to maturity till the milky juice which it affords is dried up; at which time it is to be pulled, in order to be prepared for the manufacturer. The first process which flax undergoes, is that of rating, or steeping it in water to loosen and separate the rind from the stalk. The early flax is generally watered by laying it in bundles, in a pond or reservoir of soft water, where it is pressed down by stones, or other heavy bodies. In the course of a week, the rind will be sufficiently loosened, when the flax ought to be removed from the water, spread out in the air, and dried. Great skill and precaution are necessary in this part of the operation; for should the flax be left too long in the water, the filaments or threads will become rotten and useless: it will therefore be preferable to take it out rather at an earlier period, than to leave it too long in the pits. Another process is that of dew-ripening; which is performed by spreading the flax on the grass, so that the joint action of the rain and dew produces an effect similar to that of rating. In some parts of Germany, it is never steeped in water, but only exposed for several weeks to the air, rain, and sun; by which it is said to become finer and softer than by any other method. To these operations may be added that of rippling, namely the separating of the seed from the stalk, by passing the flax through a kind of comb before it is rated or watered. These combs are made of iron, the teeth of which are so closely set together, that the heads cannot pass through, and consequently are pulled off. Some cultivators, however, beat the seed out in the field where it grew, instead of rippling, by means of a heavy piece of wood fastened to a bundle; after which it is sifted clean into a large sheet. Many attempts have been made by ingenious persons, to improve flax, or to render it finer, softer, and equal to silk in spinning. In Ireland, this object has, in a great measure, been attained by boiling it for several hours in sea-water, with the addition of a lye made of unslacked lime, and two or three parts of pot-ashes: thus we have seen the coarsest part of flax, or tow, considerably changed in its texture, so as to resemble the finest lint. In the 69th Report of the Economical Society of Leipzig, printed in 1797 (in German), we meet with the following process of converting flax into a silky substance, communicated by Count Harsch, director of the mines in Russia: take pure combed flax, tie it up into rollers covered with white buckram, fasten them with packthread, and deposit them for a fortnight in a damp cellar. Then open the flax, and place it under the cylinders of a common mangle, where it should be rolled over five or six times, in a manner similar to that pursued with linen. Next, the flax should be passed through a fine brass comb. This process of mangling and combing must be repeated a second and third time, but the combs ought to be progressively finer. By such treatment (the Count informs the Society) a very fine, tender, and glossy flax, may be obtained, scarcely inferior to China silk; and though it loses more than one-third of its substance, yet the refuse, or tow, is uncommonly fine, and still useful for the manufacture of ordinary linen. He farther observes, that, after each combing, particularly the first, the filaments appear flat and compressed, but that they recover their roundness by the subsequent operation. Flax thus prepared cannot, by mere contact, or the sense of feeling, be distinguished from silk, and is fit to be manufactured into the finest cambric, and Brabant lace. The utility of flax or linseed, in fattening cattle, is also considerable. Besides these various purposes, flax may also be considered as a manure: for the land on which it is spread, in order to prepare it for housing, is thus in a considerable degree ameliorated: and, if rated flax be laid on a coarse, sour pasture, the nature of the herbage will be totally changed; and the sweetest grasses will in future grow on such indifferent soil. The water, too, in which the flax is immersed, if properly sprinkled on land, by means of watering carts, will produce a very fertilizing effect, and increase its value ten or fifteen shillings per acre. But this water is of so poisonous a nature to cattle, that the practice of macerating or steeping flax, in any pond or running stream, is, by the 33d Henry VIII. c. 17, prohibited under very severe penalties.

FLAX, TOAD. See ANTIRRHINUM.

FLEA, in entomology. See PULEX. Children and females

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are remarkably liable to the attacks of this little enemy; a circumstance which must be attributed to their more tender skin, their purer blood, longer clothes, and, in some individuals, perhaps to a peculiar state of perspiration. Cleanliness, and frequent sprinkling of the room with a simple decoction of wormwood, will soon exterminate the whole breed of these troublesome vermin; and the best remedy to expel them from bed-clothes, is a bag filled with dry moss, the odour of which is to them extremely offensive. Others cover the floors of the rooms where fleas abound, with the leaves of the alder-tree, while the dew is on the foliage, to which these insects fondly adhere, and thus may be easily destroyed. Mercurial ointment, sulphur, and fumigation with the leaves of penny-royal, or the fresh-gathered foliage of that plant, sewed up in a bag, and laid in the bed, are also remedies pointed out for the expulsion of fleas. Dogs and cats may be effectually secured from the persecutions of these vermin, by occasionally anointing their skin with sweet oil.

FLEAM, [corrupted from *φλεβοτομος*, the instrument used in phlebotomy,] an instrument used to bleed cattle, which is placed on the vein, and then driven by a blow.

FLEAMS, A CASE OF, in farriery, comprehends six sorts of instruments; two hooked ones, called drawers, used for cleaning wounds; a pen-knife; a sharp-pointed lancet for making incisions; and two fleams, one sharp and the other broad-pointed. These last are somewhat like the point of a lancet, fixed in a flat handle, and no longer than is just necessary to open the vein.

FLECHE, a town of France, in the department of Sarthe, seated on the Loir, 21 miles S. S. W. of Mans.

FLECHIER, ESPRIT, bishop of Nismes, one of the most celebrated preachers of his age, was born at Perne in Avignon, in 1632. He was nominated bishop of Lavaur in 1685, and translated to Nismes in 1687; where he founded an academy. His palace was also a kind of academy, where he trained up young orators and authors. He published 1. *Cursus Regius*, a Latin poem; 2. *An History of Theodosius the Great, and Cardinals Ximenes and Commendon*. 3. *Several Sermons*. 4. *Miscellaneous Works*. 5. *Letters, funeral orations, &c.* He died in 1710.

FLECKEREN, an island near the S. coast of Norway, Lon. 8. 18. E. Lat. 58. 4. N.

FLEECE, the covering of wool, shorn off the bodies of sheep. See WOOL.

FLEECE, ORDER OF THE GOLDEN, an order of knighthood instituted by Philip II, duke of Burgundy. These knights at first were twenty-four, besides the duke himself, who reserved the nomination of six more: but Charles V. increased them to fifty. He gave the guardianship of this order to his son Philip king of Spain, since which the Spanish monarchs are chiefs of the order. The knights had three different mantles ordained them at the grand solemnity, the collar and fleece.

FLEECEY-HOSIERY, a very useful kind of manufacture, in which fine fleeces of wool are interwoven into a cotton piece of the common stocking texture. The manufacture is thus described in the specification of the patent granted to Mr. Holland, of Broadstreet, Bloomsbury, in the county of Middlesex. "Having in the common stocking-frame, twisted silk, cotton-yarn, flaxen or hempen thread, worsted or woollen yarn, or any such like twisted or spun materials, begin the work in the common manner of manufacturing hosiery, and having worked one or more course or courses in the common way, begin to add a coating, thus: draw the frame over the arch, and then hang wool or jersey, raw or unspun, upon the beads of the needles, and slide the same off their beads upon their stems, till it comes exactly under the ribs of the sinkers; then sink the jacks and sinkers, and bring forward the frame, till the wool or jersey is drawn under the beads of the needles, and having done this, draw the frame over the arch, and place a thread of spun materials upon the needles (under the ribs of the sinkers), and proceed in finishing the course in the usual way of manufacturing hosiery with spun materials. Any thing manufactured in this way, has, on the one side, the appearance of common hosiery, and on the other side the appearance of raw wool.

FLEET, commonly implies a company of ships of war, belonging to any prince or state; but, sometimes it denotes any number of trading ships, employed in a particular branch of commerce. In sailing, a fleet of men of war is usually divided into three squadrons; the admiral's, the vice-admiral's, and the rear-admiral's squadron,

squadron, all which, being distinguished by their flags and pendants, are to put themselves, and, as near as may be, to keep themselves in their customary places, viz. The admiral, with his squadron, to sail in the van, that so he may lead the way to all the rest in the day-time, by the sight of his flag in the main top-mast-head; and in the night-time, by his lights or lanterns. The vice-admiral and his squadron, is to sail in the centre, or middle of the fleet. The rear-admiral, and the ships of his squadron, to bring up the rear. But sometimes other divisions are made, and those composed of the lighter ships and the best sailors, are placed as wings to the van, centre, and rear. See SQUADRON, ADMIRAL, FLAG, &c. Merchant-fleets generally take their denomination from the place they are bound to, as the Turkey fleet, East-India fleet, &c. These, in time of peace, go in fleets for their mutual aid and assistance: in time of war, besides this security, they likewise procure convoys of men of war, either to escort them to the places whither they are bound, or only a part of the way, to a certain place or latitude, beyond which they are judged out of danger of privateers, &c. See CONVOY.

FLEET is also a noted prison in London, where persons are committed for contempt of the king and his laws, particularly of his courts of justice; or for debt, where any person will not, or is unable to pay his creditors. There are large rules and a warden belonging to the fleet prison, which had its name from the float or fleet of the river or ditch, on the side where it stands.

FLEMINGIANS, or FLANDRIANS, in ecclesiastical history, a sect of rigid Anabaptists, who acquired this name in the 16th century, because most of them were natives of Flanders, by way of distinction from the Waterlandians. In consequence of some dissensions among the Flemings relating to the treatment of excommunicated persons, they were divided into two sects, distinguished by the appellations of Flandrians, and Frieslanders, who differed from each other in their manners and discipline.

FLEMINGS, the natives of Flanders.

FLEMINGTON, a post town of New Jersey, in Hunterdown county, 53 miles N. E. by N. of Philadelphia.

FLEMISH BRICKS, a neat, strong, yellow kind of bricks, brought from Flanders, and commonly used in paving yards, stables, &c. being preferable for such purposes to the common bricks. See BRICK.

FLEN, a town of Sweden, in the province of Sudermania; 22 miles N. N. W. of Nyköping.

FLENSBURG, or FLENSBORG, a sea-port of Denmark, on the E. coast of Sleswick, of which it is the capital. It has a good harbour, a strong citadel, and considerable trade. It lies 16 miles N. of Sleswick. Lon. 9. 47. E. Lat. 54. 53. N.

FLESH, [*caro*,] in anatomy, a fibrous part of an animal body, soft and bloody, being that whereof most of the other parts are composed, and whereby they are connected together: or more properly, it is such parts of the body where the blood-vessels are so small, as only to retain blood enough to preserve their colour red. By chemical analysis it is found that muscular flesh is composed of a great number of fibres or threads, commonly of a reddish or whitish colour; but its appearance is too well known to require any description. Hitherto it has not been subjected to a perfectly accurate chemical analysis. From a variety of experiments and facts, ascertained by Thouvenel and Fourcroy, it appears that the muscles are composed chiefly of fibrin, to which they owe their fibrous structure and their form (see FIBRIN); and that they contain also

2. Albumen
3. Gelatine
4. Extractive
5. Phosphate of soda
6. Phosphate of ammonia
7. Phosphate of lime and carbonate of ditto.

For the discovery of the last ingredients we are indebted to Mr. Hatchett, who found that 500 parts of beef muscle left, after combustion, a residuum of 25.6 parts, consisting chiefly of these salts. When muscles are long boiled in water, Mr. Hatchett found that the greater part of the phosphate of lime; as well as of the alkaline phosphates, was dissolved; for the muscle, after this treatment, when dissolved in nitric acid, yielded scarcely any phosphate of lime; whereas if it was dissolved directly in nitric acid, a precipitate of phosphate of lime was thrown down by ammonia. Hence

it would appear, either that the phosphate of lime is united to gelatine, or that it is rendered soluble by means of it. The carbonate of lime still remains after the action of water, and is converted into oxalate when the muscle is treated with nitric acid. When meat is boiled, it is obvious that the gelatine, the extractive, and a portion of the salts, will be separated, while the coagulated albumen and fibrin will remain in a solid state. Hence the flavour and the nourishing nature of soups is derived from the extractive and gelatine. When meat is roasted, on the other hand, all these substances continue in it, and the taste and odour of the extractive are greatly heightened by the action of the fire. Hence the superior flavour of roasted meat. In a work entitled "*Miscellanea Curiosa*," by Mr. Jones, we find an easy method of preparing flesh-meat, without spices, and with very little salt; yet so as to keep good, and always ready for eating, for two or three years, and in the warmest climates. He gives us this account of the Moorish *Elcholle*, made of beef, mutton, or camel's flesh, but chiefly of beef; which is uniformly cut in long slices, well salted, and suffered to lie twenty-four hours in the pickle. It is then removed from those tubs or jars, into others filled with fresh water; and, when it has lain a night, it is taken out, put on ropes, in the sun and air to dry. When thoroughly dried and hard, it is cut into pieces of two or three inches long, and thrown into a pan, or cauldron, which is kept ready with boiling oil and suet sufficient to cover it: thus it is boiled, till it be very clear and red on cutting it; when it is again taken out and set to drain. After having undergone this process, it stands to cool, while jars are prepared for storing it; at the same time pouring upon it the liquor in which it was fried; and, as soon as it is thoroughly cold, the vessels are closely stopped. Preserved in this manner, it will remain hard, and keep two years; indeed, the hardest is considered as the best and most palatable. Thus it is brought to table by the Moors, who sometimes fry it with eggs and garlic, sometimes stew it and squeeze on it the juice of lemon. It is affirmed to be a very good dish, either hot or cold. Another method of preserving flesh-meat, especially veal and lamb, is practised in Germany, and consists simply in immersing them in skimmed milk, so as to cover the whole joint. In warm weather, the milk should be changed twice the first day, and once in 24 hours; but, in a cool temperature, it is sufficient to renew it every two or three days. Thus, the meat may be kept in a sweet state for several weeks; but it ought to be washed in spring water before it is dressed.—Game and beef, however, cannot be preserved in the same manner, and therefore should be wrapped in a clean linen cloth, and buried in a box filled with dry sand, where it will remain sweet for three weeks, if deposited in an airy, dry, and cool chamber.

FLESH is sometimes used by botanists for the soft pulpy substance of any fruit, inclosed between the outer rind or skin and the seeds or stone; or for that part of a root, fruit, &c. fit to be eaten.

FLETCHER, ANDREW, a political writer, was the son of sir Robert Fletcher, of Saltoun, in Scotland, and born in 1653. He was bred up under the care of Dr. Burnet, afterwards bishop of Salisbury, after which he went abroad. On his return to his own country, he became commissioner for East Lothian in the Scotch parliament, in which he so strongly opposed the court measures, that he found it expedient to withdraw to Holland. In 1685 he landed in the west of England with the duke of Monmouth, but was dismissed for shooting a gentleman who had remonstrated with him for stealing his horse. One of Fletcher's biographers says, that "he was a man of breeding and nice honour, in whose constitution anger was extremely predominant," and this is all the reflection he makes upon the murder. However this murder is denied in a M. S. memoir of the family. After this he was engaged in the Hungarian service against the Turks. At the Revolution he returned to his own country, and was a member of the convention for settling the government of Scotland. He died in London in 1716. His publications, which are wholly political, and filled with the boldest extravagances, were collected into one volume, 8vo. 1732.

FLETCHER, ABRAHAM, an ingenious mathematician, was born at Little Broughton, in Cumberland, in 1714, and bred to his father's business, which was that of a tobacco-pipe-maker. He learned to read and write by his own application, after which he taught himself arithmetic, mathematics, and botany. At the age of thirty he

turned schoolmaster, to which profession he added those of astrologer and doctor, by which means he acquired 3000*l*. He died in 1793. He published a compendium of practical mathematics under the title of the Universal Measurer, 1 vol. 8vo. a work of considerable merit.

FLETCHER JOHN, a pious divine, was a native of Switzerland, and educated at Geneva. He came to England, and was appointed president of lady Huntingdon's seminary of education at Treveeka, in South Wales, but was dismissed from that situation for denying the doctrine of absolute election. He afterwards obtained the vicarage of Madely in Shropshire, where he died in 1785. Mr. Fletcher wrote several excellent tracts against the Calvinists in which he manifests a spirit of meekness, wisdom, and Christian love.

FLETCHER'S NOOK, a cape of the United States, in the district of Main. Lon. 70. 59. W. Lat. 43. 25. N.

FLETEWOOD, WILLIAM, an eminent English lawyer and recorder of London, in the reign of queen Elizabeth. He was very zealous in suppressing mass-houses, and committing Popish priests; but once rushing in upon mass at the Portuguese ambassador's house, he was committed to the Fleet for breach of privilege, but soon released. Mr. Wood says, "he was a learned man, and a good antiquarian." He was a good popular speaker, and wrote well upon government. His principal works are; 1. Annalium tam Regum Edwardi V. Richardi III. and Henrici VII. quam Henrici VIII. 2. A Table of the Reports of Edmund Plowden. 3. The Office of a Justice of Peace. He died about 1593.

FLEVILLEA, in botany, a genus of the hexandria order, and diœcia class of plants. Male calyx and corolla quinquefid; stamina five; the nectarium five converging filaments. Female calyx quinquefid; styli three; apple hard, trilocular, barky.

FLEURANCE, a town of France, in the department of Gers, 13 miles N. of Auch.

FLEURI, or FLEURY, CLAUDE, one of the best French critics and historians of his age, was born at Paris in 1640. He applied himself to the law, was made advocate for the parliament of Paris, and attended the bar nine years: he then entered into orders, and was made preceptor to the princes of Conti. In 1689, Lewis XIV. made him sub-preceptor to the dukes of Burgundy, Anjou, and Berry; and in 1706, he gave him the priory of Argenteuille. In 1716, he was chosen counsellor to Louis XV. and died in 1723. He was the author of a great number of esteemed French works; the principal of which are, 1. An Ecclesiastical History, in 20 volumes, the last of which ends with the year 1414. 2. The Manners of the Israelites. 3. The Manners of the Christians. 4. Institutions of Ecclesiastical Law. 5. An Historical Catechism. 6. On the Choice and Method of Study. 7. The Duties of Masters and Servants, &c.

FLEURY, a town of France, in the department of Saone and Loire, and late province of Burgundy, 30 miles N. of Chalons.

FLEURY, a town of France, in the department of the Straits of Calais, 4½ miles N. W. of St. Pol.

FLEXIBLE, in physics, a term applied to bodies capable of being bent or diverted from their natural figure or direction.

FLEXION, in anatomy, is applied to the motion by which the arm or any other member of the body is bent. It is also applied to the muscles, nerves, &c.

FLEXOR, in anatomy, a name applied to several muscles; which are so called from their office, which is to bend the part to which they belong, in opposition to the extensors, which open or stretch them. See ANATOMY.

FLEXURE OF CURVES, in the higher geometry, is used to signify that a curve is both concave and convex, with respect to a given right-line Ap, or a fixed point P, (Plate LXX. fig. 11.) Thus the curve CMD, having the part CM concave towards Ap or P, and the part MD convex to the same; is said to have a flexure: and the point M which limits the concavity and convexity, is called the point of inflection or contrary flexure.

FLIGHT, is evading the course of justice, by a man's voluntarily withdrawing himself. On an accusation of treason or felony, or even of petty larceny, if the jury find that the party fled for the same, he shall forfeit his goods and chattels, although he be acquitted of the offence; for the very flight itself is an offence, carrying with it a strong presumption of guilt, and is at least an

endeavour to elude and stifle the course of justice prescribed by the law. But now the jury very seldom find the flight; such forfeiture being looked upon, since the vast increase of personal property, as too large a penalty for an offence, to which a man is prompted by the natural love of liberty. 4 Black. 387.

FLIGHT, is also used for the manner, duration, &c. of flying. Almost every kind of bird has its particular flight: the eagle's flight is the highest; the flight of the sparrow-hawk and vulture is noble, and fit for high enterprize and combat. The flight of some birds is low, weak, and transient; the flight of the partridge and pheasant is but of short continuance; that of the dove is laboured; that of the sparrow undulatory, &c. The augurs pretended to foretel future events from the flight of birds. See AUGURY.

FLINT, in geography, the capital of Flintshire, in North Wales, 19½ miles N. W. of London, and 12½ W. N. W. of Chester.

FLINT ISLAND, an island of North America, in the Gulph of St. Lawrence, near the E. coast of Cape Breton. Lon. 59. 40. W. Lat. 46. 10. N.

FLINT RIVER, a river of Georgia.

FLINT, a stone of the siliceous kind, found in pieces of different sizes, and usually of a figure more or less globular, commonly among chalk, and often arranged in order. Its texture is compact. Its fracture smooth, conchoidal. The stones are always covered by a white crust. Specific gravity from 2.55 to 2.63. Colour varies from honey-yellow to brownish-black. Very brittle, and splits into splinters in every direction. Two pieces of flint rubbed smartly together phosphoresce, and emit a peculiar odour. When heated it decrepitates, and becomes white and opaque. When exposed long to the air it often becomes covered with a white crust. A specimen of flint analysed by Klaproth contained,

98.00	silica,
.50	lime,
.25	alumina,
0.25	oxide of iron,
1.00	water.

100.00

Vauquelin obtained from another,

97	silica,
1	alumina and iron.

98

Another specimen analysed by Dolomieu was composed of,

97	silica,
1	alumina, and oxide of iron,
2	water.

100

The whole crust with which flint is enveloped consists of the same ingredients, and a little carbonate of lime. Water is essential to flint; for when it is separated by heat, the stone loses its properties. See SILICA.

FLIX, in geography, a town of Spain, in Catalonia, on the Ebro, 20 miles S. of Lerida.

FLOAT OF A FISHING-LINE, the cork or quill that floats or swims above water. See FISHING.

FLOAT also signifies a certain quantity of timber bound together with rafters, athwart, and put into a river to be conveyed down the stream; and even, sometimes, to carry burdens down a river with the stream.

FLOATAGES, all things floating on the surface of the sea or any water: a word much used in the commissions of water-bailiffs.

FLOAT-BOARDS, boards fixed to water-wheels of undershot mills, serving to receive the impulse of the stream, whereby the wheel is carried round. See MILL and WHEEL. It is no advantage to have too great a number of float-boards; because, when they are all struck by the water in the best manner that can be brought to come against them, the sum of all the impulses will be but equal to the impulse made against one float-board at right angles, by all the water coming out of the penstock through the opening, so as to take place on the float-board. The best rule in this case

is, to have just so many, that each of them may come out of the water as soon as possible, alter it has received and acted with its full impulse. As to the length of the float-board, it may be regulated according to the breadth of the mill.

FLOATING BODIES are those which swim on the surface of a fluid, the most interesting of which are ships and vessels employed in war and commerce, and it is of the utmost consequence to ascertain the stability of such vessels. However operose and difficult (says an able mechanic) the calculations necessary to determine the stability of nautical vessels may, in some cases, be, yet they all depend upon the four following simple and obvious theorems, accompanied with other well known stereometrical and statical principles:

Theorem 1. Every floating body displaces a quantity of the fluid in which it floats, equal to its own weight; and consequently, the specific gravity of the fluid will be to that of the floating body, as the magnitude of the whole is to that of the part immersed.

Theorem 2. Every floating body is impelled downward by its own essential power, acting in the direction of a vertical line passing through the centre of gravity of the whole; and is impelled upward by the re-action of the fluid which supports it, acting in the direction of a vertical line passing through the centre of gravity of the part immersed; therefore, unless these two lines are coincident, the floating body thus impelled must revolve round an axis, either in motion or at rest, until the equilibrium is restored.

Theorem 3. If by any power whatever a vessel be deflected from an upright position, the perpendicular distance between two vertical lines passing through the centres of gravity of the whole, and of the part immersed respectively, will be as the stability of the vessel, and which will be positive, nothing, or negative, according as the metacentre is above, coincident with, or below the centre of gravity of the vessel.

Theorem 4. The common centre of gravity of any system of bodies being given in position, if any one of these bodies be moved from one part of the system to another, the corresponding motion of the common centre of gravity, estimated in any given direction, will be to that of the aforesaid body, estimated in the same direction, as the weight of the body moved is to that of the whole system. From whence it is evident, that in order to ascertain the stability of any vessel, the position of the centres of gravity of the whole, and of that part immersed, must be determined; with which, and the dimensions of the vessel, the line of flotation, and angle of deflection, the stability or power either to right itself or overturn, may be found.

FLOATINGS, in husbandry, the drowning or watering of meadows.

FLOATING OF CHEESE, among housewives, separating the whey from the curd. See **CHEESE**.

FLOOD, a deluge or inundation of waters. See **DELUGE**.

FLOOD, among seamen, is when the tide begins to come up, or the water begins to rise, then they call it young flood; after which it is quarter-flood, half-flood, and high-flood.

FLOOD-MARK, the mark which the sea makes on the shore, at flowing water, and the highest tide: it is also called high-water mark.

FLOOD, HENRY, an eminent orator, poet, and politician, of the 18th century, the son of the Right Hon. Warden Flood, lord chief justice of the King's Bench in Ireland, was born in 1732, and educated in Dublin. In 1749, after attending Dublin college for three years, he spent other two with much advantage under the tuition of Dr. Markham, now Archbishop of York. Besides the acquisition of mathematics and other sciences, he became so complete a master of the Greek, that he read it with as much facility as English. In 1759 and 1761, he was chosen a member of the Irish Parliament, and soon rendered himself conspicuous as the great leader of opposition. The first important measure which he attempted was, an explanation of Poyning's law, by a misconstruction of which, the privy council had assumed a degree of power so unconstitutional, as to render the Irish parliament a mere cypher. By his repeated efforts, the obnoxious part of that law was repealed. He next introduced a bill for limiting the duration of the Irish parliament, which till then had always continued during the life of the king. This measure, after much opposition, he at last effected, under the administration of Lord Townshend, in

1769, when the octennial bill was passed, which first gave Ireland a constitution somewhat resembling the British. In 1775, he was appointed a privy counsellor in both kingdoms, and a vice-treasurer of Ireland; but resigned this office, in 1781; upon which his name was struck out of the list of the privy council. In 1782, the British parliament having repealed this act, 6 Geo. I. c. 5, declaring Ireland subordinate to, and dependent on, the imperial crown of Great Britain, Mr. Flood in two able speeches, insisted, that the simple repeal of this act was no security against similar future claims; and, though he was supported by only three members, in the Irish parliament, yet his doctrine was soon after adopted and ratified by the British parliament, who passed an act renouncing the claim for ever. In November 1783, a violent altercation took place between Mr. Flood and Mr. Grattan, in the course of which Mr. Flood gave a detail of his whole political life; and shewed that he had never once departed from the great principles he had always maintained. He was soon after elected a member of the British parliament for Winchester; and in the subsequent one, for Seaford, which he continued to represent till its dissolution in 1790; soon after which, he died of a pleurisy. His first known production was "Verses on the Death of Frederick Prince of Wales;" in the Oxford collection, 1751. He also wrote an Ode to Fame, translated the 1st Pythian Ode of Pindar, printed in 1785; and several orations of Demosthenes, Æschines, and Cicero; still in MS. Several of his speeches are extant; the last of which, delivered March 4th, 1790, on a parliamentary reform, was celebrated by Mr. Fox, as containing the most rational scheme ever proposed on the subject. He married Lady Frances Beresford, daughter of the Earl of Tyrone, in 1762, but had no issue.

FLOCK, or FLUKE. See **ANCHOR**.

FLOOR, in building, that part of a room we walk on. Floors are of several sorts; some of earth, some of brick, others of stone, of boards, &c. See **PAYMENT**. Carpenters never floor their rooms with boards till the carcass is set up, and also inclosed with walls, lest the weather should injure the flooring. Yet they generally rough-plane their boards for flooring before they begin any thing else about the building, that they may set them by to dry and season, which is done in the most careful manner. The best wood for flooring is the fine yellow deal well seasoned, which, when well laid, will keep its colour for a long while; whereas the white sort becomes black by often washing.

FLOOR OF A SHIP, strictly taken, is only so much of her bottom as she rests on when aground. Such ships as have long, and withal broad floors, lie on the ground with most security, and are not apt to heel, or tilt on one side; whereas others, which are narrow in the floor, or, in the sea-phrase, cranked by the ground, cannot be grounded without danger of being overturned.

FLOORS, EARTHEN, are commonly made of loam, and sometimes, especially to make malt on, of lime, and brook-sand, and gun-dust, or anvil-dust from the forge. Ox blood and fine clay, tempered together, Sir Hugh Plat says, make the finest floor in the world. The manner of making earthen floors for plain country habitations is as follows: Take two-thirds of lime, and one of coal-ashes well sifted, with a small quantity of loam clay; mix the whole together, and temper it well with water, making it up into a heap: let it lie a week or ten days, and then temper it over again. After this, heap it up for three or four days, and repeat the tempering very high, till it become smooth, yielding, tough, and gluey. The ground being then levelled, lay the floor therewith about two and a half or three inches thick, making it smooth with a trowel: the hotter the season is, the better; and when it is thoroughly dried, it will make the best floor for houses, especially malt-houses. Those who would have their floors look better, let them take lime made of rag-stones, well tempered with whites of eggs, covering the floor about half an inch thick with it, before the under flooring is too dry. If this be well done, and thoroughly dried, it will look, when rubbed with a little oil, as transparent as metal or glass. In elegant houses, floors of this nature are made of stucco, or of plaster of Paris beaten and sifted, and mixed with other ingredients.

FLOOR TIMBERS, in a ship, are those parts of a ship's timbers which are placed immediately across the keel, and upon which the bottom of the ship is framed; to these the upper parts of the timbers are united, being only a continuation of floor timbers upwards.

FLORA,

FLORA, the reputed goddess of flowers; she was, according to the poets, the wife of Zephyrus. Her image in the temple of Castor and Pollux was dressed in a close habit, and she held in her hands the flowers of pease and beans.

FLORA, among botanists, is used for a catalogue of the plants and trees growing spontaneously in any particular country or district.

FLORAC, a town of France, in the department of Lozere, near the Tarn, 13½ miles S. of Mende.

FLORAL GAMES, or **FLORALES LUDI**, in antiquity, were games held in honour of Flora. They were celebrated with shameful debaucheries.

FLORALIA, in antiquity, a general name for the feasts, games, and other ceremonies, held in honour of the goddess Flora.

FLOREN, or **FLORENCE**, [so named, says Camden, because made by Florentines,] a gold coin of Edward III. in value six shillings. Every pound weight of standard gold was by act 18 Edw. III. to be coined into 50 Florences, to be current at six shillings each; which made in tale 15 pounds; or into a proportionate number of half Florences or quarter-pieces, by indenture of the mint.

FLORENS, **ST.** a town of France, in the department of Maine and Loire, on the Loire, 20 miles S. W. of Angers.

FLORENCE, the capital of the duchy of Tuscany, and one of the finest cities in Italy. It is surrounded on all sides but one with high hills, which rise insensibly, and at last join with the lofty Apennines. The city is divided into two unequal parts by the Arno, over which there are no fewer than four bridges in sight of each other. The bridge of the Trinita is uncommonly elegant, being built entirely of white marble, and ornamented with four beautiful statues representing the Seasons. The quays, the buildings on each side, and the bridges, render that part of Florence through which the river runs by far the finest. The streets, squares, and front of the palaces, are adorned with a great number of statues; many of them by Michael Angelo, Bandinelli, Donatello, Giovanni di Bologna, Benvenuto, Cellini, &c. Some of the Florentine merchants formerly were men of vast wealth, and lived in a most magnificent manner. One of them, about the middle of the 15th century, built that noble fabric, which, from his name, is still called the Palazzo Pitti. He was ruined by the prodigious expence of this building, which was purchased by the Medici family, and has continued ever since to be the residence of the grand dukes. The gardens belonging to it are on the declivity of an eminence. On the summit there is a fort called Belvidere. From this, and some of the higher walks, there is a complete view of the city, and of the beautiful vale of Arno, in which it stands. This palace has been since enlarged. The furniture is rich and curious, particularly some tables of Florentine work, which are much admired. The most precious ornaments, however, are the paintings. The walls of the Imperial Chamber are painted in fresco, by various painters; the subjects are allegorical, in honour of Lorenzo of Medici, surnamed the Magnificent. The famous gallery attracts every stranger. One of the most interesting parts of it is the series of Roman emperors, from Julius Cæsar to Gallienus, with a considerable number of their empresses. This series is almost complete; but wherever the bust of an emperor is wanting, the place is filled up by that of some other distinguished Roman. The celebrated Venus of Medici, which is esteemed the standard of taste in female beauty and proportion, stands in a room called the Tribunal. The inscription on its base mentions its being made by Cleomenes an Athenian, the son of Apollodorus. It is of white marble, and surrounded by other master-pieces of sculpture, some of which are said to be the works of Praxiteles and other Greek masters. In the same room are many valuable curiosities, besides a collection of admirable pictures by the best masters. There are various other rooms, as the Cabinet of Arts, of Astronomy, of Natural History, of Metals, of Porcelain, of Antiquities, &c. It lies 45 miles S. of Bologna, and 125 N. of Rome. Lon. 11. 15. E. Lat. 43. 47. N.

FLORENNES, a town of France, in the department of the Ourte, 10 miles S. of Charleroy, and 16 S. W. of Namur.

FLORENSAC, a town of France, in the department of Herault, on the Herault, 10½ miles S. of Beziers.

FLORENTIA, in ancient geography, a town of Etruria, now

called Florenza, or Fiorenza, by the Italians, and Florence by the English. See **FLORENCE**.

FLORENTIN, or **ST. FLORENTIN**, a town of France, in the department of Yonne, and late duchy of Burgundy, 15 miles N. E. of Auxerre, and 80 S. E. of Paris.

FLORENTINO, one of the three provinces of Tuscany. The capital is Florence.

FLORES, one of the Azores, so named from the multitude of flowers found growing spontaneously on it. Lon. 31° 11' 22" W. from Greenwich, Lat. 39° 26' 20" N.

FLORET, [*fleurette*, Fr.] a small imperfect flower.

FLORID STYLE, a style too much enriched with figures and flowers of rhetoric. This seems to be the fault of many authors and orators of the present age.

FLORIDA, a country of N. America, bounded on the N. by Georgia, on the E. by the Atlantic, on the S. by the Gulfs of Mexico and Florida, and on the W. by the Mississippi. The climate in summer is extremely hot; in winter commonly temperate, though sometimes the rivers are covered with ice. The soil is fertile, and the country abounds with fruit-trees, many of which being in flower at the time of its discovery gave rise to the name of Florida. Oranges, peaches, plums, mulberries, cocoa-nuts, melons, vines, olives, chestnuts, cabbage-trees, &c. grow naturally in great plenty; as well as cotton, flax, hemp, saffrairs, oaks, palms, pines, cedars, cypresses, &c. Cochineal and indigo also abound; and the coasts furnish great quantities of fish, oysters, &c. The forests abound with most of the wild beasts common in America. The original Indians are numerous and active. Florida is 600 miles long, and 130 broad; lying between 82° and 92° Lon. W. and between 25° and 31° Lat. N. It is divided into East and West.

FLORIDA, GULF OF, lies on the S. E. coast of Florida, between the Gulf of Mexico and the Atlantic.

FLORILEGIUM, or **FLORILEGE**, a name the Latins have given to what the Greeks call *anthologion*, Anthology; viz. a collection of choice pieces, containing the finest and brightest things in their kind.

FLORILEGIUM, or **ANTHOLOGIA**, is particularly used for a breviary, in the Eastern church, compiled by Arcadius, for the convenience of the Greek priests and monks, who cannot carry with them in their travels and pilgrimages, all the volumes wherein their office is dispersed. It contains the general rubrics, psalter, canticles, the horologium, and the office of the feria, &c.

FLORIN, a term sometimes used for a coin, and sometimes for a money of account. As a coin, it is of different values, according to the different metals, and different countries where it is struck. The gold florins are most of them of a very coarse alloy, some of them not exceeding 13 or 14 carats, and none of them 17½. As a money of account, it is used by the Italian, Dutch, and German merchants and bankers, but admits of different divisions in different places. See **MONEY**.

FLORIN, a town of Sardinia, eight miles S. of Sassari.

FLORINIANI, or **FLORIANI**, a sect of heretics, of the second century, so named from its author Florinus. Philastrius says, that they were the same with the Carpophorians. He adds, that they were also called soldiers, milites, quia de militibus fuerunt. St. Irenæus calls them Gnostics; St. Epiphanius, Phibionites; and Theodoret, Borborites, on account of the impurities of their lives, &c. though for what particular reasons it is not easy to say, nor perhaps would it be worth an inquiry.

FLORINUS, or **FLORIANUS**, a heretic of the second century, and a priest of the Roman church, deposed for his errors along with Blastus. He made God the author of evil; or rather asserted, that the things forbidden by God are not evil.

FLORIST, a cultivator of flowers; also applied to an author who writes what is called the flora of any particular place. See **FLORA**.

FLORY, **FLOWRY**, or **FLEURY**, in heraldry, a cross that has the flowers at the end circumflex and turning down; differing from the potence, in as much as the latter stretches out more like that which is called the patee.

FLOS, a Flower, in botany. See **BOTANY**, and **FLOWER**.

FLOS FEMINEUS, a flower which is furnished with the pointal or female organ of generation, but wants the stamina or male organ. Female flowers may be produced apart from the male, either on the

same root or on distinct plants. Birch and mulberry are examples of the first case; willow and poplar of the second.

FLOS MASCULUS, a male flower. By this name, Linnaeus and the sexualists distinguish a flower which contains the stamen, or male organ of generation; but not the stigma or female organ. See **BOTANY**, **DICEIA**, and **MONŒCIA**.

FLOS, in chemistry, the most subtle part of bodies separated from the more gross parts by sublimation in a dry form.

FLOSCULUS, in rhetoric, a flower or ornament of speech. See **FLOWER**.

FLOTA, or **FIOTTA**, a **FLEET**; a name given by the Spaniards to the ships which they send annually from Cadiz to the port of Vera Cruz, to fetch thence the merchandizes gathered in Mexico for Spain.

FLOTILLA, a name given to a number of ships, which get before the rest in their return, and give information of the departure and cargo of the *flota* and galleons.

FLOTSON, or **FLOTSOM**, signifies goods lost by shipwreck; which, with *jetson* and *lagan*, are generally given to the lord admiral, when the owners are not known. See **JETSON** and **LAGAN**.

FLOUNDER, **FLUKE**, or **BUT**, in ichthyology. See **PLEURONECTES**. Flounders may be fished for all day long, either in a swift stream, or in the still deep water; but best in the stream, in April, May, June, and July; the most proper baits are all sorts of worms, wasps, and gentles.

FLOUR, *St.* a town of France in the department of Cantal. It is 45 miles S. of Clermont. Lat. 45° 1' 53" N. Lon 3° 5' 24" E. from Greenwich.

FLOUR, the meal of wheat, rye, &c. finely ground and sifted. We have already stated, that corn is the prey of a variety of insects: when converted into flour, it is subject to the depredations of another race of destroyers, which multiply in it so rapidly, that in a very short time they wholly consume its substance. These insects are of an oblong, slender form; their heads are provided with a kind of proboscis or snout, with which they take in their food; their body is composed of several rings. They do incalculable damage to the flour deposited in magazines for armies or other public uses; and after they have insinuated themselves into any parcel, the only method that can be adopted for saving the whole quantity is, to convert it immediately into bread. In order to prevent such noxious vermin from breeding in flour, this valuable commodity should be kept thoroughly dry, as well as the barrels into which it is packed: with such precautions, if the flour be placed in a cool and airy room, it will be effectually preserved. Sometimes, however, it happens, that though every attention be bestowed on it, flour becomes spirit, or damaged, and thus acquires an unpleasant flavour. This may be remedied by mixing a quantity of ground rice (in proportion of one pound to ten of flour) with the usual quantity of yeast and water; keeping the mixture before the fire for the space of two hours; at the expiration of which time, the whole may be wrought into bread, in the common manner: thus it will be totally divested of its disagreeable flavour. See **BAKING**. The proportion of flour, which a bushel of grain affords, greatly varies. A bushel of Essex wheat, Winchester measure, weigh upon an average about 60lbs., which, when ground, will yield (exclusive of the loss incurred by the grinding and drying) 45½lbs. of the flour called seconds, which alone is used for baking throughout the greater part of England, and which affords the most wholesome, though not the whitest bread. Besides the seconds, such a bushel of wheat yields 13lbs. of pollard and bran: the total loss in grinding seldom exceeds one pound and a half. And when the grinding is performed with care, and the corn of a good quality, the loss is considerably less, as has been evinced by various experiments made to ascertain this point. A correspondent of the Editors of the Supplement to the Encyclopædia Britannica (*Art. BREAD*), states, that he weighed two bushels, Winchester measure, of white and red wheat, the whole of which amounted to 122lbs. This wheat was ground under his own inspection, and yielded 121½lbs. of meal; so that the waste or loss in grinding the two bushels, amounted only to half a pound. The meal was also dressed in his presence, and produced 93½lbs. of seconds, and 25½lbs. of pollard and bran, so that the whole loss in the two bushels, both by grinding and dressing, did not exceed two pounds and a half. The bran and pollard were also dressed in a bolting mill, and produced

	lbs.	oz.
Sharps.....	6	0
Fine Pollard.....	5	8
Coarse ditto.....	7	8
Broad Bran.....	5	8
	24	8

One pound only was thus lost in the bolting, and if the sharps had been sifted, they would have afforded three pounds of good flour. We are inclined to think, from these and similar data, if the price of wheat were given, that of flour might be easily ascertained, and those frauds which are now practised with impunity, could be effectually prevented.

FLOWER, **FLOS**, among botanists and gardeners, the most beautiful part of trees and plants, containing the organs of generation and fructification. See **BOTANY**, and **FLOS**. Flowers, designed for medical use, should be plucked when they are moderately blown, and on a clear day before noon: for conserves, roses must be taken in the bud. Flowers were in great request at the entertainments of the ancients, being provided by the master of the feast, and brought in before the second course; or, as some think, at the beginning of the entertainment. They not only adorned their heads, necks, and breasts, with flowers, but often bestrewed the beds, whereon they lay, and all parts of the room with them. But the head was chiefly regarded. See **GARLAND**. Flowers were likewise used in bedecking tombs.

FLOWER DE LIS, or **FLOWER DE LUCE**, in heraldry, a bearing representing the lily, called the queen of flowers, and the true hieroglyphic of royal majesty; but of late it is become more common, being borne in some coats one, in others three, in others five, and in some semée or spread all over the escutcheon in great numbers. The arms of France, under monarchy, were three flower de lis, or, in a field, azure.

FLOWER DE LUCE, in botany. See **IRIS**.

FLOWER, **GENTLE**. See **AMARANTHUS**.

FLOWERS, METHODS OF PRESERVING. A method of preserving flowers in their natural beauty through the whole year has been much sought after. Some have attempted it by gathering them when dry and not too much opened, and burying them in dry sand; but this, though it preserves their figure well, takes off from the liveliness of their colour. I. Muntingius prefers the following method to all others. Gather the flowers, when they are not yet thoroughly open, in the middle of a dry day: put them into a good earthen vessel glazed within; fill the vessel up to the top with them; and when full sprinkle them over with some good French wine, with a little salt in it; then set them in a cellar, tying down the mouth of the pot. After this they may be taken out at pleasure; and, on setting them in the sun, or within reach of the fire, they will open as if growing naturally; and not only the colour, but the smell also will be preserved. The flowers of plants are by much the most difficult parts of them to preserve in any tolerable degree of perfection; of which we have instances in all the *hortisicci*, or collections of dried plants. In these the leaves, stalks, roots, and seeds, of the plants appear very well preserved, the strong texture of these parts making them always retain their natural form, and the colour in many species naturally remaining. But where these fade, the plant is little worse for use as to the knowing the species by it. But it is very much otherwise in regard to flowers: these are naturally by much the most beautiful parts of the plants to which they belong; but they are so much injured in the common way of drying, that they not only lose but change their colours one into another, by which means they occasion many errors: and they usually also wither up, so as to lose their very form and natural shape. The primrose and cowslip afford remarkable instances of the change of colours in the flowers of dried specimens: for those of this class of plants easily dry in their natural shape; but they lose their yellow, and, instead of it, acquire a fine green colour, much superior to that of the leaves in their most perfect state. The flowers of all the violet kind lose their beautiful blue, and become of a dead white: so that in dried specimens there is no difference between the blue-flowered violet and the white-flowered. II. Sir Robert Southwell has communicated to the world a method of drying plants, by which this defect is proposed to be in a great measure remedied, and all flowers preserved in their natural shape, and many in their natural colours.

For this purpose two plates of iron are to be prepared of the size of a large half-sheet of paper, or larger, for particular occasions: these plates must be made so thick as not to bend; and there must be a hole near every corner for a screw to fasten them close together. When these are prepared, lay in readiness several sheets of paper, and then gather the plants with their flowers when quite perfect. Let this be always done in the middle of a dry day; and then lay the plant and its flower on one of the sheets of paper doubled in half, spreading out all the leaves and petals as nicely as possible. If the stalk is thick, it must be pared or cut in half, so that it may lie flat; and if it is woody, it may be peeled, and only the bark left. When the plant is thus expanded, lay round about it some loose leaves and petals of the flower, which may serve to complete any part that is deficient. When all is thus prepared, lay several sheets of paper over the plant, and as many under it; then put the whole between the iron plates, laying the papers smoothly on one, and laying the other evenly over them: screw them close, and put them into an oven after the bread is drawn, and let them lie there two hours. After that, make a mixture of equal parts of aquafortis and brandy; shake these well together, and when the flowers are taken out of the plates, rub them lightly over with a camel's-hair pencil dipped in this liquor; then lay them upon fresh brown paper, and covering them with some other sheets, press them between this and other papers with a handkerchief till the wet of these liquors is dried wholly away. When the plant is thus far prepared, take the bulk of a nutmeg of gum-dragon; put this into a pint of pure water cold, and let it stand 24 hours; it will in this time be wholly dissolved: then dip a fine hair pencil in this liquor, and with it daub over the back sides of the leaves, and lay them carefully down on a half-sheet of white paper fairly expanded, and press them down with some more papers over these. When the gum-water is fixed, let the pressure and papers be removed, and the whole work is finished. The leaves retain their verdure in this case, and the flowers usually keep their natural colours. Some care, however, must be taken, that the heat of the oven be not too great. When the flowers are thick and bulky, some art may be used to pare off their backs, and dispose the petals in due order; and after this, if any of them are wanting, their places may be supplied with some of the super-numerary ones dried on purpose; and if any of them are only faded, it will be prudent to take them away, and lay down others in their stead: the leaves may be also disposed and mended in the same manner. III. Another method of preserving both flowers and fruit sound throughout the whole year, is also given by the same author. Take saltpetre one pound, Armenian bole two pounds, clean common sand three pounds. Mix all well together; then gather fruit of any kind that is not fully ripe, with the stalk to each; put these in, one by one, into a wide-mouthed glass, laying them in good order. Tie over the top with an oil cloth, and carry them into a dry cellar, and set the whole upon a bed of the prepared matter, of two inches thick, in a box. Fill up the remainder of the box with the same preparation; and let it be four inches thick all over the top of the glass, and all round its sides. Flowers are to be preserved in the same sort of glasses, and in the same manner; and they may be taken up after a whole year as plump and fair as when they were buried.

FLOWERS, in chemistry, generally imply dry bodies reduced into very fine parts, either spontaneously, or by some operation of art; but the term is chiefly applied to volatile solid substances, reduced into a kind of fine meal by sublimation. Some flowers are nothing else than the bodies themselves, which are sublimed entire, without suffering any alteration or decomposition; others are some of the constituent parts of the body subjected to sublimation.

FLOWERS, in heraldry. They are much used in coats of arms; and in general signify hope, or denote human frailty and momentary prosperity.

FLOWERS, in rhetoric, [*flosculi*, Lat.] figures or ornaments of language. See COMPARISON, FIGURE, ORATORY, &c.

FLOWN SHEETS, in the sea language, a ship is said to sail with flown sheets when her sails are not haled home, or close to the blocks. The sheets are flown; that is, they are let loose, or run as far as they will.

FLUATES, in chemistry, salts first discovered by Scheele; they are distinguished by the following properties: 1. When sulphuric

acid is poured upon them, they emit acrid vapours of fluoric acid, which corrode glass. 2. When heated, several of them phosphoresce. 3. They are not decomposed by heat, nor altered by combustibles. 4. They combine with silica by means of heat. Most of them are sparingly soluble in water.

FLUATE OF LIME, FLUOR SPAR. This mineral is found abundantly in different countries, particularly in Derbyshire. It is both amorphous and crystallised. The primitive form of the crystals is the regular octahedron; that of its integrant molecules the regular tetrahedron. The varieties of its crystals hitherto observed amount to nine. These are the primitive octahedron; the cube; the rhomboidal dodecahedron; the cubo-octahedron, which has both the faces of the cube and of the octahedron: the octahedron wanting the edges; the cube wanting the edges, and either one face or two faces in place of each. According to Pelletier, it is composed of

21 lime
15 alumina
31 silica
28 fluoric acid
1 phosphoric acid
1 muriatic acid
1 oxide of iron
1 water

99

FLUELLIN, the herb SPEEDWELL. See ANTIRRHINUM.

FLUENT, in fluxions, the flowing quantity, or that which is continually either increasing, or decreasing, whether line, surface, solid, &c. See FLUXION.

FLUID, in physics, is a term applied to all bodies whose particles easily yield to the least partial pressure, or force impressed. See FLUIDITY and HYDROSTATICS.

FLUID, in physiology, an appellation given to all bodies whose particles easily yield to the least partial pressure, or force impressed. See HYDROSTATICS, and the next article.

FLUIDITY, is that state or affection of bodies in which their parts easily move one among another. All substances in nature, as far as we are acquainted with them, occur in one or other of the three following states; namely, the state of solids, of liquids, or of elastic fluids or vapours. It has been ascertained, that in a vast number of cases, the same substance is capable of existing successively in each of these states. Thus sulphur is usually a solid body; but when heated to 212° it is converted into a liquid; and at a still higher temperature (about 570°), it assumes the form of an elastic vapour of a deep-brown colour. Water also in our climate is usually a liquid; but when cooled down to 32° it is converted into a solid body, and at 212° it assumes the form of an elastic fluid. Most solid bodies may be converted into liquids by heating them sufficiently, and on the other hand, every liquid, except spirit of wine, is convertible into a solid body, by exposing it to a sufficient degree of cold. All liquid bodies may, by heating them, be converted into elastic fluids, and a great many solids are capable of undergoing the same change; and, lastly, the number of elastic fluids which by cold are condensable into liquids or solids, is by no means inconsiderable. These facts have led philosophers to form this general conclusion, "that all bodies, if placed in a temperature sufficiently low, would assume a solid form; that all solids become liquids when sufficiently heated; and that all liquids, when exposed to a certain temperature, assume the form of elastic fluids." The state of bodies then depends upon the temperature in which they are placed; in the lowest temperatures they are all solid, in higher temperatures they are converted into liquids, and in the highest of all they become elastic fluids. The particular temperatures at which bodies undergo those changes are exceedingly various, but they are always constant for the same bodies. Thus we see that heat produces changes on the state of bodies, converting them all, first into liquids, and then elastic fluids.

I. When solid bodies are converted by heat into liquids, the change in some cases takes place at once. There is no interval between solidity and liquidity; but in other cases a very gradual change may be perceived; the solid becomes first soft, and it passes slowly through all the degrees of softness, till at last it becomes perfectly fluid. The conversion of ice into water is an instance

stance of the first change; for in that substance there is no intervening state between solidity and fluidity. The melting of glass, of wax, and of tallow, exhibits instances of the second kind of change; for these bodies pass through every possible degree of softness before they terminate in fluidity. In general, these solid bodies which crystallise or assume regular prismatic figures, have no interval between solidity and fluidity, while those that do not usually assume such shapes have the property of appearing successively in all the intermediate states. Solid bodies never begin to assume a liquid form till they are heated to a certain temperature; this temperature is constant in all. In the first class of bodies it is very well defined; but in the second, though it is equally constant, the exact temperature of fluidity cannot be pointed out with such precision on account of the infinite number of shades of softness through which the bodies pass before they acquire their greatest possible fluidity. But even in these bodies we can easily ascertain that the same temperature always produces the same degree of fluidity. The temperature at which this change from solidity to liquidity takes place, receives different names according to the usual state of the body thus changed. When the body is usually observed in a liquid state, we call the temperature at which it assumes the form of a solid, its freezing point, or congealing point. Thus the temperature in which water becomes ice, is called the freezing point of water; on the other hand, when the body is usually in the state of a solid, we call the temperature at which it liquefies its melting point; thus 212° is the melting point of sulphur, 442° the melting point of tin. The following table contains a list of the melting points of a considerable number of solid bodies:

Substance.	Melting point.
Lead.....	594°
Bismuth.....	576°
Tin.....	442°
Sulphur.....	212°
Wax.....	142°
Spermaceti.....	133°
Phosphorus.....	100°
Tallow.....	92°
Oil of anise.....	50°
Olive-oil.....	36°
Ice.....	32°
Milk.....	30°
Vinegar.....	28°
Blood.....	25°
Oil of bergamot.....	23°
Wines.....	20°
Oil of turpentine.....	14°
Sulphuric acid.....	36°
Mercury.....	39°
Liquid ammonia.....	46°
Ether.....	46°
Nitric acid.....	66°

Before Dr. Black began to deliver his chemical lectures in Glasgow in 1757, it was universally supposed, that solids were converted into liquids by a small addition of heat after they had been once raised to the melting point, and that they returned again to the solid state on a very small diminution of the quantity of heat necessary to keep them at that temperature. An attentive view of the phenomena of liquefaction and solidification gradually led this sagacious philosopher to observe their inconsistency with the then received opinions, and to form another, which he verified by direct experiments, and drew up an account of his theory, and the proofs of it, which was read to a literary society in Glasgow on April 23d, 1762; and every year after he gave a detailed account of the whole doctrine in his lectures. The opinion which he formed was, that when a solid body is converted into a liquid, a much greater quantity of heat enters into it than is perceptible immediately after by the thermometer. This great quantity of heat does not make the body apparently warmer, but it must be thrown into it in order to convert it into a liquid; and this great addition of heat is the principal and most immediate cause of the fluidity induced. On the other hand, when a liquid body assumes the form of a solid, a very great quantity of heat leaves it without sensibly diminishing its temperature; and the state of solidity can-

not be induced without the abstraction of this great quantity of heat. Or, in other words, whenever a solid is converted into a fluid, it combines with a certain dose of caloric, without any augmentation of its temperature; and it is this dose of caloric which occasions the change of the solid into a fluid. When the fluid is converted again into a solid, the dose of caloric leaves it, without any diminution of its temperature; and it is this abstraction which occasions the change. Thus the combination of a certain dose of caloric with ice causes it to become water, and the abstraction of a certain dose of caloric from water causes it to become ice. Water then is a compound of ice and caloric; and in general all fluids are combinations of the solid, to which they may be converted by the application of cold, and a certain dose of caloric. Such is the opinion concerning the cause of fluidity taught by Dr. Black as early as 1762. Its truth was established by the following experiments:

First. If a lump of ice, at the temperature of 22° , is brought into a warm room, in a very short time it is heated to 32° , the freezing point. It then begins to melt; but the process goes on very slowly, and several hours elapse before the whole ice is melted. During the whole of that time its temperature continues at 32° ; yet as it is constantly surrounded by warm air, we have reason to believe that caloric is constantly entering into it. Now as none of this caloric is indicated by the thermometer, what becomes of it, unless it has combined with that portion of the ice which is converted into water, and unless it is the cause of the melting of the ice? Dr. Black took two thin globular glasses, four inches in diameter, and very nearly of the same weight. Both were filled with water; the contents of the one were frozen into a solid mass of ice, the contents of the other were cooled down to 33° ; the two glasses were then suspended in a large room at a distance from all other bodies, the temperature of the air being 47° . In half an hour the thermometer placed in the water-glass rose from 33° to 40° , or 7 degrees; the ice was at first 4 or 5 degrees colder than melting snow, but in a few minutes the thermometer applied to it stood at 32° . The instant of time when it reached that temperature was noted, and the whole left undisturbed for ten hours and a half. At the end of that time the whole ice was melted, except a very small spongy mass, which floated at the top, and disappeared in a few minutes. The temperature of the ice water was 40° . Thus $10\frac{1}{2}$ hours were necessary to melt the ice, and raise the product to the temperature of 40° . During all this time it must have been receiving heat with the same celerity as the water-glass received it during the first half-hour. The whole quantity received then was 21 times 7, or 147; but its temperature was only 40° ; therefore 139 or 140 degrees had been absorbed by the melting ice, and remained concealed in the water into which it had been converted, its presence not being indicated by the thermometer. That caloric, or heat, is actually entering into the ice, is easily ascertained by placing the hand on a thermometer under the vessel containing it. A current of cold air may be perceived descending from it during the whole time of the process. But it will be said, perhaps, that the heat which enters into the ice does not remain there, but is altogether destroyed. This opinion is refuted by the following experiment.

Second. If, when the thermometer is at 22° , we expose a vessel full of water at 52° to the open air, and beside it another vessel full of brine at the same temperature, with thermometers in each, we shall find that both of them gradually lose caloric, and are cooled down to 32° . After this the brine (which does not freeze till cooled down to 0°) continues to cool without interruption, and gradually reaches 22° , the temperature of the air, but the pure water remains stationary at 32° . It freezes, indeed, but very slowly; and during the whole process its temperature is 32° . Now, why should the one liquid refuse all on a sudden to give out caloric and not the other? Is it not much more probable that the water, as it freezes, gradually gives out the heat which it had absorbed during its liquefaction; and that this evolution maintains the temperature of the water at 32° , notwithstanding what it parts with to the air during the whole process? We may easily satisfy ourselves that the water while congealing is constantly imparting heat to the surrounding air; for a delicate thermometer suspended above it is constantly affected by an ascending stream of air less cold than the air around. The following experiment, first made

by Fahrenheit, and afterwards often repeated by Dr. Black and others, affords a palpable evidence, that such an evolution of caloric actually takes place during congelation.

Third. If, when the air is at 22° , we expose to it a quantity of water in a tall beer-glass, with a thermometer in it and covered, the water gradually cools down to 22° without freezing. It is therefore 10° below the freezing point. Things being in this situation, if the water is shaken, part of it instantly freezes into a spongy mass, and the temperature of the whole instantly rises to the freezing point, so that the water has acquired ten degrees of caloric in an instant. Now whence came these ten degrees? Is it not evident that it must have come from that part of the water which was frozen, and consequently that water in the act of freezing gives out caloric? From many experiments made on water in these circumstances, it is found that the quantity of ice which forms suddenly on the agitation of water, cooled down below the freezing point, bears always a constant ratio to the coldness of the liquid before agitation. Thus when water is cooled down to 22° very nearly $\frac{1}{2}$ of the whole freezes; when the previous temperature is 27° , about $\frac{1}{3}$ of the whole freezes. In all cases when water is cooled down below 32° , it loses a portion of the caloric which is necessary to constitute its liquidity. The instant that such water is agitated, one portion of the liquid seizes upon the quantity of caloric in which it is deficient, at the expense of another portion, which of course becomes ice. Thus when water is cooled down to 22° , every particle of it wants 10° of the caloric necessary to keep it in a state of liquidity. Thirteen parts of it seize 10 degrees each from the fourteenth part. These thirteen of course acquire the temperature of 32° ; and the other part, being deprived of $10 \times 13 = 130$, which with the ten degrees that it had lost before constitute 140° , or the whole of the caloric necessary to keep it fluid, assumes of consequence the form of ice.

Fourth. If these experiments should not be considered as sufficient to warrant Dr. Black's conclusion, the following, for which we are indebted to the same philosopher, puts the truth of his opinion beyond the reach of dispute. He mixed together given weights of ice at 32° , and water at 190° of temperature. The ice was melted in a few seconds, and the temperature produced was 53° .

The weight of the ice was 119 half-drachms;

That of the hot water 135

of the mixture 254

of the glass vessel 16

Sixteen parts of glass have the same effect in heating cold bodies, as eight parts of equally hot water. Therefore, instead of the 16 half-drachms of glass, eight of water may be substituted, which makes the hot water amount to 143 half-drachms. In this experiment there were 158 degrees of heat contained in the hot water, to be divided between the ice and the water. Had they been divided equally, and had the whole been afterwards sensible to the thermometer, the water would have retained $\frac{143}{2}$ parts of this heat, and the ice would have received $\frac{119}{2}$ parts: that is to say, the water would have retained 86° , and the ice would have received 72° ; and the temperature after mixture would have been 104° . But the temperature by experiment is found to be only 53° ; the hot water lost 137° , and the ice only received an addition of temperature equal to 21° . But the loss of 18° of temperature in the water is equivalent to the gain of 21° in the ice. Therefore $158 - 18 = 140^{\circ}$ of heat have disappeared altogether from the hot water. These 140° must have entered into the ice, and converted it into water without raising its temperature. In the same manner, if we take any quantity of ice, or, which is the same thing, snow at 32° , and mix it with an equal weight of water at 172° , the snow instantly melts, and the temperature of the mixture is only 32° . Here the water is cooled 140° , while the temperature of the snow is not increased at all; so that 140° degrees of caloric have disappeared. They must have combined with the snow; but they have only melted it, without increasing its temperature. Hence it follows irresistibly, that ice, when it is converted into water, absorbs and combines with 140° of caloric. Water, then, after being cooled down to 32° , cannot freeze till it has parted with 140° of caloric; and ice, after being heated to 32° , cannot melt till it has absorbed 140° of caloric. This is the cause of the extreme slowness of these operations. With regard to water, then, there can be no doubt that it owes its fluidity to the caloric which

it contains, and that the caloric necessary to give fluidity to ice is equal to 140° . To the quantity of caloric which thus occasions the fluidity of solid bodies by combining with them, Dr. Black gave the name of latent heat, because its presence is not indicated by the thermometer; a term sufficiently expressive, but other philosophers have rather chosen to call it caloric of fluidity. Dr. Black and his friends ascertained also, by experiment, that the fluidity of melted wax, tallow, spermaceti, and metals, is owing to the same cause. Landriani proved, that this is the case with sulphur, alum, nitre, and several of the metals; and it has been found to be the case with every substance hitherto examined. We may consider it therefore as a general law, that whenever a solid is converted into a fluid, it combines with caloric, and that this is the cause of its fluidity. From the experiments of Dr. Irvine, it appears that the caloric of fluidity of spermaceti is..... 145°

Bees-wax..... 175°

Tin..... 500°

These are the only substances in which the quantity of caloric, absorbed during fusion, has been ascertained. In all of them we see this rule to hold, that the caloric of fluidity increases with the temperature at which liquidity takes place. Dr. Black has rendered it exceedingly probable also, or rather he has proved by his experiments and observations, that the softness of such bodies as are rendered plastic by heat, depends upon a quantity of latent heat which combines with them. Metals also owe their malleability and ductility to the same cause. Hence the reason why they become hot and brittle when hammered.

II. Thus it appears, that the conversion of solids into liquids, is occasioned by the combination of a dose of caloric with the solid. But there is another change of state still more remarkable, to which bodies are liable when exposed to the action of heat. Almost all liquids, when raised to a certain temperature, gradually assume the form of an elastic fluid, invisible like air, and possessed of the same mechanical properties. Thus water, by boiling, is converted into steam, an invisible fluid, 1800 times more bulky than water, and as elastic as air. These fluids retain their elastic form as long as their temperature remains sufficiently high; but when cooled down again, they lose that form, and are converted into liquids. All liquids, and even a considerable number of solids, are capable of undergoing this change when sufficiently heated. With respect to the temperatures at which liquids undergo this change, they may be all arranged under two divisions. There are some liquids which are gradually converted into elastic fluids at every temperature, while others again never begin to assume that change till their temperature reaches a certain point. Water is a well-known example of the first class of bodies. If an open vessel, filled with water, is carefully examined, we find that the water diminishes in bulk day after day, and at last disappears altogether. If the experiment is made in a vessel sufficiently large, and previously exhausted of air, we shall find that the water will fill the vessel in the state of invisible vapour, in whatever temperature it is placed. Alcohol likewise, and ether, and volatile oils, gradually assume the form of an elastic fluid in all temperatures. But sulphuric acid and the fixed oils never begin to assume the form of vapour till they are raised to a certain temperature. Though left in open vessels they lose no perceptible weight; neither does sulphuric acid lose any weight, though kept ever so long in the temperature of boiling water. When liquids gradually assume the form of elastic fluids in all temperatures, they are said to evaporate spontaneously. The second class of liquids want that property altogether. When all other circumstances are the same, the evaporation of liquids increases with their temperature; and after they are heated to a certain temperature, they assume the form of elastic fluids with great rapidity. If the heat is applied to the bottom of the vessel containing the liquids, as is usually the case, after the whole liquid has acquired this temperature, those particles of it which are next the bottom become an elastic fluid first: they rise up, as they are formed, through the liquid, like air-bubbles, and throw the whole into violent agitation. The liquid is then said to boil. Every particular liquid has a fixed point at which this boiling commences (other things being the same), and this is called the boiling point of the liquid. Thus water begins to boil when raised to 212° . It is remarkable, that after a liquid has begun to boil, it never becomes any hotter, however strong the fire to which it is exposed. A strong heat in-

deed makes it boil more rapidly, but does not increase its temperature. This was first observed by Dr. Hooke. It was observed, when treating of the melting point of solids, that it is capable of being varied considerably by altering the situation of the body. Thus water may be cooled down considerably lower than 32° , without freezing. The boiling point is still less fixed, depending entirely on the degree of pressure to which the liquid to be boiled is exposed. If we diminish the pressure, the liquid boils at a lower temperature; if we increase it, a higher temperature is necessary to produce ebullition. From the experiments of professor Robison, it appears that, in a vacuum, all liquids boil about 145° lower than in the open air under a pressure of 30 inches of mercury; therefore water would boil in vacuo at 67° , and alcohol at 34° . In a Papin's digester, the temperature of water may be raised to 300° , or even 400° , without ebullition: but the instant that this great pressure is removed, the boiling commences with prodigious violence. The elasticity of all the elastic fluids into which liquids are converted by heat, increases with the temperature; and the vapour formed, when the liquid boils in the open air, possesses an elasticity just equal to that of air, or capable at a medium of balancing a column of mercury 30 inches high. The following very important table, drawn up by Mr. Dalton from his own experiments, exhibits the elasticity of steam, or the vapour of water of every temperature, from -40° to 325° . The elasticities of all the temperatures from 32° to 212° were ascertained by experiment; the rest were calculated by observing the rate at which the elasticity increased or diminished according to the temperature.

TABLE OF THE ELASTICITY OF STEAM.

Temperature.	Force of Vap. in inches of Mercury.	Temperature.	Force of Vap. in inches of Mercury.	Temperature.	Force of Vap. in inches of Mercury.	Temperature.	Force of Vap. in inches of Mercury.	Temperature.	Force of Vap. in inches of Mercury.	Temperature.	Force of Vap. in inches of Mercury.
-40°	.013	32	.200	70°	.721	108°	2.39	146°	6.70		
-30	.020	33	.207	71	.745	109	2.46	147	6.87		
-20	.030	34	.214	72	.770	110	2.53	148	7.05		
-10	.043	35	.221	73	.796	111	2.60	149	7.23		
0	.064	36	.229	74	.823	112	2.68	150	7.42		
1	.066	37	.237	75	.851	113	2.76	151	7.61		
2	.068	38	.245	76	.880	114	2.84	152	7.81		
3	.071	39	.254	77	.910	115	2.92	153	8.01		
4	.074	40	.263	78	.940	116	3.00	154	8.20		
5	.076	41	.273	79	.971	117	3.08	155	8.40		
6	.079	42	.283	80	1.00	118	3.16	156	8.60		
7	.082	43	.294	81	1.04	119	3.25	157	8.81		
8	.085	44	.305	82	1.07	120	3.33	158	9.02		
9	.087	45	.316	83	1.10	121	3.42	159	9.24		
10	.090	46	.328	84	1.14	122	3.50	160	9.46		
11	.093	47	.339	85	1.17	123	3.59	161	9.68		
12	.096	48	.351	86	1.21	124	3.69	162	9.91		
13	.099	49	.363	87	1.24	125	3.79	163	10.15		
14	.101	50	.375	88	1.28	126	3.89	164	10.41		
15	.104	51	.388	89	1.32	127	4.00	165	10.68		
16	.106	52	.401	90	1.36	128	4.11	166	10.96		
17	.109	53	.415	91	1.40	129	4.22	167	11.25		
18	.112	54	.429	92	1.44	130	4.34	168	11.54		
19	.116	55	.443	93	1.48	131	4.47	169	11.83		
20	.120	56	.458	94	1.53	132	4.60	170	12.13		
21	.124	57	.474	95	1.58	133	4.73	171	12.43		
22	.129	58	.490	96	1.63	134	4.86	172	12.73		
23	.134	59	.507	97	1.68	135	5.00	173	13.02		
24	.139	60	.524	98	1.74	136	5.14	174	13.32		
25	.144	61	.542	99	1.80	137	5.29	175	13.62		
26	.150	62	.560	100	1.86	138	5.44	176	13.92		
27	.156	63	.578	101	1.92	139	5.59	177	14.22		
28	.162	64	.597	102	1.98	140	5.74	178	14.52		
29	.168	65	.616	103	2.04	141	5.90	179	14.83		
30	.174	66	.635	104	2.11	142	6.05	180	15.15		
31	.180	67	.655	105	2.18	143	6.21	181	15.50		
32	.186	68	.676	106	2.25	144	6.37	182	15.86		
33	.193	69	.698	107	2.32	145	6.53	183	16.23		

Temperature.	Force of Vap. in inches of Mercury.	Temperature.	Force of Vap. in inches of Mercury.	Temperature.	Force of Vap. in inches of Mercury.	Temperature.	Force of Vap. in inches of Mercury.	Temperature.	Force of Vap. in inches of Mercury.	Temperature.	Force of Vap. in inches of Mercury.
184°	16.61	213°	30.60	242°	51.34	271°	78.89	300°	111.81		
185	17.00	214	31.21	243	52.18	272	79.94	301	112.98		
186	17.40	215	31.83	244	53.03	273	80.98	302	114.15		
187	17.80	216	32.46	245	53.88	274	82.01	303	115.32		
188	18.20	217	33.09	246	54.68	275	83.13	304	116.50		
189	18.60	218	33.72	247	55.54	276	84.35	305	117.68		
190	19.00	219	34.35	248	56.42	277	85.47	306	118.86		
191	19.42	220	34.99	249	57.31	278	86.50	307	120.03		
192	19.86	221	35.63	250	58.21	279	87.63	308	121.20		
193	20.32	222	36.25	251	59.12	280	88.75	309	122.37		
194	20.77	223	36.88	252	60.05	281	89.87	310	123.53		
195	21.22	224	37.53	253	61.00	282	90.99	311	124.69		
196	21.68	225	38.20	254	61.92	283	92.11	312	125.85		
197	22.13	226	38.89	255	62.85	284	93.23	313	127.00		
198	22.69	227	39.59	256	63.76	285	94.35	314	128.15		
199	23.16	228	40.30	257	64.82	286	95.48	315	129.29		
200	23.64	229	41.02	258	65.78	287	96.64	316	130.43		
201	24.12	230	41.75	259	66.75	288	97.80	317	131.57		
202	24.61	231	42.49	260	67.73	289	98.96	318	132.72		
203	25.10	232	43.24	261	68.72	290	100.12	319	133.86		
204	25.61	233	44.00	262	69.72	291	101.28	320	135.00		
205	26.13	234	44.78	263	70.73	292	102.45	321	136.14		
206	26.66	235	45.58	264	71.74	293	103.63	322	137.28		
207	27.20	236	46.39	265	72.76	294	104.80	323	138.42		
208	27.74	237	47.20	266	73.77	295	105.97	324	139.56		
209	28.29	238	48.02	267	74.79	296	107.14	325	140.70		
210	28.84	239	48.84	268	75.80	297	108.31				
211	29.41	240	49.67	269	76.82	298	109.48				
212	30.00	241	50.50	270	77.85	299	110.64				

Mr. Dalton has discovered that the elasticity of every other vapour or steam is precisely the same with that of the steam of water at the same distance from its boiling point. Thus water boils at 212° ; its elasticity at the temperature of 182° , or 30 under its boiling point, we see from the table is 15.86. Alcohol boils at 176° ; the elasticity of the steam of alcohol at 146° , or 30° under its boiling point, is likewise 15.86. This very important discovery enables us to ascertain the elasticity of the vapours of all liquids whatever at any temperature, provided their boiling points are known. We have only to find how many degrees the temperature at which the elasticity required is distant from the boiling point of this liquid. The same number of degrees, added to or subtracted from 212° , gives us a temperature, opposite to which in the above table we shall find the elasticity required. Such are the phenomena of the conversion of liquid into elastic fluids. Dr. Black applied his theory of latent heat to this conversion with great sagacity; and demonstrated, that it is owing to the very same cause as the conversion of solids into liquids; namely, to the combination of a certain dose of caloric with the liquid, without any increase of temperature. The truth of this very important point was established by the following experiments:

First. When a vessel of water is put upon the fire, the water gradually becomes hotter till it reaches 212° ; but afterwards its temperature is not increased. Now caloric must be constantly entering from the fire and combining with the water. But as the water does not become hotter, the caloric must combine with that part of it which flies off in the form of steam; but the temperature of the steam is only 212° ; therefore the caloric combined with it does not increase its temperature. We must conclude, then, that the change of water to steam is owing to the combination of this caloric; for it produces no other change. Dr. Black put some water in a tin-plate vessel upon a red-hot iron. The water was of the temperature 50° ; in four minutes it began to boil, and in 20 minutes it was all boiled off. During the first four minutes it had received 162° , or $40\frac{1}{2}$ per minute. If we suppose that it received as much per minute during the whole process of boiling, the caloric which entered into the water and converted it into steam would amount to $40\frac{1}{2} \times 20 = 810^{\circ}$. This caloric is not indicated by the thermometer, for the temperature of steam is only 212° ; therefore Dr. Black called it latent heat.

Second. Water may be heated in a Papin's digester to 400° without boiling; because the steam is forcibly compressed, and prevented from making its escape. If the mouth of the vessel is suddenly opened while things are in this state, part of the water rushes out in the form of steam, but the greater part still remains in the form of water, and its temperature instantly sinks to 212°; consequently 188° of caloric have suddenly disappeared. This caloric must have been carried off by the steam. Now as only about one-fifth of the water is converted into steam, that steam must contain not only its own 188°, but also the 188° lost by each of the other four parts; that is, it must contain $188^\circ \times 5$, or about 940°. Steam therefore is water combined with at least 940° of caloric, the presence of which is not indicated by the thermometer. This experiment was first made by Dr. Black, and afterwards with more precision by Mr. Watt.

Third. When hot liquids are put under the receiver of an air-pump, and the air is suddenly drawn off, the liquids boil, and their temperature sinks with great rapidity a considerable number of degrees. Thus water, however hot at first, is very soon reduced to the temperature of 70°, and ether becomes suddenly so cold, that it freezes water placed round the vessel which contains it. In these cases the vapour undoubtedly carries off the heat of the liquid; but the temperature of the vapour is never greater than that of the liquid itself; the heat therefore must combine with the vapour, and become latent.

Fourth. If one part of steam at 212° is mixed with nine parts by weight of water at 62°, the steam instantly assumes the form of water, and the temperature after mixture is 178.6°, consequently each of the nine parts of water has received 116.6° of caloric; of course the steam has lost $9 \times 116.6^\circ = 1049.4^\circ$ of caloric. But as the temperature of the steam is diminished by 33.3°, we must subtract this sum. There will remain rather more than 1000°, which is the quantity of caloric which existed in the steam without increasing its temperature. This experiment cannot be made directly; but it may be made by passing a given weight of steam through a metallic worm, surrounded by a given weight of water. The heat acquired by the water indicates the caloric which the steam gives out during its condensation. From the experiments of Mr. Watt made in this manner, it appears that the latent heat of steam amounts to 940°. The experiments of M. Lavoisier make it rather more than 1000°. By the experiments of Dr. Black and his friends, it was ascertained, that not only water, but all other liquids during their conversion into vapour, combine with a dose of caloric, without any change of temperature; and that every kind of elastic fluid, during its conversion into a liquid, gives out a portion of caloric without any change of temperature. Dr. Black's law then is very general, and comprehends every change in the state of a body. The cause of the conversion of a solid into a liquid is the combination of the solid with caloric; that of the conversion of a liquid into an elastic fluid is the combination of the liquid with caloric. Liquids are solids combined with caloric. This law, in its most general form, may be stated as follows: whenever a body changes its state, it either combines with caloric, or separates from caloric. No person will dispute that this is one of the most important discoveries hitherto made in philosophy. Science is indebted for it entirely to the sagacity of Dr. Black. Other philosophers indeed have laid claim to it; but these claims are either without any foundation, or their notions may be traced to Dr. Black's lectures, as their opinions originated many years posterior to the public explanation of Dr. Black's theory in the chemical chairs of Glasgow and Edinburgh.

III. A very considerable number of bodies, both solids and liquids, may be converted into elastic fluids by heat; and as long as the temperature continues sufficiently high, they retain all the mechanical properties of gaseous bodies. It is exceedingly probable, that if we could command a heat sufficiently intense, the same change might be produced on all bodies in nature. This accordingly is the opinion at present admitted by philosophers. But if all bodies are convertible into elastic fluids by heat, it is exceedingly probable that all elastic fluids in their turn might be converted into solids or liquids, if we could expose them to a sufficiently low temperature. In that case, all the gases must be supposed to owe their elasticity to a certain dose of caloric: they must be considered as compounds of caloric with a solid or liquid body. This opinion was first stated by Amontons, and it was supported with

much ingenuity both by Dr. Black and Lavoisier, and his associates. It is at present the prevailing opinion; and it is certainly supported not only by analogy, but by several very striking facts. If its truth be admitted, we must consider all the gases as capable of losing their elasticity by depriving them of their heat: they differ merely from the vapours in the great cold which is necessary to produce this change. Now the fact is, that several of the gases may be condensed into liquids by lowering their temperatures. Oxymuriatic acid gas becomes liquid at a temperature not much under 40°; and at 32° it even forms solid crystals. Ammoniacal gas condenses into a liquid at -45°. None of the other gases have been hitherto condensed. It is well known, that the condensation of vapours is greatly assisted by pressure; but the effect of pressure diminishes as the temperature of vapours increases. It is very likely that pressure would also contribute to assist the condensation of gases. It has been tried without effect indeed in several of them. Thus air has been condensed till it was heavier than water; yet it shewed no disposition to lose its elasticity. But this may be ascribed to the high temperature at which the experiment was made relative to the point at which air would lose its elasticity. At the same time it cannot be denied, that there are several phenomena scarcely reconcilable to this constitution of the gases, ingenious and plausible as it is. One of the most striking is the sudden solidification which ensues when certain gases are mixed together. Thus when ammoniacal gas and muriatic acid gas are mixed, the product is a solid salt; yet the heat evolved is very inconsiderable, if we compare it with the difficulty of condensing these gases separately, and the great cold which they endure before losing their elasticity. In other cases too, gaseous bodies unite, and form a new gas, which retains its elasticity as powerfully as ever. Thus oxygen gas and nitrous gas combined form a new gas, namely, nitric acid, which is permanent till it comes into contact with some body on which it can act.

FLUKE. See PLEURONECTES.

FLUKE, in entomology. See FASCIOLA.

FLUKE OF AN ANCHOR, that part of it which fastens in the ground. See ANCHOR.

FLUKE-WORM. See FASCIOLA.

FLUMET, a town of France, in the department of Mont Blanc, 30 miles N. E. of Chambery, and 31 S. E. of Geneva.

FLUMMERY, a kind of jelly made of oatmeal, in the following manner: steep three large table-spoonfuls of finely ground oatmeal for 24 hours in two quarts of pure water, then pour off the clear fluid, and replace it by three pints of fresh water; strain it through a fine hair-sieve, add to it two spoonfuls of orange-flower water, and one of sugar; boil the whole to the consistence of a hasty pudding, stirring it continually while boiling, till it become perfectly smooth. This preparation affords a grateful and nutritive breakfast to persons liable to costiveness, in consequence of a sedentary life.

FLUOR-SPAR. See FLUATE OF LIME, and the next article. The fluates are principally used for smelting ores, being found to act as very powerful fluxes.

FLUORIC ACID. The mineral called fluor, or fusible spar, and in this country Derbyshire spar, was not properly distinguished from other spars till Margraff published a dissertation on it in the Berlin Transactions for 1768. He first proved, that it contained no sulphuric acid, as had been formerly supposed: he then attempted to decompose it, by mixing together equal quantities of this mineral and sulphuric acid, and distilling them. By this method he obtained a white sublimate, which he supposed to be the fluor itself volatilized by the acid. He observed with astonishment, that the glass retort was corroded, and even pierced with holes. Nothing more was known concerning fluor till Scheele published his experiments three years after, by which he proved that it is composed chiefly of lime and a particular acid, which has been called fluoric acid. The composition of fluoric acid is equally unknown with that of muriatic acid. Mr. Henry tried in vain to decompose it by means of electricity. It is always obtained from fluor spar, in which mineral it is found in abundance. For the investigation of the properties of this acid, we are indebted chiefly to Scheele and Priestley. 1. It may be obtained by putting a quantity of the spar in powder into a retort, pouring over it an equal quantity of sulphuric acid, and then applying a very gentle heat. A gas issues from the beak of the retort, which may be

received

received in the usual manner in glass jars standing over mercury. This gas is fluoric acid. The acid may be obtained dissolved in water by luting to the retort a receiver containing water. The distillation is to be conducted with a very moderate heat, not only to allow the gas to condense, but also to prevent the fluor itself from subliming. After the process, provided a glass retort has been employed, a crust of white earth is found in the receiver, which has all the properties of silica. Scheele supposed that the silica produced was formed of fluoric acid and water; and Bergman adopted the same opinion. But Wiegand and Buccholz shewed that the quantity of silica was exactly equal to what the retort lost in weight; and Meyer completed the proof that it was derived from the glass, by the following experiment. He put into each of three equal cylindrical tin vessels a mixture of three ounces of sulphuric acid and one ounce of fluor, which had been pulverized in a mortar of metal. Into the first he put one ounce of pounded glass; into the second the same quantity of quartz in powder; and into the third nothing. Above each of the vessels he hung a sponge moistened with water, and having covered them, he exposed them to a moderate heat. The sponge in the first cylinder was covered with the crust in half an hour; the sponge in the second in two hours; but no crust was formed in the third, though it was exposed several days. In consequence of this decisive experiment, Bergman gave up his opinion; and wrote an account of Meyer's experiment to Morveau, who was employed in translating his works, to enable him to correct the mistake in his notes. Soon after the discovery of this acid, difficulties and doubts concerning its existence as a peculiar acid were started by some French chemists. To remove these objections, Mr. Scheele instituted and published a new set of experiments; which not only completely established the peculiar nature of the fluoric acid, but once more displayed the unrivalled abilities of the illustrious discoverer.

1. Fluoric acid gas is invisible and elastic like air; it does not maintain combustion, nor can animals breathe it without death. It has a pungent smell, not unlike that of muriatic acid. It is heavier than common air. It corrodes the skin almost instantly.
2. Neither caloric nor light produces any alteration on it.
3. When water is admitted in contact with this gas, it absorbs it rapidly; and if the gas has been obtained by means of glass vessels, it deposits at the same time a quantity of silica. Water absorbs a considerable proportion of this gas, but the precise quantity has not been determined. The compound is usually termed fluoric acid by chemists. It is specifically heavier than water, has an acid taste, reddens vegetable blues, and does not freeze till cooled down to 23°. When heated, the acid gas is easily expelled, except the last portions of it, which adhere with great obstinacy.
4. Neither oxygen gas nor any of the simple combustibles or incombustibles produce any change on fluoric acid, either in the gaseous or liquid state.
5. Fluoric acid gas does not act upon any of the metals, but liquid fluoric acid is capable of oxidizing iron, zinc, copper, and arsenic. It does not act upon gold, platinum, silver, mercury, lead, tin, antimony, cobalt.
6. It combines with alkalies, earths, and metallic oxides, and forms with them salts which are denominated fluates. See FLUATE. The most singular property of fluoric acid is the facility with which it corrodes glass and siliceous bodies, especially when hot, and the ease with which it holds silica in solution even when in the state of gas. This affinity for silica is so great, that the thickest glass vessels can only withstand its action for a short time; and the greatest precautions are scarcely sufficient to obtain it entirely free from siliceous earth.
7. It produces no change, as far as is known, upon any of the acids already described.
8. Its affinities are as follows:

Lime,
Barytes,
Strontian,
Magnesia,
Potass,
Soda,
Ammonia,
Glucina,
Alumina,
Zirconia,
Silica.

10. As fluoric acid produces an insoluble compound with lime, it may be employed with great advantage, as Pelletier has observed, to detect the presence of that earth when held in solution. A

drop or two of the acid causes a milky cloud or precipitate to appear, if any time be present. The property which this acid has of corroding glass, has induced several ingenious men to attempt, by means of it, to engrave, or rather etch, upon glass. The glass is covered completely with wax; and then that part where the letters or figures are to appear is laid bare, by removing the wax. The whole is then exposed for some time to the hot vapours of fluoric acid. This simple process is employed with advantage in writing labels on glass vessels, and in graduating thermometers, and other similar instruments. The discovery is by no means new; it has been shewn by Beckman and Accum, that this acid was employed for that purpose by Henry Swanhard, an artist of Nuremberg, as early as 1670. He seems to have kept his art for some time secret, but the receipt was made public by Pauli in 1725. See ETCHING ON GLASS.

FLUSHING, FLESSINGUE, or VLISSINGEN, a strong sea-port town of Holland in the island of Walcheren, and department of the Meuse, 4 miles S.W. of Middleburg, and 28 N.E. of Ostend. This town together with the whole island was annexed to France by an imperial decree of Dec. 27, 1809. Lat. 51° 26' 37" N. Lon. 3° 34' 9" E. from Greenwich.

FLUSTRA, a genus of worms of the order zoophyta. Animal a polype proceeding from porous shells; stem fixed, foliaceous, membranaceous, consisting of numerous rows of cells united together, and woven like a mat. There are about 18 species. The verticillata is found in the Mediterranean, adhering to fuci.

FLUTE, [*fistula*], an instrument of music, the simplest of all those of the wind kind. It is played on by blowing it with the mouth, and the tones or notes are changed by stopping and opening the holes disposed for that purpose along its side. The ancient fistulae, or flutes, were made of reeds, afterwards of wood, and last of metal.

FLUTE, GERMAN, is an instrument entirely different from the common flute. It is not, like that, put into the mouth to be played, but the end is stopt with a tampon, or plug, and the lower lip is applied to a hole about two inches and a half, or three inches, distant from the end. Although playing the flute is on the Continent more generally practised than in Britain, yet we think it useful to observe, that this exercise is by no means compatible with either young or weak lungs. Indeed, all wind-instruments are in many respects objectionable, because, after blowing forcibly, a large portion of air is suddenly inhaled, and afterwards partially expelled from the lungs, so that they are by this debilitating action continually expanded and relaxed, in a manner very different from that which Nature pursues in the process of respiration.

FLUTE, or FLUYT, (originally perhaps *float*) is a kind of long vessel, with flat ribs, or floor timbers; round behind, and swelled in the middle; serving chiefly for the carrying of provisions in fleets, or squadrons of ships, though it is also used for merchandize.

FLUTES, or FLUTINGS, in architecture, perpendicular channels, or cavities, cut along the shaft of a column, or pilaster. See ARCHITECTURE.

FLUX, in medicine, an extraordinary issue, or evacuation, of some humours of the body. See MEDICINE.

FLUX, in metallurgy, is sometimes used synonymously with fusion: for instance, an ore, or rather matter, is said to be in liquid flux, when it is completely fused. But the word flux is generally used to signify certain saline matters, which facilitate the fusion of ores, and other substances which are difficultly fusible in assays, and in the reductions of ores. We shall here describe the fluxes recommended by Bergman, in vol. ii.

1. The phosphoric acid, or rather the microcosmic salt, as it is called, which contains that acid partly saturated with mineral, partly with ammonia, and loaded besides with much water. This salt, when exposed to the flame, boils and foams violently, with a continual crackling noise, until the water and ammonia have flown off; afterwards it is less agitated, sending forth something like black scoræ arising from the burned gelatinous part: these, however, are soon dispelled, and exhibit a pellucid sphericle encompassed by a beautiful green cloud, which is occasioned by the deflagration of the phosphorus, arising from the extrication of the acid by means of the inflammable matter. The clear globule which remains, upon the removal of the flame, continues longer soft than that formed by borax, and therefore is more fit for the addition of the matter to be dissolved. The ammonia is expelled by the fire; therefore an excess of acid remains

remains in what is left behind, which readily attracts moisture in a cool place. 2. Soda, when put upon charcoal, melts superficially, penetrates the charcoal with a crackling noise, and then disappears. In the spoon it yields a permanent and pellucid sphericle, as long as it is kept fluid by the blue apex of the flames, but when the heat is diminished, it becomes opaque, and assumes a milky colour. It attacks several earthy matters, particularly those of the siliceous kind, but cannot be employed on charcoal. 3. Crystallized borax, exposed to the flame urged by the blow-pipe or charcoal, first becomes opaque, white, and excessively swelled, with various protuberances, or branches proceeding out from it. When the water is expelled, it easily collects itself into a mass, which, when well fused, yields a transparent sphericle, retaining its transparency even after cooling. If calcined borax be employed, the clear sphericle is obtained the sooner. Having provided every thing necessary, the following directions, are next to be attended to.

1. A common tallow candle, not too thick, is generally preferable to a wax candle, or to a lamp. The snuff must not be cut too short, as the wick should bend towards the object. 2. The weaker exterior flame must first be directed upon the object, until its effects are discovered; after which the interior flame must be applied. 3. We must observe with attention whether the matter decrepitates, splits, swells, vegetates, boils, &c. 4. The piece exposed to the flame should scarcely ever exceed the size of a pepper-corn, but ought always to be large enough to be taken up by the forceps. 5. A small piece should be added separately to each of the fluxes; concerning which it must be observed whether it dissolves wholly or only in part; whether this is effected with or without effervescence, quickly or slowly; whether the mass is divided into a powder, or gradually and externally corroded; with what colour the glass is tinged, and whether it becomes opaque, or remains pellucid. Having given these directions, Mr. Bergman proceeds next to consider the subjects proper to be examined by the blowpipe. These he divides into four classes: 1. Saline; 2. Earthy; 3. Inflammable; and 4. Metallic. These subjects are treated at considerable length, in Mr. Bergman's writings, to which we refer the reader. Fixed alkalies, nitre, borax, tartar, and common salt, are the saline matters of which fluxes are generally composed. But the word flux is more particularly applied to mixtures of different proportions of only nitre and tartar; and these fluxes are called by particular names, according to the proportions of these ingredients, as in the following instances:

FLUX, WHITE, is made with equal parts of nitre and of tartar detonated together, by which they are alkalis. The residuum of this detonation is an alkali composed of the alkalies of the nitre and of the tartar, both which are absolutely of the same nature. As the proportion of nitre in this mixture is more than

is sufficient to consume entirely all the inflammable matter of the tartar, the alkali remaining after the detonation is perfectly white, and is therefore called white flux; and as this alkali is made very quickly, it is also called extemporaneous alkali. When a small quantity only of white flux is made, as a few ounces for instance, some nitre always remains undecomposed, and a little of the acid of the tartar, which gives a red, or even a black colour, to some part of the flux; but this does not happen when a large quantity of white flux is made, because then the heat is much greater. This small quantity of undecomposed nitre and tartar which remains in white flux is not hurtful in most of the metallic fusions in which this flux is employed: but if the flux is required perfectly pure, it might easily be disengaged from those extraneous matters by a long and strong calcination, without fusion.

FLUX, CRUDE. By crude flux is meant the mixture of nitre and tartar in any proportions, without detonation. Thus the mixture of equal parts of the two salts used in the preparation of the white flux, or the mixture of one part of nitre and two parts of tartar for the preparation of the black flux, are each of them a crude flux before detonation. It has also been called white flux, from its colour; but this might occasion it to be confounded with the white flux above described. The name, therefore, of crude flux is more convenient. Crude flux is detonated and alkalis during the reductions and fusions in which it is employed; and is then changed into white or black flux, according to the proportions of which it is composed. This detonation produces good effects in these fusions and reductions, if the swelling and extravasation of the detonating matters are guarded against. Accordingly, crude flux may be employed successfully in many operations; as, for instance, in the ordinary operation for procuring the regulus of antimony.

FLUX, BLACK. Black flux is produced from the mixture of two parts of tartar and one part of nitre detonated together. As the quantity of nitre which enters into the composition of this flux is not sufficient to consume all the inflammable matter of the tartar, the alkali which remains after the detonation contains much black matter, of the nature of coal, and is therefore called black flux. This flux is designedly so prepared, that it shall contain a certain quantity of inflammable matter; for it is thereby capable, not only of facilitating the fusion of metallic earths like the white flux, but also of reviving these metals. From this property it is also called reducing flux; the black flux, therefore, or crude flux made with such proportions of the ingredients as to be convertible into black flux, ought always to be used when it is required that metallic matters are at once to be fused and reduced. See FUSION.

FLUXIONS.

HISTORY OF FLUXIONS.

(1.) The doctrine of Fluxions comprehends the arithmetic and analysis of fluxions, and Fluents or flowing quantities. It consists of two principal parts, one called the direct, and the other the inverse method of fluxions; the first of these being the same in effect with the differential calculus, and the last the same with the integral calculus of the foreign mathematicians.

(2.) It has been a matter of much dispute among mathematicians, who was the first inventor of this method of calculation; and two of the most celebrated philosophers of the seventeenth century, have laid claim to the honour of the discovery, viz. Sir Isaac Newton, and Mr. Leibnitz. It appears however certain, that Sir Isaac Newton was the first inventor of the method of fluxions, that he had completed his discovery about the year 1669, and had made use of the method in his *Compendium of Analysis and Quadrature of Curves*, before that time. His attention seems even to have been directed to the subject before the year 1665. But it

was M. Leibnitz that first printed any thing relative to this branch of calculation; for in 1684, he gave the rules of the method in the *Leipsic Acts* of that year, but without demonstrations. These however were soon found out by the two brothers John and James Bernoulli, who applied the calculus with considerable success to a number of difficult problems.

(3.) In 1687, Sir Isaac Newton's *Principia* was published, a work which is almost wholly founded upon the same calculus. The common opinion then was, that Newton and Leibnitz had each invented it about the same time; and in confirmation of this opinion, it was observed, that neither of them made any mention of the other, and that though they agreed in the substance of the thing, yet they differed in their ways of conceiving it, calling it by different names, and using, each, a different notation. However, foreign mathematicians having first learned the method by means of M. Leibnitz's publication, became accustomed to look upon him as the sole, or principal inventor, and were ever after strongly prejudiced in favour of his notation, and mode of conceiving.

6 A

(4.) About

(4.) About the year 1699, Mr. Facio, in a Treatise on the Line of Swiftest Descent, declared that he was obliged to own Newton as the first inventor of the differential calculus, and the first by many years; and that he left the world to judge whether Leibnitz, the second inventor, had taken any thing from him. This precise distinction between the first and second inventor, with the suspicion it insinuated, raised a controversy between M. Leibnitz, supported by the editors of the Leipsic Acts, and the English mathematicians, who declared for Newton; but Sir Isaac himself never appeared on the scene. Writing succeeded each other, at first but slowly on either side, probably on account of the distance of places, but the controversy grew still hotter and hotter, till at length, in the year 1711, Mr. Leibnitz complained to the Royal Society, that Dr. Keil had accused him of publishing the method of fluxions invented by Sir Isaac Newton, under other names and characters. He insisted, that nobody knew better than Sir Isaac himself, that he had stolen nothing from him: and required that Dr. Keil should disavow the ill construction that might be put upon his words.

(5.) The society referred the matter to a committee, who, after due consideration, gave in their report as follows: "That M. Leibnitz was in London in 1673, and kept a correspondence with Mr. Collins, by means of Mr. Oldenburgh, till Sept. 1676, when he returned from Paris to Hanover, by way of London and Amsterdam: that it did not appear that M. Leibnitz knew any thing of the differential calculus before his letter of the 21st June, 1677, which was a year after a copy of a letter written by Newton in 1672, had been sent to Paris to be communicated to him, and above four years after Mr. Collins began to communicate that letter to his correspondents; in which the method of fluxions was sufficiently explained, to let a man of his sagacity into the whole matter; and that Sir Isaac Newton had even invented his method before the year 1669, and consequently 15 years before M. Leibnitz had given any thing on the subject in the Leipsic Acts." From which they concluded, that Dr. Keil had not at all injured M. Leibnitz in what he said.

(6.) It seems beyond doubt, that Newton was the first inventor, but some have been of opinion, that notwithstanding the decision given by the Royal Society, there are strong presumptions of M. Leibnitz having found the method for himself, without being previously acquainted with Newton's invention.

(7.) As the method of fluxions was invented by Sir Isaac Newton, so it was carried by him to a considerable degree of perfection, as may be seen in his Fluxions, and in his Quadrature of Curves. The same has been since farther prosecuted and improved by Maclaurin in his Treatise of Fluxions; by D'Alembert in the Memoires de l'Acad. de Berlin; by Euler in his various writings, as well as his Institutio Calculi Integralis; by Cotes in his Harmonia Mensurarum; by Walmesley in his Analyse des Mesures des Rapports et des Angles, &c. and by different authors, both of this and other countries, as Emerson, Simpson, Landen, Waring, Vince, &c. also, L'Hopital, the Bernoullis, Herman, Riccati, La Grange, Cousin, and many others.

DEFINITIONS, PRINCIPLES, AND NOTATION OF FLUXIONS.

(8.) In the method of fluxions, magnitudes or quantities of every kind, are considered as generated by continued motion, by means of which they increase or decrease; as a line by the motion of a point, a surface by the motion of a line, a solid by the motion of a surface, and an angle by the rotation of one of the lines which contain it: the flux of time being supposed to be always uniform; and since all quantities, when we consider their magnitude only, without regarding their position, figure, and other affections, may be represented by lines, it follows, that quantities of every kind may be considered as generated by motion.

(9.) Any variable quantity thus generated, is called a *Fluent* or *Flowing Quantity*; and the rate, or proportion, according to which any flowing quantity increases at any position or instant, is the *fluxion* of that quantity, at that position or instant. This rate of increase is proportional to the magnitude by which the flowing quantity would be uniformly increased in a given time with the generating celerity continued during that time, which magnitude may therefore be taken as a measure of the fluxion of the variable quantity.

(10.) To illustrate these definitions, suppose a point m , Plate

LXXII, fig. 1; be conceived to move from the position A, and to generate a line AP, by a motion any how regulated; and suppose the celerity of the point m , at any position P, to be such, as would, if from thence it should become, or continue uniform, be sufficient to cause the point to pass uniformly over, the distance Pp in the time allowed for the fluxion, then will the said line Pp represent the fluxion of the fluent or flowing line AP at that position.

(11.) Again, suppose the right line mn , fig. 2, to move, from the position AB, continually parallel to itself with any continued motion, so as to generate the fluent or flowing rectangle ABQP, whilst the point m describes the line AP; also let the distance Pp be taken, as before, to represent the fluxion of the line, or base AP, and complete the rectangle PQqp; then, like as Pp is the fluxion of the line AP, so is Pq the fluxion or flowing parallelogram AQ; for if the line Pp be supposed to be generated with an uniform celerity, in a given time, the parallelogram Pq will also be generated with an uniform celerity in the same time.

(12.) In like manner, if the solid AERP, fig. 3, be conceived to be generated by the plane PQR moving, from the position ABE, always parallel to itself, along the line AD, and if Pp denote the fluxion of the line AP; then, like as the rectangle PQqp expresses the fluxion of the flowing rectangle ABQP, so also shall the fluxion of the variable solid, or prism ABERQP, be expressed by the prism PQRrqp. And in both these last two cases, it appears that the fluxion of the generated rectangle, or prism, is equal to the product of the generating line, or plane, drawn into the fluxion of the line along which it moves.

(13.) Hitherto the generating line or plane has been considered as of a constant or invariable magnitude; in which case the fluent, or quantity generated, is a rectangle or a prism, the former being described by the motion of a line, and the latter by the motion of a plane. So in like manner are other figures, whether plane or solid, conceived to be described by the motion of a variable magnitude, whether it be a line or a plane. Thus, let a variable line PQ, fig. 4, 5, and 6, be carried with a parallel motion along the line AP, so that while the point P generates the line AP, the line PQ may generate the area APQ; by this means the point Q will generate the line AQ, which will be a straight line when PQ as well as AP, flows uniformly, otherwise it will be a curve. Here therefore, there are several fluents or flowing quantities, namely, the absciss or base AP, the perpendicular or ordinate PQ, the area APQ, and the straight line or curve AQ.

(14.) In order to exhibit the fluxions of these quantities: let Pp, as before, be the fluxion of the base, complete the rectangle PQRp, this rectangle will be the measure of the fluxion of the curvilinear area APQ. For if the generating line were supposed to become invariable at the position PQ, it is evident that while the line Pp was described by the point P with an uniform celerity, the parallelogram Pp would also be generated by the line PQ uniformly, and with the very celerity with which the area APQ was increasing at the position PQ. Next suppose that the variable line PQ increases uniformly, after leaving the position PQ, with the very degree of celerity of increase it had when in that position; it is evident that the point Q will now describe a straight line Qq, which, as in fig. 5 and 6, will be a tangent to the curve at Q, this line will also be generated with an uniform celerity, viz. the very celerity with which the generating point was moving in the curve at the position Q. Hence it appears, that as Pp is the measure of the fluxion of the base, or absciss AP, and Pp of the fluxion of the area APQ, so is the line r q, the measure of the fluxion of the ordinate, or generating line PQ, and Qq the measure of the fluxion of the curve line AQ.

(15.) In the doctrine of fluxions, the initial letters of the alphabet, a, b, c, d , &c. are commonly used to denote constant or invariable quantities; and the last letters z, y, x, w , &c. to denote variable or flowing quantities. Thus, the variable line AP, fig. 3, may be represented by x , and the constant line PQ by a ; also, in fig. 5 and 6, the variable absciss AP may be represented by x , the ordinate PQ by y , and the curve line AQ by z .

(16.) The fluxion of a variable quantity denoted by a single letter is represented by the same letter with a point over it. Thus, the fluxion of x is represented by $\dot{x}$, the fluxion of y by $\dot{y}$, &c. therefore in fig. 5, the line Pp or Qr will be represented by $\dot{x}$, the line r q by $\dot{y}$, and Qq by $\dot{z}$. For these fluxions are as their measures

measures, and therefore may be used instead of them. When the fluxion of a quantity is itself variable its fluxion is called the second fluxion of the first quantity, and is denoted by two dots over it; if the second fluxion be variable, its fluxion is the third fluxion and is denoted by three dots over it, &c. $\dot{x}, \ddot{x}, \dddot{x}$, &c. represent the first, second, third, fourth, &c. fluxion of x . The higher orders of fluxions may be illustrated by fig. 4, 5, and 6; where if x denote AP and y , PQ, and if PQ flow along AP uniformly, the fluxion of the absciss AP or $\dot{x}$ is constant, or always the same, or $\dot{x} = 0$, in all the figures, if AQ be a right line, as in fig. 4, then $\dot{y} = r q$, is also constant, for the angle $q Q r =$ the angle A being constant, and the angle $Q r q$, a right angle, also $Q r$, constant, $r q$ is always the same, or $\dot{y} = 0$. But in fig. 5, $r q$, or $\dot{y}$ continually increases; and in fig. 6, decreases more and more, hence in both cases y has a second fluxion, which is positive in fig. 5, and negative in fig. 6.

TO FIND THE FLUXIONS OF FLOWING QUANTITIES, CALLED THE DIRECT METHOD.

(17.) If a variable quantity x be multiplied by a constant quantity a , the fluxion will be $a\dot{x}$. For if x increase uniformly, $a x$ will increase uniformly, and a times as fast, hence the fluxion will be $a\dot{x}$, and thus in all cases the constant multiplier must be retained.

(18.) The fluxion is not altered when a constant quantity is connected to the variable one by the sign plus or minus; thus the fluxion of $x \pm a$ is $\dot{x}$. For since a is constant and only to be added or subtracted, it does not affect the increase or decrease of x .

(19.) The fluxion of the product of two variable quantities, as xy , is the sum of the products of each into the fluxion of the other, as $x\dot{y} + y\dot{x}$. Let AP, fig. 7, be x , and PQ = y ; then BP = xy is the flowing or variable rectangle, and let AD so move on AC, and AC on AD, that the intersection Q may describe the curve AQ, and let Pp represent the fluxion of AP, and Bb of AB or PQ, then $x\dot{y}$ is the fluxion of the trilinear space ABQ, and $y\dot{x}$ that of the space AQP, therefore $x\dot{y} + y\dot{x}$ is the fluxion of the whole rectangle PB, by art. 14. Otherwise. Let the factors of the product x and y , by flowing become $x + \dot{x}$, and $y + \dot{y}$, then the new or contemporaneous value of the flowing product will by multiplication be found equal to $xy + x\dot{y} + y\dot{x} + \dot{x}\dot{y}$; and subtracting the original product xy , the remainder $x\dot{y} + y\dot{x} + \dot{x}\dot{y}$ will be the increment of the product generated in the same time as $\dot{x}$ or $\dot{y}$; but this increment is not uniformly generated, for the part of it denoted by $\dot{x}\dot{y}$ arises from an increase added to that by which the product is uniformly augmented, as may be thus shewn. Let some part as half of the time be taken, then the quantities are

$x + \frac{\dot{x}}{2}$ and $y + \frac{\dot{y}}{2}$, and, as above, the increment of the product

in the same time will be found $\frac{x\dot{y}}{2} + \frac{y\dot{x}}{2} + \frac{\dot{x}\dot{y}}{4}$; in $\frac{1}{4}$ of the time

it is $\frac{x\dot{y}}{4} + \frac{y\dot{x}}{4} + \frac{\dot{x}\dot{y}}{16}$, in $\frac{1}{8}$ it is $\frac{x\dot{y}}{8} + \frac{y\dot{x}}{8} + \frac{\dot{x}\dot{y}}{64}$ &c. Hence it is evident that the part of the increment $x\dot{y} + y\dot{x} + \dot{x}\dot{y}$ has arisen from an uniform increase, and the part $\dot{x}\dot{y}$ has wholly proceeded from an augmentation to that increase, for it continually rises from 0 to $\dot{x}\dot{y}$ in a duplicate ratio; hence had there not been an accelerated increase, the quantity $\dot{x}\dot{y}$ would not have been generated; therefore if we write the fluxions $\dot{y}$ and $\dot{x}$ instead of their measures y and x , we have $x\dot{y} + y\dot{x}$ for the fluxion of xy .

(20.) By means of the above, the fluxions of the continued product of any number of flowing quantities may be found as of xyz , $wxyz$, &c. Put $v = xyz$, and $w = xy$, then $v = wz$, and $\dot{v} = \dot{w}z + w\dot{z}$; and $\dot{w} = \dot{x}y + x\dot{y}$ (art. 19.); and by substituting the values of w and $\dot{w}$, we have $\dot{v} = x\dot{y}z + y\dot{x}z + \dot{x}\dot{y}z$; and in a similar manner the fluxion of $wxyz$ will be found equal to $w\dot{x}y + \dot{w}xy + x\dot{w}y + \dot{x}\dot{w}y$; and thus for any number of factors.

(21.) The fluxion of a fraction $\frac{x}{y}$ is easily determined from that

of a product. Put $\frac{x}{y} = v$, then $x = vy$, and $\dot{x} = v\dot{y} + y\dot{v}$

and $y\dot{v} = \dot{x} - x\dot{y}$, and $\dot{v} = \frac{\dot{x} - x\dot{y}}{y}$, and by substituting the value of v , we have $\dot{v} = \frac{\dot{x} - x\dot{y}}{y} = \frac{\dot{x}}{y} - \frac{x\dot{y}}{y^2}$, the fluxion of $\frac{x}{y}$.

(22.) From art. 19, and 20, the fluxion of the powers of flowing quantities are also determined, for if x and y (art. 19,) be equal, then the product xy becomes x^2 and the fluxion $x\dot{y} + y\dot{x}$ becomes $x\dot{x} + x\dot{x} = 2x\dot{x}$, and thus the fluxion of xyz (art. 20,) is equal to $3x^2\dot{x}$ when each of the factors is equal to x . And in general the fluxion of x^n by the same article is evidently equal to $x^{n-1}\dot{x}$ repeated as often as there are units in n , that is equal to $n x^{n-1} \dot{x}$.

(23.) Hence the fluxion is found when the index is a fraction as of $x^{\frac{n}{m}}$, which put equal y , then $y^m = x^n$, and in fluxions $m y^{m-1} \dot{y} = n x^{n-1} \dot{x}$, and $\dot{y} = \frac{n x^{n-1} \dot{x}}{m y^{m-1}}$ (by substituting the value

of y) $\frac{n x^{n-1} \dot{x}}{m x^{\frac{n}{m}-1}} = \frac{n}{m} x^{\frac{n}{m}} \dot{x}$

(24.) In like manner is the fluxion obtained when the index is negative, as of $x^{-n} = \frac{1}{x^n}$, which put equal y , then is $y x^n = 1$,

and in fluxions $x^n \dot{y} + y n x^{n-1} \dot{x} = 0$, and $\dot{y} = -\frac{y n x^{n-1} \dot{x}}{x^n} = -\frac{y n \dot{x}}{x} =$ (by substituting the value of y) $-\frac{n \dot{x}}{x^{n+1}} = -\frac{n}{x^{n+1}} \dot{x}$.

(25.) The fluxion of the hyperbolic logarithm of any quantity x is equal to $\frac{\dot{x}}{x}$, that is the fluxion of the quantity divided by the quantity itself. Let L be the principal vertex of an hyperbola LV, Plate LXXII. fig. 8, OR and OS the asymptotes, and OA = AL = 1, the parameter, and PM an ordinate parallel to AL. Then from the nature of the hyperbola and of logarithms, the space ALMP is known to be the hyperbolic logarithm of OP; put OP = x , and PM = y , then the fluxion of the space ALMP is equal $y +$ the fluxion of AP, or of $x - 1 = y \dot{x}$, (art. 14, and 18,) = the fluxion of the logarithm of x : but from the nature of the curve OA + AL = OP + PM; hence $1 = xy$, and $y = \frac{1}{x}$, therefore

$y \dot{x} = \frac{\dot{x}}{x}$ = the fluxion of the hyperbolic logarithm of x .

(26.) Let m be the modulus of any other system of logarithms, and let x be the hyperbolic logarithm of any quantity x , then it is well known that $m x$ is the logarithm of x in the proposed system;

but the fluxion of $m x$ is equal to $m \dot{x}$, (art. 17,) and $\dot{x} = \frac{\dot{m x}}{m}$, (art.

25,) hence $m \dot{x} = \frac{m \dot{x}}{m}$, hence the fluxion of the logarithm of any quantity in any system of logarithms is equal to the fluxion of that quantity multiplied by the modulus of the system, and divided by the quantity itself.

(27.) By means of logarithms the fluxions of exponential quantities

ties are found, as of y^x which put equal to z , then by the properties of logarithms the $\log. z = x \times \log. y$, hence by taking the

$$\text{fluxions } \frac{\dot{z}}{z} = x \times \log. y + x \times \frac{\dot{y}}{y} \quad (\text{art. 25, and 19,}) \text{ therefore } \dot{z} = z \times \log. y + \frac{z x \dot{y}}{y} = (\text{by puling } y^x \text{ for its equal } z) y^x \dot{x} \times \frac{z}{y}$$

$\log. y + x y^{x-1} \dot{y}$ = the fluxion of the exponential y^x ; which consists of two terms, and it is evident that if either of the quantities x or y be constant, the term into which its fluxion enters will vanish, the fluxion being equal to nothing: hence when the root y is constant, the fluxion of the exponential quantity y^x is equal $\dot{y}^x \times \log. y$. If x be constant it ceases to be an exponential, and the fluxion is $x y^{x-1} \dot{y}$ as in articles 22, 23, and 24.

(28.) The second fluxion is derived from the first, and the third from the second &c. in the same manner as the first from the flowing quantity. Thus the fluxion of x^3 is $3 x^2 \dot{x}$; (art. 22,) its second fluxion is $6 x \ddot{x} + 3 x^2 \ddot{x}$, (art. 19, and 22,) &c. If $\ddot{x}$ be constant, $\ddot{x} = 0$, and the second fluxion of x^3 is $6 x \ddot{x}$.

(29.) In the foregoing articles, it has been supposed that the fluents increase, and that their fluxions are therefore positive; but when it happens that the fluents decrease, then the fluxions are negative and must be written with a contrary sign to that determined by those articles; thus if in the product $x y$, y decrease while x increases, the fluxion of y is $-\dot{y}$ and the fluxion of the product is $y \dot{x} - x \dot{y}$.

(30.) From what has been advanced we may easily collect the following practical rules for finding the fluxions of quantities.

1st. *For the fluxion of any power or root of a flowing quantity.* Multiply by the index and by the fluxion of the root, and diminish the index by unity, (art. 22, 23, 24.)

2nd. *For the fluxion of a product.* Multiply the fluxion of each quantity by the product of all the rest, and connect them by their proper signs, (art. 19, 20.)

3rd. *For the fluxion of a fraction.* From the fluxion of the numerator multiplied into the denominator, subtract the fluxion of the denominator multiplied into the numerator, and divide by the square of the denominator, (art. 21.)

4th. *For the fluxion of a logarithm.* Divide the fluxion of the quantity by the quantity itself, and multiply the result into the modulus of the system of logarithms, (art. 25, 26.)

5th. *For the fluxion of an exponential quantity.* Multiply the given quantity into the fluxion of its exponent and into the hyp. log. of the root, and add the fluxion of the given quantity, found by the first rule, as if the root only were variable. The last part vanishes, and therefore need not be found when the root is constant, (art. 27.)

6th. In complex cases the preceding rules are to be used jointly. Or the following general rule will be found useful when there are several variable quantities. Take the fluxion of the given quantity as often as there are variable letters or symbols in it, supposing first only one of them variable, and the rest constant; then another variable, and the rest constant; and so on till each has been considered as variable, and connect all these fluxions by their proper signs.

Note. When the given quantity consists of several terms, find the fluxion of each term separately, and connect them all together by their proper signs. The following example is added to illustrate the rules, particularly the sixth.

Examp. To find the fluxion of $\frac{2 a x^3 y^3}{z} + \text{hyp. log. } x z - c y z^x$, where x, y and z are flowing quantities. Proceeding as directed in the first part of rule 6, the fluxion will stand thus;

$$\frac{4 a x^3 y \dot{y} + 6 a y^3 x^2 \dot{x} \times z - 2 a x^3 y^3 \dot{z}}{z^2} + \frac{x \dot{z} + z \dot{x}}{x z} - c z^x \dot{y} -$$

$(z^x \times \text{hyp. log. } z + x z^{x-1} \dot{z}) \times c y$. Or, proceeding according to the latter part of the 6th rule it will stand as follows, viz.

$$\frac{4 a x^3 y \dot{y}}{z^2} + \frac{6 a y^3 x^2 \dot{x}}{z} + \frac{2 a x^3 y^3 \dot{z}}{z^2} + \frac{\dot{z}}{z} + \frac{\dot{x}}{x} - c z^x \dot{y} - c y z^x \dot{z}$$

$\times \text{hyp. log. } z - c x y z^{x-1} \dot{z}$, which is the same as the foregoing. The second, third, &c. fluxions are found by the same rules (art. 28.)

Thus the fluxion of x^3 is $3 x^2 \dot{x}$; its second, $6 x \ddot{x} + 3 x^2 \ddot{x}$; and so on: but if $\ddot{x}$ be invariable, $\ddot{x} = 0$, and the second fluxion of $x^3 = 6 x \ddot{x}$.

PROB. I. TO DETERMINE MAXIMA and MINIMA.

(31.) When a quantity increases, its fluxion is positive; when it decreases, it is negative; therefore when it is just betwixt increasing and decreasing, its fluxion is $= 0$.

Rule. Find the fluxion, make it $= 0$, whence an equation will result giving an answer to the question.

(32.) *Examp. 1.* To determine the dimensions of a cylindric measure ABCD, fig. 9, open at the top, which shall contain a given quantity under the least internal superficies possible.

Let the diameter AB $= x$, the altitude AC $= y$, the given quantity, or content $= c$, and $\frac{1}{4}$ of the circumference of a circle whose diameter is unity $= p = .78539$, &c. Then $p x^2 y = c$, and

$$4 p x y = \frac{4 c}{x}, \text{ but } 4 p x y = \text{the concave superficies, therefore}$$

$$\frac{4 c}{x} + p x^2 = \text{the whole internal superficies, which is to be a mi-}$$

$$\text{nimum, therefore, its fluxion } - \frac{4 c \dot{x}}{x^2} + 2 p x \dot{x} = 0, \text{ hence } p x^3$$

$$= 2 c, \text{ and } x = \sqrt[3]{\frac{2 c}{p}}. \text{ Since } p x^3 = 2 c, \text{ and } p x^2 y = c, p x^2 y$$

$$= 2 p x^2 y, \text{ and } x = 2 y; \text{ whence } y \text{ is also known, and the dia-}$$

meter of the base must be just double the altitude.

Examp. 2. Let ABC represent a cone, AC the diameter of the base; to inscribe in it the greatest cylinder DFGI, fig. 16.

Put $p = .78539$, &c., then since AC $= a$. BH $= b$. BE

$$= x, \frac{p a^2 x^2}{b^2} = \text{the area of the end D E F of the cylinder; hence,}$$

$$\text{the content of the cylinder} = \frac{p a^2 x^2}{b^2} \times \overline{b-x} = \text{max. or } x^2 \times$$

$$\overline{b-x} = b x^2 - x^3 = \text{max. } \therefore 2 b x \dot{x} - 3 x^2 \dot{x} = 0; \text{ hence, } x =$$

$$\frac{2}{3} b; \text{ therefore } E H = \frac{1}{3} b.$$

Examp. 3. Given $x + y + z = a$, and $x y^2 z^3$ a maximum, to find x, y , and z .

As x, y, z , must have some certain determinate values to answer these conditions, let us suppose such a value of y to remain constant, whilst x and z vary till they answer the conditions, and then $\dot{x} + \dot{z} = 0$, and $z^3 \dot{x} + 3 x z^2 \dot{z} = 0$; hence, $\dot{x} = -\dot{z} = -$

$$\frac{3 x z^2 \dot{z}}{z^3} = -\frac{\dot{z}}{z}, \therefore z = 3 x. \text{ Now let us suppose the value of}$$

z to remain constant, and x and y to vary, so as to satisfy the conditions; then $\dot{x} + \dot{y} = 0$, $y^2 \dot{x} + 2 x y \dot{y} = 0$; hence, $\dot{x} = -\dot{y} = -$

$$\frac{2 x y \dot{y}}{y^2} = -\frac{\dot{y}}{y}, \therefore y = 2 x; \text{ substitute in the given equa-}$$

$$\text{tion these values of } y \text{ and } z \text{ in terms of } x, \text{ and } x + 2x + 3x = a, \text{ or}$$

$$6 x = a; \text{ hence, } x = \frac{1}{6} a; \therefore y = \frac{1}{3} a; z = \frac{1}{2} a. \text{ In like man-}$$

ner, whatever be the number of unknown quantities, make any one of them variable with each of the rest, and the values of each in terms of that one quantity will be obtained; and by substituting the values of each in terms of that one, in the given equation, you will get the value of that quantity, and hence the values of the others.

(33.) Fig. 10. To find the longest and shortest ordinates of any curve, DEF, whose equation is known.

Make AC the abscissa = x , and CE the ordinate = y ; take by means of the equation of the curve a value of y in terms of x , and find its fluxion; which making = 0, an equation will result whose roots give the value of x when y is a maximum or minimum.

(34.) To determine when it is a maximum and when a minimum, take the value of y , when x is a little more than the root of the equation so found, and it may be perceived whether it increases or decreases.

PROB. II. TO DRAW A TANGENT TO ANY CURVE.

(35.) If TQ q be a tangent at Q to the curve AB, fig. 5, and 6, and P p or Q r the fluxion of the absciss, then $r q$ is the fluxion of the ordinate P Q, and since the triangles Q $r q$ and TPQ are similar, $r q : r Q :: Q P : P T$; hence we have this

Rule. As the fluxion of the ordinate in terms of the absciss, is to the fluxion of the absciss, so is the ordinate, to the subtangent PT, and from T thus found, and through Q, the tangent is to be drawn.

Examp. To draw a right line CT, fig. 11, to touch a given circle BCA in a point C.

Let CS be perpendicular to the diameter AB, and put AO = OB = a , BS = x , and SC = y : then, by the property of the

$$\text{circle, } y = \sqrt{2ax - x^2}, \text{ and } \dot{y} = \frac{a\dot{x} - x\dot{x}}{\sqrt{2ax - x^2}} : \dot{x} :: \sqrt{2ax - x^2}$$

$2ax - x^2$
: $\frac{a - x}{\sqrt{2ax - x^2}}$ = ST, the subtangent; which we also know from other principles.

PROB. III. TO DETERMINE POINTS OF CONTRARY FLEXURE IN CURVES.

(36.) Fig. 10. Supposing CE to move uniformly from A to B, the curve DEF will be convex towards AB when the fluxion of the ordinate increases, and concave when it decreases (art. 16.); therefore at the point where it ceases to be convex and begins to be concave, CE will have no second fluxion. And from this it is evident, that if we suppose the ordinate CE to increase uniformly, or its fluxion to be constant, the curve will be convex while the fluxion of the absciss decreases, and concave while it increases; hence, in the point of inflexion, the second fluxion of the absciss will vanish; therefore, we have this

Rule. Find the second fluxion of either the ordinate or absciss, supposing the fluxion of the other constant, and put it = 0, then from this equation, and the equation of the curve, the value of the absciss is determined.

Examp. 1. Let the nature of the curve be defined by the equation, $a x^2 = a^2 y + x^2 y$, then $y = \frac{a x^2}{a^2 + x^2}$, and $\dot{y} = 2 a \dot{x} \times$

$$\frac{x}{(a^2 + x^2)^2} : \text{hence, since } \dot{x} \text{ is constant, } \dot{y} = 2 a \dot{x} \times \frac{a^2 - 3x^2}{(a^2 + x^2)^3} = 0; \text{ therefore } 3x^2 = a^2, \text{ and } x = a \sqrt{\frac{1}{3}} = AF; \text{ from which we}$$

$$\text{determine FG or } y = \frac{a x^2}{a^2 + x^2} = \frac{\frac{1}{3} a^3}{a^2 + \frac{1}{3} a^2} = \frac{1}{4} a.$$

Examp. 2. To find the point of inflexion or contrary flexure in the conchoid of Nicomedes, fig. 12, putting AB = x , and BC = y , also AG = b , and AP = a , then the equation of the curve

$$\text{is } x = \frac{a+y}{y} \times \sqrt{b^2 - y^2}; \text{ hence } \dot{x} = \dot{y} \times \left(-\frac{a}{y^2} \times \sqrt{b^2 - y^2} - \frac{a+y}{y^2} \right), \text{ and considering } \dot{y} \text{ constant, } \dot{x} = y^3 \dot{y}^2 \sqrt{b^2 - y^2} \times$$

$$\left(2a \times \frac{b^2 - y^2}{b^2 - y^2} + a y^2 - y^3 - \frac{a y^4 + y^5}{(b^2 - y^2)} \right) = 0, \text{ or } y^3 + 3a y^2 =$$

$$2ab^2, \text{ from which } y \text{ and } x \text{ are easily found. If } \dot{x} \text{ had been considered constant, we should have had } \dot{y} = -\dot{x} \times \frac{y^2 \sqrt{b^2 - y^2}}{ab^2 + y^3}$$

$$\text{hence } \dot{y} = -\frac{\dot{x} y \sqrt{b^2 - y^2}}{(ab^2 + y^3)^2} \times \frac{(2b^2 - 3y^2) \times ab^2 + y^3 - 3b^2 y^4 + 3y^5}{(ab^2 + y^3)^2} = 0, \text{ from which } y^3 + 3a y^2 = 2ab^2 \text{ as before.}$$

PROB. IV. TO FIND THE RADII OF CURVATURE.

(37.) The curvature of a circle is uniform in every point, that of every other curve continually varying: and it is measured at any point by that of a circle whose radius is of such a length that the circle shall coincide with it in curvature in that point.

Thus if the circle SQD, and curve AQB, (fig. 13,) have the same curvature at the point Q, and CQ be the radius of the circle, it will also be the radius of curvature of the curve at Q, and if the curve be generated by the evolution of a line from the curve ICE, so that the radius of curvature CQ is always equal to the part CIA, then is the curve ICE called the evolute, of which the curve AQB is the involute.

Draw the diameter SD parallel to the absciss AP, draw the ordinate QPF, and the tangent TQ q , also draw Q r parallel to AP or SF, and $r q$ parallel to QP, and put AP = x , PQ = y , and QC = r , = radius of curvature. Now, since the curves SQD, AQB, have the same curvature at Q, they have a common tangent TQ q , at right angles to QC; hence they have the same fluxion $\dot{x}$ measured by Q q , also the fluxions of their abscisses and ordinates are the same; that is $\dot{x}$ and $\dot{y}$ measured by Q r , and $r q$ are also the fluxions of SF and FQ, but from the similar

$$\text{triangles Q } r q \text{ and QCF, } QF = \frac{r \dot{x}}{\dot{z}}, \text{ and } FC = \frac{r \dot{y}}{\dot{z}}, \text{ or}$$

$$SF = r - \frac{r \dot{y}}{\dot{z}}; \text{ therefore taking the fluxions, } r \dot{\dot{x}} - r \dot{\dot{z}} =$$

$$\dot{z}^2 \dot{y}, \text{ and } -r \dot{\dot{y}} \dot{z} + r \dot{y} \dot{\dot{z}} = \dot{z}^2 \dot{x}, \text{ hence } \dot{\dot{z}} = \frac{r \dot{\dot{x}} - \dot{z}^2 \dot{y}}{\dot{z}^2} = \frac{r \dot{\dot{x}} + \dot{z}^2 \dot{x}}{\dot{z}^2},$$

$$\text{or, } r \dot{\dot{x}} - \dot{z}^2 \dot{y} = r \dot{y} \dot{\dot{z}} + \dot{z}^2 \dot{x}, \text{ or, } QC = r = \frac{\dot{z}^2 + \dot{y}^2 \times \dot{z}}{\dot{x} \dot{y} - \dot{y} \dot{x}}$$

Any of the quantities $\dot{x}$, $\dot{y}$, or $\dot{z}$ may be supposed

constant, if $\dot{x}$ be constant, or $\dot{x} = 0$, it will become $\frac{\dot{z}^2}{-\dot{x} \dot{y}}$, if $\dot{y}$

be constant, or $\dot{y} = 0$, it will be $\frac{\dot{z}^2}{\dot{y} \dot{x}}$, and if $\dot{z}$ be constant it will

be $\frac{\dot{z} \dot{y}}{\dot{x}}$ = QC, for $\dot{x}^2 + \dot{y}^2 = \dot{z}^2$, and by taking the fluxions

$$2\dot{x} \dot{\dot{x}} + 2\dot{y} \dot{\dot{y}} = 0, \text{ or, } \dot{\dot{y}} = -\frac{\dot{x} \dot{\dot{x}}}{\dot{y}}, \text{ and } QC = \frac{\dot{z}^2}{\dot{y} \dot{x} - \dot{y} \dot{x}} =$$

$$\frac{\dot{z}^2}{\dot{y} \dot{x} + \frac{\dot{x} \dot{\dot{x}}}{\dot{y}} \times \dot{z}} = \frac{\dot{y} \dot{z}^2}{\dot{y}^2 + \dot{x}^2 \times \dot{z}} = \frac{\dot{y} \dot{z}^2}{\dot{z}^2} = \dot{y}$$

From these several values of the radius of curvature QC, here found, the corresponding values of AK and KC, will be obtained, by means of the equations above.

$$\text{Thus AK} = AP + FC = x + \frac{r \dot{y}}{\dot{z}} = x + \frac{\dot{z}^2 \dot{y}}{\dot{y} \dot{x} - \dot{y} \dot{x}}, \text{ and KC}$$

$$= QF - QP = \frac{r \dot{x}}{\dot{z}} - y = \frac{\dot{z}^2 \dot{x}}{\dot{y} \dot{x} - \dot{y} \dot{x}} - y. \text{ Hence if } \dot{x} \text{ be con-}$$

$$\text{stant, AK} = x + \frac{\dot{z}^2 \dot{y}}{-\dot{x} \dot{y}}, \text{ and KC} = \frac{\dot{z}^2}{-\dot{y}} - y. \text{ If } \dot{y} \text{ be constant,}$$

$$AK = x + \frac{\dot{z}^2}{\dot{y} \dot{x}}, \text{ and KC} = \frac{\dot{z}^2}{\dot{y} \dot{x}} - y. \text{ Lastly, if } \dot{z} \text{ be constant,}$$

then, r being $\frac{\dot{y}z}{x}$, $AK = x + \frac{\dot{y}z}{x}$, and $KC = \frac{\dot{y}z}{x} - y$.

And these expressions will serve as so many theorems for determining the curvature, and the evolutes of given curves.

Examp. To find the radius of curvature, and the evolute of the common cycloid.

Let AQB, (fig. 14.) be the given curve, and ACH its evolute, and let QD and EC be parallel, and QF and KC perpendicular to AG; put $AQB = a (= 2BG)$, $AQ = z$, $AP = x$, and $QP = y$. And by the property of the curve $AB^2 : BQ^2 :: BG : BD$, or

$$y = \frac{2az - z^2}{2a}; \text{ therefore } \dot{y} = \frac{a - z}{a}, \quad \dot{z}^2 - \dot{y}^2 = \dot{x}^2 =$$

$$\frac{2az - z^2 \times \dot{z}^2}{a^2}, \text{ and } \dot{x} = \frac{\dot{z}\sqrt{2az - z^2}}{a}. \text{ And making } \dot{z} \text{ constant}$$

$$\dot{x} = \frac{\dot{z}^2 \times \overline{a - z}}{a\sqrt{2az - z^2}}; \text{ hence } QC = \frac{\dot{y}z}{\dot{x}} = \sqrt{2az - z^2}, \text{ and } KC$$

$$\text{or } AE = \frac{\dot{y}z}{\dot{x}} - y = \frac{2az - z^2}{2a}, \text{ which when } z = a, \text{ or } QCH$$

coincides with BH, $ACH = BH = a$, and hence $GH = \frac{1}{2}a$, therefore because $AH^2 (a^2) : AC^2 (2az - z^2) :: AO (\frac{1}{2}a) : AE (\frac{2az - z^2}{2a})$ which is the property of the cycloid, the evolute ACH is also a cycloid, equal and similar to the involute AQB.

PROB. V. TO DEMONSTRATE THE BINOMIAL THEOREM.

(38.) It is well known, that by the continual multiplication of $1 + x$, a series is produced with all the powers of x regularly ascending; the first term being 1, and that the coefficients are not affected by the value of x , so that if x be made to vanish, they are unaltered: let $(1 + x)^n = 1 + ax + bx^2 + cx^3 + dx^4 + \&c.$ Now, to determine the values of $a, b, c, d, \&c.$ take the fluxion of both sides of this equation, omitting x , which is found in every term; then take the fluxion of the resulting equation, and so on continually, whence the following equations:

$$n \times (1 + x)^{n-1} = a + 2bx + 3cx^2 + 4dx^3 + \&c.$$

$$n \times n-1 \times (1 + x)^{n-2} = 2b + 2.3cx + 3.4dx^2 + \&c.$$

$$n \times n-1 \times n-2 \times (1 + x)^{n-3} = 2.3c + 2.3.4dx + \&c.$$

Now make $x = 0$, and from the first equation, $n = a$; from the second, $n.n-1 = 2b$; from the third $\frac{n.n-1.n-2}{n-1} = 2.3c$, &c, hence $a = n$; $b = n \cdot \frac{n-1}{2}$, $c = n \cdot \frac{n-1}{2} \cdot \frac{n-2}{3}$, &c.

$$\text{Hence } (1 + x)^n = 1 + nx + n \cdot \frac{n-1}{2} x^2 + n \cdot \frac{n-1}{2} \cdot \frac{n-2}{3} x^3 + \&c.$$

$x^3 + \&c.$ which investigation holds whether n be a whole number or fraction, positive or negative. It is evident, that if x be negative, the odd powers in the series will be negative. See ALGEBRA.

THE INVERSE METHOD, OR THE FINDING OF FLUENTS.

(39.) The fluxion of any flowing quantity may be easily found in all cases; but it is difficult to find the fluents of many given fluxions, and frequently it cannot be done at all, except by means of the quadrature or rectification of curve lines, or by logarithms or by infinite series; for, as there is no method for deducing the fluent from the fluxion a priori, by a direct investigation; therefore we can only lay down rules for those particular forms of fluxions

that we know, from the direct method, belonging to such kinds of flowing quantities.

1. To find the fluent of any simple fluxion, you need only write the letters without the dots over them: thus, the fluent of $\dot{x}$ is x , and that of $a\dot{x} + b\dot{y}$, is $ax + by$.

2. To assign the fluent of any power of a variable quantity, multiplied by the fluxion of the root; first divide by the fluxion of the root, add unity to the exponent of the power, and divide by the exponent so increased: for dividing the fluxion $n\dot{x}^{n-1}$ by $\dot{x}$ it becomes $n\dot{x}^{n-1}$; and adding 1 to the exponent $(n-1)$ we have $n\dot{x}^n$; which, divided by n , gives $\dot{x}^n$, the fluent of $n\dot{x}^{n-1}$. Hence, by the same rule, the fluent of $2x^5\dot{x}$ is $\frac{2}{6}x^6$; that of $\frac{a+z}{4}\dot{z}$ is $\frac{a+z}{4}$; and that of $a^m + z^m$ is $\frac{a^m + z^m}{m+1}$.

When the root under a vinculum is a compound quantity, and the index of the part or factor without the vinculum, increased by 1, is some multiple of that under the vinculum, put a single variable letter for the compound root, and substitute its powers and fluxion instead of those of the same value, in the given quantity, so will it be reduced to a more simple form, to which the preceding rule can then be applied. Let $a^2 + x^2$ be proposed, put $z = a^2 + x^2$, then $\dot{z} = 2x\dot{x}$, and

hence $x^2\dot{x} = \frac{1}{2}\dot{z}$, and $(a^2 + x^2)^{\frac{3}{2}}x^2\dot{x} = \frac{1}{2}\dot{z}^{\frac{3}{2}}$, its fluent is $\frac{1}{2} \cdot \frac{2}{5} \dot{z}^{\frac{5}{2}} = \frac{1}{5} \dot{z}^{\frac{5}{2}}$, and by substituting the value of z , the fluent becomes $\frac{1}{5} (a^2 + x^2)^{\frac{5}{2}}$.

3. To find the fluents of such fluxionary expressions as involve two or more variable quantities, substitute, instead of such fluxion, its respective flowing quantity; and if every term be the same quantity, that quantity will be the fluent. If the terms differ in the signs, it shews that some of the factors increase while others decrease. Thus the fluent of $\dot{x}y + \dot{y}x$, or $\dot{x}y - \dot{y}x = xy$; in the latter case y decreases while x increases, and the fluent of $\dot{x}y - \dot{y}x$ is $xy - yx$, also the fluent of $\frac{\dot{x}y}{y^2}$, or

$\frac{\dot{x}y}{y^2} = \frac{\dot{x}}{y}$, where x increases, while $\frac{1}{y}$ decreases, and $\frac{\dot{y}x}{y^2} = \frac{\dot{y}}{y^2}x$, where both factors x and $\frac{1}{y^2}$ increase or decrease together. But it seldom happens that these kinds of fluxions, which involve two variable quantities in one term, and yet admit of known and perfect fluents, are to met with in practice.

4. When the fluxion of a quantity is divided by the quantity itself, the fluent is the hyperbolic logarithm of that quantity, or which is the same, the common logarithm multiplied into 2.30258,

&c. Thus the fluent of $\frac{\dot{x}}{x}$ is the hyperbolic logarithm of x ,

and the fluent of $\frac{a\dot{x}}{x}$ is $a \times$ hyperbolic logarithm of x . On the same principle the fluents of the four following fluxionary forms are obtained:

First Form. The fluent of $\frac{2ab\dot{x}}{a^2 - x^2}$, or $b \times \frac{2a\dot{x}}{a^2 - x^2}$, is $b \times$ hyperbolic logarithm of $\frac{a+x}{a-x}$; for the fluxion of $\frac{a+x}{a-x} = \frac{2a\dot{x}}{a-x^2}$, which divided by $\frac{2a\dot{x}}{a-x^2}$, gives $\frac{a+x}{a-x}$. The truth of the other forms are shewn in the same manner.

Second

Second Form. The fluent of $\frac{b \dot{x}}{\sqrt{x^2 \pm a^2}}$ is $b \times$ hyperbolic logarithm of $x + \sqrt{x^2 \pm a^2}$.

Third Form. The fluent of $\frac{b \dot{x}}{\sqrt{2ax + x^2}}$ is $b \times$ hyperbolic logarithm of $a + x + \sqrt{2ax + x^2}$.

Fourth Form. The fluent of $\frac{2ab\dot{x}}{x\sqrt{a^2 \pm x^2}}$ is $b \times$ hyperbolic logarithm of $\frac{a - \sqrt{a^2 \pm x^2}}{a + \sqrt{a^2 \pm x^2}}$.

5. Certain fluents may be found by means of circular arcs of a circle to the radius 1.

Let AD, fig. 13, be a circular arc, put AT, its tangent = t , DB the sine = y , AB = x , CT = s , the radius CD = a , and the arc AD = z ; also let the tangent Ds represent $\dot{z}$, Dn parallel to AB, sn to DB will express $\dot{x}$ and $\dot{y}$. Then from the similar triangles TAC, DBC, and Dns, we obtain $\dot{z} = \frac{a^2 \dot{t}}{a^2 + t^2} = \frac{a \dot{y}}{\sqrt{a^2 - y^2}}$

$= \frac{a \dot{x}}{\sqrt{2ax - x^2}} = \frac{a^2 \dot{s}}{s\sqrt{s^2 - a^2}}$, and thus four forms of fluxions,

which differ only in the signs from those found by logarithms, may be found by means of circular arcs, whose lengths are given in a table, to a circle, the radius of which is 1, thus,

First Form. The fluent of $\frac{b a \dot{t}}{a^2 + t^2} = b \times$ arc to tang. $\frac{t}{a}$.

Second Form. The fluent of $\frac{b \dot{y}}{\sqrt{a^2 - y^2}} = b \times$ arc to sine $\frac{y}{a}$.

Third Form. The fluent of $\frac{b \dot{x}}{\sqrt{2ax - x^2}} = b \times$ arc to vers. $\frac{x}{a}$.

Fourth Form. The fluent of $\frac{b a \dot{s}}{s\sqrt{s^2 - a^2}} = b \times$ arc to sec. $\frac{s}{a}$.

To the above we add the following, which are easily investigated; the hyperbolic logarithm is to be understood, and the radius of the circle is 1.

FORMS.	FLUXIONS.	FLUENTS.
I.	$\frac{x^{2n-1} \dot{x}}{a \pm x^n}$	$\pm \frac{1}{n}$ logarithm of $a \pm x^n$
II.	$\frac{x^{-1} \dot{x}}{a \pm x^n}$	$\frac{1}{na}$ logarithm of $\frac{x^n}{a \pm x^n}$
III.	$\frac{x^{\frac{1}{2}n-1} \dot{x}}{a - x^n}$	$\frac{1}{n\sqrt{a}}$ logarithm of $\frac{\sqrt{a} + \sqrt{x^n}}{\sqrt{a} - \sqrt{x^n}}$
IV.	$\frac{x^{\frac{1}{2}n-1} \dot{x}}{a + x^n}$	$\frac{1}{n\sqrt{a}}$ $\times$ arc to cosine $\frac{a - x^n}{a + x^n}$

FORMS.	FLUXIONS.	FLUENTS.
V.	$\frac{x^{\frac{1}{2}n-1} \dot{x}}{\sqrt{\pm a + x^n}}$	$\frac{2}{n}$ logarithm of $\sqrt{x^n} + \sqrt{\pm a + x^n}$
VI.	$\frac{x^{\frac{1}{2}n-1} \dot{x}}{\sqrt{a - x^n}}$	$\frac{2}{n} \times$ arc to sine $\sqrt{\frac{x^n}{a}}$
VII.	$\dot{x}\sqrt{2ax - x^2}$	$\frac{1}{2}$ circ. seg. to rad. a and vers. x

(40.) When the given fluxion is so complex that its fluent cannot be found by any of these means, it is then to be determined by the method of infinite series; thus, expand the radical or fraction in the given fluxion by division, extraction of roots, the binomial theorem, &c. and multiply the series by the fluxional letter, if it had been left out in the operation, and such variable simple factor as the given fluxional expression may contain; then find the fluent of each term, by the foregoing rules for the fluents required.

Thus, if it were proposed to find the fluent of $\frac{a\dot{x}}{a-x}$, it becomes necessary to throw the fluxion into an infinite series, by dividing $a\dot{x}$ by $a-x$: thus, $a\dot{x} \div a-x = \dot{x} + \frac{x\dot{x}}{a} + \frac{x^2\dot{x}}{a^2} + \frac{x^3\dot{x}}{a^3} + \frac{x^4\dot{x}}{a^4} + \dots$ Now the fluent of each term of this series, may be found by the foregoing rules to be $x + \frac{x^2}{2a} + \frac{x^3}{3a^2} + \frac{x^4}{4a^3} + \frac{x^5}{5a^4} + \dots$ Again, to approximate the fluent of $\frac{a^2 - x^2}{a^2 - x^2} \times \frac{1}{2} x^n$, we first find the value of $\frac{a^2 - x^2}{a^2 - x^2} \times \frac{1}{2}$ expressed in a series to be

$\frac{a}{c} + \frac{a}{2c^3} - \frac{1}{2ac} \times x^2 + \frac{3a}{8c^5} - \frac{1}{4ac^3} - \frac{1}{8a^3c} \times x^4 + \frac{5a}{16c^7} - \frac{3}{16ac^5} - \frac{1}{16a^3c^3} - \frac{1}{16a^5c} \times x^6 + \dots$ which value

being multiplied by x^n , and the fluent taken by the rules above

laid down, we get $\frac{ax^{n+1}}{n+1 \times c} + \frac{a}{2c^3} - \frac{1}{2ac} \times \frac{x^{n+3}}{n+3} + \frac{3a}{8c^5} - \frac{1}{4ac^3} - \frac{1}{8a^3c} \times \frac{x^{n+5}}{n+5} + \frac{5a}{16c^7} - \frac{3}{16ac^5} - \frac{1}{16a^3c^3} - \frac{1}{16a^5c} \times \frac{x^{n+7}}{n+7} + \dots$

(41.) The fluent found from a given fluxion by the foregoing rules will frequently require a correction, for though a fluent can have but one fluxion, yet a fluxion may have an infinite number of

of fluents; thus the fluent of $\dot{x}$ is x , or $x \pm c$, (art. 18.) whatever be the value of the constant part c , called the correction.

To determine the correction, consider whether the fluent becomes equal to nothing, or of a known value at the time it ought; if not such a quantity must be annexed as will bring it to its proper value. Or proceed by the following rule:

In the general equation of the fluents, write for each quantity the value it is known to have at any one certain time or position, and subtract the sides of the resulting equation from the corresponding side of the general one, and the remainder will give the correction sought.

Let $\dot{z} = 4ax^3$, the general fluent is $z = ax^4$, and let $z = d$ when $x = b$; then,

For the general equation $z = ax^4$; substitute d for z , and b for x , then $d = ab^4$, and by subtracting $z = d = ax^4 - ab^4$, or $z = ax^4 - ab^4 + d$ the correct fluent, the correction being equal to $d - ab^4 = c$, it is evident that if $d = 0$, the correction is $c = -ab^4$, and if $b = 0$, it is $c = d$, if $d = 0$, and $b = 0$, the correction vanishes, or is equal to nothing.

PROB. I. TO FIND THE AREA OF ANY CURVE.

(42.) RULE. Multiply the ordinate by the fluxion of the absciss, and the product gives the fluxion of the figure, whose fluent, corrected if necessary, is the area of the figure.

Examp. 1. Fig. 17. Let the curve ARMH be the common parabola. Let u represent the area, and $\dot{u}$ its fluxion.

$y = a^{\frac{1}{2}} x^{\frac{1}{2}}$; therefore $\dot{u} = Rm HB (= y\dot{x}) = a^{\frac{1}{2}} x^{\frac{1}{2}} \dot{x}$: whence $u = \frac{2}{3} \times a^{\frac{1}{2}} x^{\frac{3}{2}} = \frac{2}{3} a^{\frac{1}{2}} x^{\frac{1}{2}} \times x = \frac{2}{3} yx = \frac{2}{3} \times AB \times BR$: hence a parabola is $\frac{2}{3}$ of a rectangle of the same base and altitude.

Examp. 2. Let the proposed curve CSDR (fig. 18.) be of such a nature, that (supposing AB unity) the sum of the areas CSTBC and CDGBC, whose abscisses are AT and AG, shall be equal to the area CRNBC, whose corresponding absciss AN is equal to AT $\times$ AG, the product of the measures of the two former abscisses.

First, in order to determine the equation of the curve (which must be known before the area can be found,) let the ordinates GD and NR move parallel to themselves towards HF; and then having put $GD = y$, $NR = z$, $AT = a$, $AG = s$, and $AN = u$, the fluxion of the area CDGB will be represented by $y\dot{s}$, and that of the area CRNB by $z\dot{u}$: which two expressions must, by the nature of the problem, be equal to each other; because the latter area CSTB, which is here considered as a constant quantity: and it is evident that two expressions that differ only by a constant quantity, must always have equal fluxions.

Since, therefore, $y\dot{s} = z\dot{u}$, and $u = as$, by hypothesis, it follows, that $\dot{u} = a\dot{s}$, and that the first equation (by substituting for $\dot{u}$) will become $y\dot{s} = az\dot{s}$, or $y = az$, or lastly $y\dot{s} = zas$, that is, $GD \times AG = NR \times AN$: therefore, $GD:NR::AN:AG$; whence it appears, that every ordinate of the curve is reciprocally as its corresponding absciss.

Now, to find the area of the curve so determined, put $AB = 1$, $BC = b$, and $BG = x$: then since $AG (1+x):AB (1):BC$

$(b):GD (y)$ we have $y = \frac{b}{1+x}$, consequently $\dot{u} (=y\dot{x}) =$

$\frac{b\dot{x}}{1+x} = b \times \dot{x} \times \frac{1-x}{1+x} = \frac{b}{1+x} (1-x) \dot{x}$, &c. Whence BGDC,

the area itself, will be $= b \times x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \frac{x^5}{5}$, &c.

which was to be found.

(43.) Hence it appears, that as these areas have the same properties as logarithms, this series gives an easy method of computing logarithms; and the fluent may be found by means of a table of logarithms; and every fluxion whose fluent agrees with any known logarithmic expression, may be found the same way.

PROB. II. TO DETERMINE THE LENGTH OF CURVES.

(44.) Fig. 19. Because Ced is a right-angle, $Cd^2 = Ce^2 + de^2$; wherefore the fluxions of the absciss and ordinate being

squared, their sum gives the square of the fluxion of the curve; whose root being extracted, and the fluent taken, gives the length of the curve.

Examp. To find the length of a circle from its tangent. Make the radius AO , fig. 19, $= a$, the tangent of $AC = t$, and its secant $= s$, the curve $= z$, and its fluxion $\dot{z}$; because the triangles OTC , OCS , are similar, $OT:OC::OC:OS$; whence $OS =$

$\frac{a^2}{s}$, and $SA = a - \frac{a^2}{s} = a - \frac{a^2}{\sqrt{a^2+t^2}}$; whose fluxion is $\frac{a^2 t \dot{t}}{a^2+t^2}$

and because the triangles OTC , dCe are similar, $TC (=t):TO (=$

$\sqrt{a^2+t^2})::Cd (= \frac{a^2 t \dot{t}}{a^2+t^2}):C\dot{d} = \frac{a^2 \dot{t}}{a^2+t^2}$ = fluxion of

the curve. Now by converting this into an infinite series we have

the fluxion of the curve $= \frac{t^2 \dot{t}}{a^2} + \frac{t^4 \dot{t}}{a^4} + \frac{t^6 \dot{t}}{a^6}$, &c. and conse-

quently $z = t - \frac{t^3}{3a^2} + \frac{t^5}{5a^4} - \frac{t^7}{7a^6} + \frac{t^9}{9a^8}$, &c. = AR.

(45.) Other series may be deduced from the versed sine, secant, &c. and these are of use for finding fluents which cannot be expressed in finite terms.

PROB. III. TO FIND THE CONTENT OF A SOLID.

(46.) Let the surface of the generating plane be multiplied by the space it passes through in any time, the product will give a solid which is the fluxion of the solid required: the surface must be computed in terms of x , which represents the line or axis on which it moves, and by its motion on which the fluxion is to be measured, and the fluent found will give the content of the solid.

Examp. 1. Let it be proposed to find the content of a cone ABC, fig. 20.

Put the given altitude (AD) of the cone $= a$, and the semidiameter (BD) of its base $= b$, the solid $= s$, its fluxion $= \dot{s}$ and the area of a circle, whose radius is unity, $= p$: then the distance (AF) of the circle EH, from the vertex A, being denoted by x , we have by similar triangles, as $a:b::x:EF (y) = \frac{bx}{a}$.

Whence in this case, $\dot{s} (= p y^2 \dot{x}) = \frac{p b^2 x^2 \dot{x}}{a^2}$; and consequently $s =$

$\frac{p b^2 x^3}{3a^2}$; ($= p \times BD^2 \times \frac{1}{3} AD$) for the content of the whole

cone ABC: which appears from hence to be just $\frac{1}{3}$ of a cylinder of the same base and altitude.

Examp. 2. Let it be required to find the solid content of a spheroid, AFBH, fig. 21. Let the axis AB, about which the solid is generated, be $= a$, p = area of a circle to the radius 1, and the other axis FH of the generating ellipsis $= b$; then, from the property of the ellipsis, we have $a^2:b^2::AD \times BD (x \times a - x):DE^2$

(y^2) . Hence $y^2 = \frac{b^2}{a^2} \times \frac{ax - x^2}{a - x}$; and the fluxion of the solid, $\dot{s}$

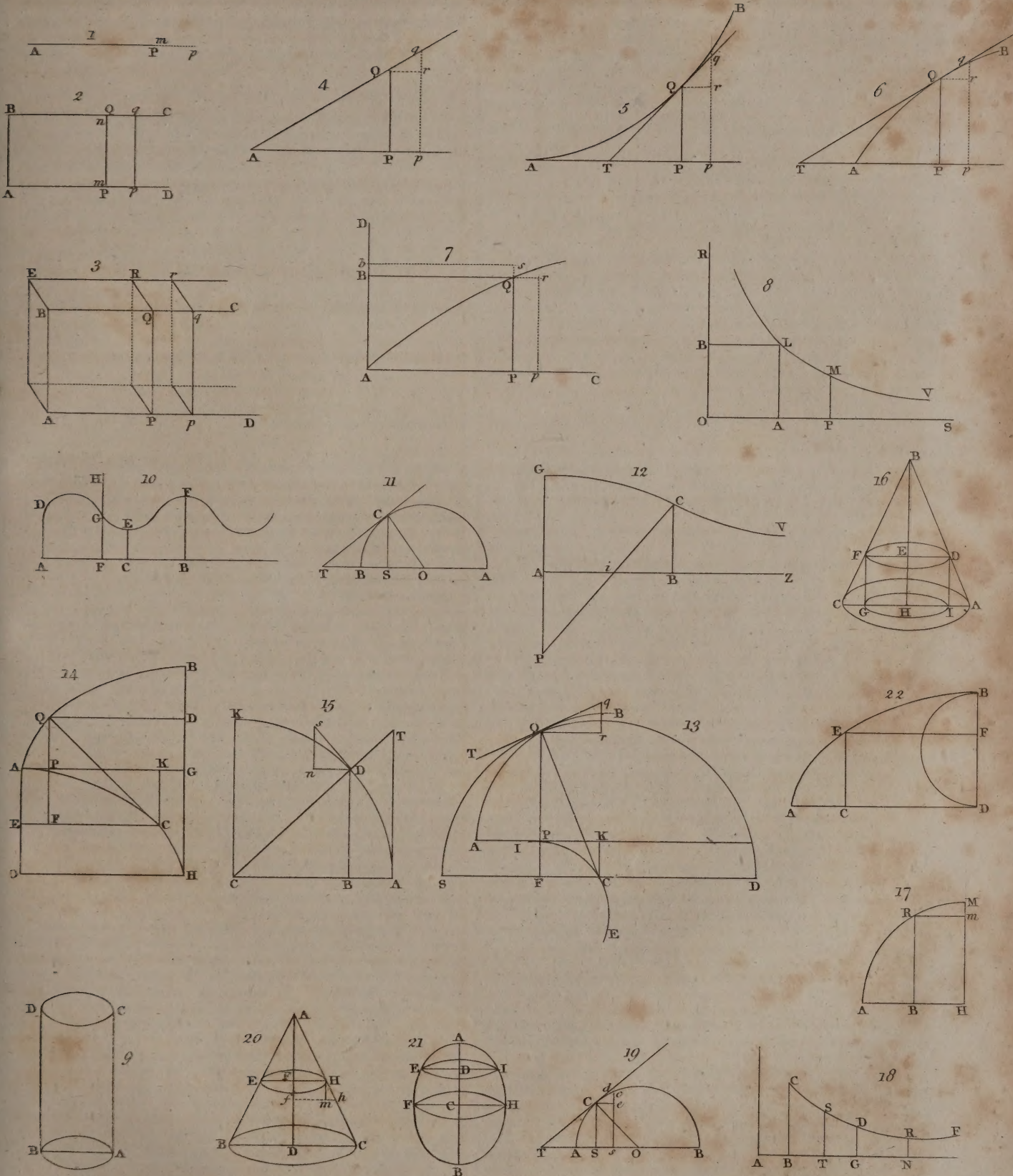
$(= p y^2 \dot{x}) = \frac{p b^2}{a^2} \times \frac{ax - x^2}{a - x} \dot{x}$ and the solidity $s = \frac{p b^2}{a^2} \times$

$\frac{1}{2} ax - \frac{1}{3} x^3 =$ the segment AIE; which, when $AD (x) = AB$

(a) becomes $\left(\frac{p b^2}{a^2} \times \frac{1}{2} a^2 - \frac{1}{3} a^3 \right) \frac{1}{6} p a b^2 =$ the content of the

whole spheroid. Where, if $b (FH)$ be taken $= a (AB)$, we shall also get $\frac{1}{6} p a$ for the true content of the sphere, whose diameter is a . Hence a sphere or spheroid is $\frac{2}{3}$ of its circumscribing cylinder: for the area of the circle FH being expressed by $\frac{p b^2}{4}$, the

content



content of the cylinder, whose diameter is FA, and altitude AB, will be $\frac{pba}{3}$; of which $\frac{2}{3} p a b^2$ is evidently the two-third parts.

PROB. IV. TO COMPUTE THE SURFACE OF ANY SOLID BODY.

(47.) The fluxion of the surface of the solid is equal to the periphery of the surface, by whose motion the solid is generated, multiplied by its velocity on the edge of the solid, and the computation is made as in the foregoing.

Examp. 1. Let it be proposed to determine the convex superficies of a cone ABC, fig. 20, then the semidiameter of the base (BD or CD) being put $= b$, the slanting line, or hypotenuse, AC $= c$, and FH (parallel to DC) $= y$, AH $= z$, the surface $= w$, its fluxion $= \dot{w}$, and p $=$ the periphery of a circle, whose diameter is unity, we shall, from the similarity of the triangles ADC and

Hmh, have $b:c :: y:(mh) \cdot z:(Hh) = \frac{cy}{b}$: whence $\dot{w} = 2py\dot{z}$
 $= \frac{2pcy\dot{y}}{b}$; and consequently $\dot{w} = \frac{pcy\dot{y}}{b}$. This, when $y = h$, be-

comes $= pch = p \times DC \times AC =$ the convex superficies of the whole cone ABC: which therefore is equal to a rectangle under half the circumference of the base and the slanting line.

Examp. 2. To find the surface generated by the cycloidal curve. Put BE, fig. 22, $= z$, FD $= y$, EF $= x$, BD $= a$, s $=$ the surface, and $p = 6.28318$, &c. then from the property of the cycloid it will appear that $\dot{z} = a^{\frac{1}{2}} x^{-\frac{1}{2}} \dot{x}$; therefore $\dot{s} = py\dot{z} = pya^{\frac{1}{2}} x^{-\frac{1}{2}} \dot{x} = p \times a^{\frac{1}{2}} x^{-\frac{1}{2}} \times a^{\frac{1}{2}} x^{-\frac{1}{2}} \dot{x} = pa^{\frac{1}{2}} x^{-\frac{1}{2}} \dot{x} - pa^{\frac{1}{2}} x^{\frac{1}{2}} \dot{x}$; hence $s = 2pa^{\frac{3}{2}} x^{\frac{1}{2}} - \frac{2}{3} pa^{\frac{1}{2}} x^{\frac{3}{2}}$, the surface generated by BE, which needs no correction, since when $s = 0$, $x = 0$; when $x = a$, we have $s = 4pa^2$, equal to the whole surface generated by BA.

(48.) The method of fluxions is also applied to find the centres of gravities, and oscillation of different bodies; to determine the paths described by projectiles acted on by central forces, the resistances to motions in resisting media, the attractions of bodies under different forms, the directions of wind which has the greatest effect on an engine, and to solve many curious and useful problems, as may be seen in the authors on this subject above mentioned. The treatise by Simpson, and that by Vince, deserve particular notice.

FLY, in entomology, a large order of insects, the distinguishing characteristic of which is, that their wings are transparent. By this they are distinguished from beetles, butterflies, grasshoppers, &c. Flies are subdivided into those which have four and those which have two wings. See APIS, FORMICA, CULEX, MUSCA, &c.

FLY, in mechanics, a cross with leaden weights at its ends; or rather a heavy wheel at right angles, to the axis of a windlass, jack, or the like; by means of which, the force of the power, whatever it is, is not only preserved, but equally distributed in all parts of the revolution of the machine. See MECHANICS. The fly may be applied to several sorts of engines, whether moved by men, horses, wind, or water, or any other animate or inanimate power; and is of great use in those parts of an engine which have a quick circular motion, and where the power of the resistance acts unequally in the different parts of a revolution. This has made some people imagine, that the fly adds a new power; but though it may be truly said to facilitate the motion, by making it more uniform, yet upon the whole it causes a loss of power, and not an increase: for as the fly has no motion of its own, it certainly requires a constant force to keep it in motion; not to mention the friction of the pivots of the axis, and the resistance of the air. The reason, therefore, why the fly becomes useful in many engines, is not that it adds a new force to them; but because, in cases where the power acts unequally, it serves as a moderator to make the motion of revolution almost every where equal: for as the fly has accumulated in itself a great degree of power, which it equally and gradually exerts, and as equally and gradually receives, it makes the motion in all parts of the revolution pretty nearly equal and uniform. The very manifest consequence of this is, that the engine becomes more easy and convenient to be acted on and moved by the impelling force; and this is the only benefit obtained by the fly. The best form for a fly, is that of a heavy wheel or circle, of a fit size, as this will not only meet with less resistance from the air, but being continuous, and the weight every where equally distributed through the perimeter of the wheel, the motion will be more easy, uniform, and regular. In this form, the fly is most aptly applied to the perpendicular drill, which it likewise serves to keep upright by its centrifugal force: also to a windlass or common winch, where the motion is quick; for in pulling upwards from the lower part, a person can exercise more power than in thrusting forward in the upper quarter: where, of course, part of his force would be lost, were it not accumulated and conserved in the equable motion of the fly. Hence, by this means, a man may work all day in drawing up a weight of 40lb. whereas 30lb. would create him more labour in a day without the fly.

FLY, in the sea language, that part of the mariner's compass on which the several winds or points are drawn. "Let fly the sheet,"

is a word of command to let loose the sheet, in case of a gust of wind, lest the ship should overset, or spend her top-sails and masts; which is prevented by letting the sheet go a-main, that it may hold no wind.

FLY-BOAT, a large vessel with a double brow, carrying from four to six hundred tons.

FLYERS, in architecture, such stairs as go straight, and do not wind round; nor have the steps made tapering, but the fore and back part of each stair, and the ends, respectively parallel to one another; so that if one flight do not carry you to your intended height, there is a broad half space, from whence you begin to fly with steps every where of the same length and breadth, as before.

FLY-FISHING, the act, or art, of catching fish with a fly. The fly with which the hook is baited may be either natural or artificial; they are made of various sizes and colours according to the sort of fish or the season. See FISHING.

FLY HONEYSUCKLE. See LONICERA, No. 10.

FLY HONEYSUCKLE, AFRICAN. See HALLERIA.

FLYING, the progressive motion of a bird, or other winged animal in the air. The parts of birds chiefly concerned in flying are the wings and the tail: by the former, the bird sustains and wafts himself along; and by the latter, he is assisted in ascending and descending, to keep his body poised and upright, and to obviate the vacillations thereof. It is by the largeness and strength of the pectoral muscles, that birds are so well disposed for quick, strong, and continued flying. These muscles, which in men are scarce a 70th part of the muscles of the body, in birds exceed and outweigh all the other muscles taken together; upon which Mr. Willoughby remarks, that if it be possible for a man to fly, his wings must be so contrived and adapted, that he may use his legs, and not his arms, in managing them. The tail, Messrs. Willoughby, Ray, and many others, imagined to be principally employed in steering and turning the body, as a rudder; but Borelli has put it beyond all doubt, that this is the least use of it. Its chief use is to assist the bird in its ascent and descent in the air, and to obviate the vacillations of the body and wings; for, as to turning the body to this or that side, it is performed by the wings and inclination of the body, and but very little by the help of the tail. The flying of a bird, in fact, is quite a different thing from the rowing of a vessel. Birds do not vibrate their wings towards the tail, as oars are struck towards the stern, but waft them downwards; nor does the tail of the bird cut the air at right angles, as the rudder does the water; but is disposed horizontally, and preserves the same situation what way soever the bird turns. In effect, as a vessel is turned about on its centre of gravity to the right, by a brisk application of the oars to the left; so a bird in beating the air with its right wing alone, towards the tail, will turn its fore-part

to the left. Thus pigeons changing their course to the left would labour it with their right wing, keeping the other almost at rest. Birds of a long neck alter their course by the inclination of their head and neck, which altering the course of gravity, the bird will proceed in a new direction. The act of flying is thus performed: The bird first bends his legs, and springs with a violent leap from the ground; then opens and expands the joints of his wings, so as to make a right line perpendicular to the sides of his body: thus the wings, with all the feathers therein, constitute one continued lamina. Being now raised a little above the horizon, and vibrating the wings with great force and velocity perpendicularly against the subject air, that fluid resists those successions, both from its natural inactivity and elasticity, by means of which the whole body of the bird is protruded. The resistance the air makes to the withdrawing of the wings, and consequently the progress of the bird, will be so much the greater, as the stroke of the fan of the wing is longer: but as the force of the wing is continually diminished by this resistance, when the two forces continue to be in equilibrio, the bird will remain suspended in the same place; for the bird only ascends so long as the arch of air the wing describes makes a resistance equal to the excess of the specific gravity of the bird above the air. If the air, therefore, be so rare as to give way with the same velocity as it is struck withal, there will be no resistance, and consequently the bird can never mount. Birds never fly upwards in a perpendicular line, but always in a parabola. In a direct ascent, the natural and artificial tendency would oppose and destroy each other, so that the progress would be very slow. In a direct descent they would aid one another, so that the fall would be too precipitate.

FLYING, ARTIFICIAL, that attempted by men, by the assistance of mechanics. The art of flying has been attempted by several persons in all ages. The Leucadians, out of superstition, are reported to have had a custom of precipitating a man from a high cliff into the sea, first fixing feathers, variously expanded, round his body, in order to break the fall. Friar Bacon, not only affirms the art of flying possible, but assures us, that he himself knew how to make an engine wherein a man sitting might convey himself through the air like a bird; and further adds, that there was then one who had tried it with success. The secret consisted in a couple of large thin hollow copper globes, exhausted of air; which being much lighter than air, would sustain a chair whereon a person might sit. Fa. Francisco Lana, in his *Prodromo*, proposes the same thing as his own thought. But Dr. Hook proves that this is impracticable. The philosophers of King Charles II's reign were mightily busied about this art. Bishop Wilkins was so confident of success in it, that he says, he does not question but in future ages it will be as usual to hear a man call for his wings, when he is going a journey, as it is now to call for his boots.

FLYING-ARMY, a small body under a lieutenant or major-general, sent to harass the country, intercept convoys, prevent the enemy's incursions, cover its own garrisons, and keep the enemy in continual alarm.

FLYING FISH, a name given to several species of fish, which, by means of their long fins, keep themselves out of water a considerable time. See *EXOCOETUS*.

FLYING PINION, a part of a clock, having a fly or fan to gather air, and so bridle the rapidity of the clock's motion, when the weight descends in the striking piece.

FLY-TRAP, VENUS's, in botany, a singular sensitive plant, lately discovered. See *DIONEÆ*.

FLY-WORT, in botany. See *SILENE*.

FO, or **FOE**, an idol of the Chinese, originally worshipped in the Indies, and transported from thence into China, together with the tables with which the Indian books were filled. He is said to have performed most wonderful things, which the Chinese have described in several volumes, and represented by cuts.

FOCHIA, NOVA, or FOUCHEA, a sea-port town of Asiatic Turkey, in Natolia, on the Gulf of Smyrna. It is 32 miles S. S. W. of Pergamo.

FOCUS, [Lat.] in optics, the point from which rays diverge, or to which they converge. See *OPTICS*.

FOCUS, in conic sections. See *CONIC SECTIONS*.

FODDER, [*fothre, fother*, Sax.] dry food stored up for cattle against winter.

FODDER, in the civil law, is used for a prerogative that the prince has, to be provided of corn and other meats for his verses, by the subjects, in his warlike expeditions.

FODDER, in mining, a measure containing 22 hundred and a half weight, though in London only 20 hundred weight.

FENUGREEK. See *TRIGONELLA*.

FENUS NAUTICUM. Where money was lent to a merchant, to be employed in a beneficial trade upon condition to be repaid, with extraordinary interest, in case such voyage was safely performed, the agreement was sometimes called *fenus nauticum*, sometimes *usura maritima*. But, as this gave an opening for usurious and gaming contracts, 19 Geo. II. c. 37, enacts, that all money lent on bottomry, or at respondentia, on vessels bound to or from the East Indies, shall be expressly lent only upon the ship or merchandise: the lender to have the benefit of salvage, &c. Blackstone's Com. II. 459. Mol. de Jur. Mar. 361.

FETUS, the young of all viviparous animals whilst in the womb, and of oviparous animals before being hatched. The name is transferred by botanists to the embryos of vegetables. Till the young is perfectly formed, it is more properly called Embryo. In the human fetus there exist several peculiarities not to be found in the adult: 1. The arteries of the naval string, which are continuations of the hypogastrics, are after the birth shrivelled up, and form the lower umbilical ligament. 2. The veins of the naval string are formed by the union of all the venous branches in the placenta; and, passing into the abdomen, become the falciform ligament of the liver. 3. The lungs, before being inflated with air, are compact and heavy; but after one inspiration they become light, and as it were spongy: and it may be noted here, that the notion of the lungs sinking in water before the child breathes, and of their swimming after the reception of air, are no certain proofs that the child had or had not breathed, much less that it was murdered: for the uninfused lungs become specifically lighter than water, as soon as any degree of putrefaction takes place in them; and this soon happens after the death of the child; besides, where the utmost care has been taken to preserve the child, it has breathed once or twice, and then died. 6. The thymus gland is very large in the fetus, but dwindles away in proportion as years advance. 7. The foramen ovale in the heart of a fetus is generally closed in an adult.

FOG, or **MIST**, a meteor consisting of gross vapours floating near the surface of the earth. Fogs have a considerable influence on the winter. In the summer of 1783, an uncommon fog prevailed all over Europe, and great part of North America. It was dry, of a permanent nature, and the rays of the sun had but little effect in dissipating it, which they easily do in moist fogs arising from water. The effect of the rays in heating the earth was exceedingly diminished: hence its surface was frozen early, the first snows remained on it undissolved, and received continual additions; the air was more chilled, and intensely cold, and the winter of 1783 and 1784 was exceedingly severe. The spring fogs are most detrimental to such young fruit, and other trees, as are planted in low situations; because they moisten the young shoots, and thus render them more liable to the injuries of the frosty nights succeeding them, but which they escape when placed in more elevated situations.

FOGAGE, or **FOGAGIUM**, in the forest law, rank grass not eaten up in summer.

FOGARAS, a town of Transylvania, on the Alauta, the see of a Greek bishop. It is 26 miles N. E. of Hermanstadt.

FOGO, a small island near the coast of Newfoundland. Lon. 54. 10. W. Lat. 50. 2. N.

FO-HI, FO, or FE, the chief god of the Chinese, whom they adore as the sovereign of heaven. They represent him shining all in light, with his hands hid under his robes, to shew that his power does all things invisibly. He has at his right hand the famous Confucius, and at his left Lanza, or Lanca, chief of the second sect of their religion.

FO-HI is also the name of the first emperor of China, according to the most credible and authentic histories. Some suppose him the same with Noah; others place him 200 years after the deluge. The Chinese say he reigned 115 years.

FOHR, or **FORA**, a fertile island of Denmark, on the coast of Sleswick; 12 miles in circuit. Lon. 8. 31. E. Lat. 54. 44. N.

FOIL, among glass-grinders, a sheet of tin, with quicksilver, or the like, laid on the back side of a looking-glass, to make it reflect. See *FOLIATING*.

FOIL, among jewellers, a thin leaf of metal placed under a precious stone, in order to make it look transparent, and give it an agreeably.

agreeably different colour, either deep or pale: thus, if a stone be wanted to be of a pale colour, put a pale-coloured foil under it, or if deep, a dark one. These foils are made either of copper, gold, or gold and silver together. The copper foils are commonly known by the name of Nuremberg, or German foils.

FOIX, a late county of France, anciently independent, but united to that kingdom by Henry IV. and now included in the department of Arriege.

FOIX, a town of France, in the department of Arriege, 8 miles S. of Pamiers.

FOKIEN, a province of China, bounded on the N. by that of Tche-Kiang; E. by the sea; S. by Quang-tong, and W. by Kiang-Si. It is commodiously situated for navigation and commerce.

FOLD-NET, among sportsmen, a sort of net with which small birds are taken in the night, of which there are two sorts; the less may be managed by one man only, but the greater must be carried by two, and used thus: let the net be fixed on both sides to two strong, straight, and light poles about twelve feet long, each man holding one of them; let there be one behind them, at the distance of two yards, to carry lights: the nets must be carried between the wind and the birds, which all naturally roost on their perches with their breasts against the wind; by reason of this, he that beats the bushes on the other side of the hedge, will drive them out that way towards the light.

FOLIAGE, [*folium*, Lat. *feuillage*, Fr.] leaves; tufts of leaves; the apparel of leaves to a plant.

FOLIAGE, in architecture, used for the representations of flowers, leaves, branches, rinds, &c. whether natural or artificial, as are used for enrichments on capitals, friezes, pediments, &c.

FOLIATE, in the higher geometry, a name given by M. de Moivre to a curve of the second order, expressed by the equation $x^3 + y^3 = axy$; being a species of defective hyperbolas with one asymptote, and consisting of two infinite legs crossing one another, and forming a sort of leaf.

FOLIATING OF GLASS PLATES FOR MIRRORS, the spreading the plates over, after they are polished, with quicksilver, &c. to make them reflect images. It is performed thus: A thin blotting paper is spread on the table, and then a fine lamina or leaf of tin called foil, is laid over the paper; upon this is poured mercury, which is to be distributed equally over the leaf with a hare's foot or cotton: over this is laid a clean paper, and over that the glass plate, which is pressed down with the right hand, and the paper drawn gently out with the left: this being done, the plate is covered with a thicker paper, and loaded with a greater weight, that the superfluous mercury may be driven out and the tin adhere more closely to the glass. When it is dried, the weight is removed, and the looking-glass is complete. Some add an ounce of marcasite, melted by the fire, and lest the mercury should evaporate in smoke, they pour it into cold water; and when cooled, squeeze through a cloth, or through leather. Some add a quarter of an ounce of tin and lead to the marcasite, that the glass may dry the sooner.

FOLIATING OF GLOBE GLASSES FOR MIRRORS, is done as follows: Take five ounces of quicksilver and one ounce of bismuth; of lead and tin, half an ounce each: first put the lead and tin into fusion, then put in the bismuth; and when that is also in fusion, let it stand till it is almost cold, and pour the quicksilver into it: after this, take the glass globe, which must be very clean, and the inside free from dust: make a paper funnel, which put into the hole of the globe, as near the glass as possible, so that the amalgam, when poured in, may not splash, and cause the glass to be full of spots; pour it in gently, and move it about, so that the amalgam may touch every where: if the amalgam begin to be curdly and fixed, hold it over a gentle fire, and it will easily flow again; and if it be too thin, add a little more lead, tin, and bismuth, to it. The finer and clearer the globe is, the better will the looking-glass be. Dr. Shaw observes, that this operation has considerable advantages, as being performable in the cold; and that it is not attended with the danger of poisonous fumes from arsenic, or other unwholesome matters, usually employed for this purpose. How far it may be applicable to the more commodious foliating of the common looking-glasses, and other speculums, he thinks, deserves to be considered.

FOLIFERO-FLORIFEROUS PLANTS, plants that pro-

duce both leaves and flowers. Some plants, as the *Alnus*, produce leaves only: others, as the *Populus*, *Fraxinus*, &c. bear leaves and flowers distinct.

FOLIGNI, FOLIGNO, or FULIGNO, a town of Italy, in the duchy of Spoleto, anciently called Fulginium. It contains eight churches, and twenty-three convents; and is famous for its paper-mills and silk manufactures. It is seated on the side of a mountain, 15 miles N. of Spoleto, and 69 N. of Rome.

FOLIO, among printers and booksellers the largest form of books, when each sheet is so printed, that it may be bound up in two leaves only. This form is only used in large works; but the quarto or octavo forms are much more handy.

FOLIO, in merchant's book, denotes a page, or rather both the right and left hand pages, these being expressed by the same figure, and corresponding to each other. See **BOOK-KEEPING**.

FOLIS. See **FOLLIS**.

FOLIUM, or **LEAF**, in botany. See **LEAF**.

FOLKES, MARTIN, an English antiquary, mathematician, and philosopher, born at Westminster about 1690, greatly distinguished as F. R. S. London, and of the Academy of Sciences at Paris. He was admitted into the former at 24 years of age; made one of their council two years after; named by Sir Isaac Newton himself as vice-president; and, after Sir Hans Sloan, became president. There are numerous Memoirs of his in the Philosophical Transactions. Coins, ancient and modern, were his great object: and his last production was a book upon the "English Silver Coin, from the Conquest to his own Times." He died at London in 1754. Dr. Birch drew up materials for his life, which are preserved in the Anecdotes of Bower, p. 562, et seq.

FOLKESTONE, a town of Kent, between Dover and Hythe, appears to have been a very ancient place, from the Roman coins and British bricks often found in it. It is 7 miles S. W. of Dover, and 72 E. S. E. of London.

FOLK-LANDS, or FOLC-LANDS, [*Sax.*] copyhold lands, so called in the time of the Saxons, as charter-lands were called *boc-lands*, Kitch. 174. Folkland was terra vulgi or popularis; the land of the vulgar people, who had no certain estate therein, but held the same, under the rents and services accustomed or agreed, at the will only of their lord the thane; and it was therefore not put in writing, but accounted *prædium rusticum et ignobile*. Spelm. of Feuds, c. 5.

FOLKMOTE, or FOLCMOTE, [*Folcgemot*, *Sax. i. e. a meeting of the people*,] is compounded of *folk*, the people, and *mote*, or *gemote*, to meet; and signified originally, as Somner in his Saxon Dictionary informs us, a general assembly of the people, to consider of and order matters of the commonwealth. And Sir Henry Spelman says, the folcmote was a sort of annual parliament, or convention of the bishops, thanes, aldermen, and freemen, upon every May-day yearly; where the laymen were sworn to defend one another and the king, and to preserve the laws of the kingdom; and then consulted the common safety. But Dr. Brady infers from the laws of the Saxon kings of England, that it was an inferior court, held before the king's reeve or steward, every month, to do folk right, or compose smaller differences, from whence there lay appeal to the superior courts; Gloss. p. 48. Squire seems to think the folcmote not distinct from the shiremot, or common general meeting of the county. See his *Angl. Sax. Gov.* 155. n.

FOLKMOTE was also used for any kind of popular or public meeting; as of all the tenants at the court-leet, or court-baron.

FOLLICLE, [*folliculus*, Latin,] in botany, the seed-vessels; capsula seminalis, or case; which some fruits and seeds have over them; as that of the alkengi, pedicularis, &c.

FOLLICULI are defined by Linnaeus to be small glandular vessels distended with air, which appear on the surface of some plants; as at the root of water milfoil, and on the leaves of *aldrovanda*. In the former, the vessels in question are roundish with an appearance like two horns; in the latter, pot-shaped, and semi-circular.

FOLLICULUS, [from *follis*, Lat. a bag,] is also a species of seed-vessel, first mentioned by Linnaeus, in his "Delinatio Plantarum."

FOLLIS, or FOLIS, anciently signified a little bag or purse; whence it came to be used for a sum of money, and very different sums were called by that name.

FOMAHANT,

FOMAHANT, in astronomy, a star of the first magnitude in the mouth of the Southern Fish.

FOMENTATION, in medicine, the bathing of any part of the body with a convenient liquor; which is usually a decoction of herbs, water, wine, or milk; and the applying of bags stuffed with herbs and other ingredients, which is commonly called dry fomentation.

FOMENTATIONS are usually applied as warm as the patient can bear, in the following manner: Two flannel-cloths are dipped into the heated liquor, one of which is wrung as dry as the necessary speed will admit, then immediately applied to the part affected; it lies on until the heat begins to go off, and the other is in readiness to apply at the instant in which the first is removed: thus these flannels are alternately applied, so as to keep the affected part constantly supplied with them warm. This is continued fifteen or twenty minutes, and repeated two or three times a-day. Every intention of relaxing and soothing by fomentations may be answered as well by warm water alone, as when the whole tribe of emollients are boiled in it; but when discutients or antiseptics are required, such ingredients must be called in as are adapted to that end. The degree of heat should never exceed that of producing a pleasing sensation; great heat produces effects very opposite to that intended by the use of fomentations.

FONDI, 1. a town, and 2. a lake of Naples in the province of Lavora; 50 miles S. E. of Rome.

FONG-YANG, a city of China, in the province of Kiangnan, situated on a mountain, which hangs over the Yellow river, and incloses with its walls several fertile little hills. Its jurisdiction is very extensive, comprehending 18 cities; five of which are of the second, and 13 of the third class.

FONS, a town of France, in the department of Lot, $4\frac{1}{2}$ miles N. W. of Figeac.

FONT, among ecclesiastical writers, a large basin, in which water is kept for the baptizing of infants, or other persons. It is so called probably because baptism was usually performed among the primitive Christians at springs or fountains. In process of time the font came to be used, being placed at the lower end of the church, to intimate, perhaps, that baptism is the rite of admission into the Christian church.

FONT, in the art of printing, denotes a complete assortment of types for letters, accents, &c. See **FOUNT**.

FONTAINBLEAU, a town of France, in the department of Seine and Marne, 35 miles S. E. of Paris. Lon. 2. 47. E. Lat. 48. 25. N.

FONTAINE, **JOHN DE LA**, a French poet, was born at Chateau-Thierry in 1621. He was educated first at Rheims, and afterwards under the fathers of the Oratory. He was a man of excessive simplicity of manners, credulous, fearful, and uncommonly absent. He lived for some time with the superintendent Fouquet, who allowed him a pension. Afterwards he was in the service of Princess Henrietta of England, and next lived with Madame de la Sabliere. He was married, but his wife had as little knowledge of economy as himself. He died in 1693, and on being laid out, a hair shirt was found next his skin. His Tales are very licentious, but his Fables are usually put into the hands of young people. They are very natural, poetical, and entertaining. He also wrote "Les Amours de Psyché," a romance; some comedies; Letters, &c. to be found in his miscellanies.

FONTAINE, **L'EVEQUE**, in the department of the North, and late province of Hainault, 3 miles W. of Charleroi, and 10 E. of Mons.

FONTAINES, **PETER FRANCIS**, a French critic, born at Rouen in 1685. At 15, he entered into the society of the Jesuits, and at 30 quitted it, though he was a priest, and had a cure in Normandy. Having excited some attention at Paris by his critical productions, the Abbé Bignon in 1724 committed to him the "Journal de Scavans." He was peaceably enjoying the applauses of the public, when his enemies, whom he had raised by his critical strictures in his Journal, accused him of a most abominable crime, and procured him to be imprisoned. He was set at liberty in fifteen days; the magistrate of the police justified him in a letter to the Abbé Bignon; and he was unanimously re-established in his former credit, in 1725. In 1731, he began a work entitled "Novelliste du Parnasse, ou Reflexions sur les Ouvrages Nouveaux;" but only proceeded to two volumes; the work hav-

ing been suppressed by authority, from the incessant complaints of authors ridiculed therein. In 1735, he obtained a new privilege for a periodical production, entitled, "Observations sur les Ecrits Modernes;" which, after continuing to 33 volumes was suppressed in 1743. Yet in 1744, he published another weekly paper, called, "Jugemens sur les Ouvrages Nouveaux," which proceeded to 11 volumes: the two last being done by other hands. In 1745, he was attacked with a disorder in the breast, which ended in a dropsy that proved fatal in five weeks. "He was (says M. Freron) born a sentimental person; a philosopher in conduct as well as in principle; exempt from ambition, and of a noble firm spirit, which would not submit to sue for preferments or titles. In common conversation he appeared only a common man; but when any thing out of the ordinary way was agitated, he discovered great force of imagination and wit." He was the author of many other works; his biographer mentions 17 articles; many of them critical, some historical, and some translations from Pope, Swift, Fielding, &c. The Abbé de la Porte, published in 1737, "L'Esprit de l'Abbé des Fontaines," in four volumes 12mo.; with his Life, a catalogue of his works, and of writings against him.

FONTANELLA, in anatomy, the quadrangular aperture betwixt the os frontis and ossa sincipitis, in children just born; also called fons pulsatilis.

FONTANELLA, in geography, a rich town of Italy, in the Cremonese.

FONTANESIA, in botany, a genus of the diandria monogynia class and order. Natural order, Separiæ. Calyx four-parted, inferior; petals two, two-parted; capsule membranaceous, not opening, two-celled; cells one-seeded. It has one species.

FONTARABIA, a sea-port town of Spain in Biscay, and in the territory of Guipuscoa. Lon. 1. 47. W. Lat. 43. 22. N.

FONTENELLE, **BERNARD DE**, a celebrated French author, born in 1657. He discharged the office of perpetual secretary to the Academy of Sciences above forty years with universal applause; and his History of that Academy throws great light upon their memoirs. The elogies he pronounced on the deceased members of the Academy excite a respect for the sciences, as well as for the author. In his poetical performances, and his "Dialogues of the Dead," the spirit of Voiture was discernible, though more extended and more philosophical. His "Plurality of Worlds," is a singular work, the design of which was to present that part of philosophy to view in a pleasing dress. He died in 1756, near 100 years old.

FONTENOY, a town of France, in the department of Jemappes, late Austrian Netherlands, and province of Hainault, 4 miles S. S. E. of Tournay.

FONTES, a town of France, in the department of Herault, 6 miles N. W. of Montagnac.

FONTEVRAULD, a town of France, in the department of Maine and Loire, and late province of Anjou. It is 6 miles S. E. of Saumur, and 160 S. W. of Paris.

FONTEVRAULD, or **FRONTEVAUX**, **ORDER OF**, in ecclesiastical history, a religious order instituted by Robert d'Arbrissel, about the end of the 11th century; taken under the protection of the holy see, by Pope Pascal II. in 1106; confirmed by a bull in 1113, and invested by his successors with extraordinary privileges. The chief of this order is a female, who is appointed to inspect both the monks and the nuns.

FONTINALIA, or **FONTANALIA**, in antiquity, a religious feast held among the Romans in honour of the deities who presided over fountains or springs.

FONTINALIS, in botany, a genus of the cryptogamia musci, or Mosses. Capsule oblong, with the mouth ciliate; opening with an acuminate lid; covered with a sessile, smooth, conical veil; included in a pitcher-shaped, imbricate perichætium. Only four species are known, they are natives of England: three of them are water-mosses, and one grows upon trees. Professor Martyn says, that several new species have been discovered by Swartz in the West Indies.

FOOD, [*fædan*, Sax. *voeden*, Dut. to feed,] in the most extensive signification of the word, implies all aliments taken into the body, whether solid or fluid; but, in common language, it is generally used to signify only the solid part. Lord Monboddo and other authors, who are fond of representing mankind as origi-

nally

nally very little, if at all, wiser than brutes, tell us, that, in the first ages, men lived upon acorns, berries, and such fruits as the earth spontaneously produces; that they next proceeded to eat the flesh of wild animals taken in hunting; but the number of these decreasing, and mankind multiplying, necessity taught them the art of cultivating the ground, sowing corn, &c. That after this, reason suggests the expedient of domesticating certain animals, both to assist them in their labours and supply them with food: that hogs were the first animals of the domestic kind that appeared upon their tables; that they held it to be ungrateful to devour the beasts that assisted them in their labours, &c. But all this is at best conjectural, unsupported by any better authority, than that of the fabulous Herodotus. Nay the fact seems to be, that animal and vegetable food, such as we now use, were both made use of in the very first age of the world. Moses, the most ancient, as well as the most authentic of historians, informs us, that "Abel was a keeper of sheep, and Cain a tiller of the ground;" whence we may fairly presume, that sheep were then kept and fed, as they now are, for the sake of their mutton; for we cannot suppose the woollen manufacture to have been among the most early inventions, though the skins untanned might serve for cloathing. As to cookery, it is supposed, and seems not improbable, that all animal food was at first only roasted, and that boiling was a later invention. Even in the present age the inhabitants of Otaheite are said to have been entirely unacquainted with it, till the Europeans visited them. The eating of fish too seems also to have been of a much later date than that of flesh. Homer makes Menelaus complain that they had been constrained to eat them. Though originally designed to be a blessing to mankind, as well as their support, food may, in many cases, by our abuse of it, be justly considered as a curse: for we do not hesitate to affirm, that the injudicious conduct of parents and nurses, during infancy, and the early years of childhood, lays the foundation of those numerous diseases, which, at a maturer age arise from indigestion, and have, in many families, become hereditary. The aliment of children ought to be adapted to their age, and the strength of their digestive powers. Hence they ought by no means to be fed immoderately, and promiscuously with every kind of food: as, by this indulgence, the first passages are distended, and their stomachs gradually acquire an unnatural craving for victuals, before the preceding meal is properly assimilated. Such conduct is particularly injurious during the first year of their age: for, when their stomachs become more vigorous, they may be enabled, by slow degrees, to digest different kinds of victuals, the nature and properties of which are extremely opposite; though excess in quantity is always hurtful. No food whatever, that has been prepared for many hours, should be given to children, especially after being warmed up, as it generates flatulence, heart-burn, costiveness, and a variety of disorders which are equally painful and difficult to remove. Sudden changes from liquid to solid food are equally dangerous: one kind of aliment only, should be given at each meal, in moderate portions; and not a multiplicity of incongruous mixtures, in immediate succession, such as broth or soup, meat boiled or roasted, after taking milk, fruit, &c. All stimulating dishes, prepared for adults, as well as beer, wine, spices, coffee, and other heating liquors, should be carefully withheld from children; as they often occasion the most afflictive complaints, for instance, eructations, vomiting, spasms, and convulsions, especially during dentition; and, if the hapless victims of indulgence survive that period, they become liable to other tormenting diseases, the most frequent of which are the scurvy, scrophula, and consumption. There is another abuse in the feeding of children, which cannot be too seriously reprehended, namely, to introduce chewed victuals into their mouth, a practice equally disgusting and unwholesome. Young and healthy mothers, it has been said, may safely perform this office for their children: but, in such case, it is requisite that the parent be in a complete state of health, that she be provided with sound teeth, and rinse her mouth previously with pure water. Under these circumstances, she may venture to perform mastication, though it would be more advisable to relinquish this practice, and to give infants such food only as they are able to chew and digest. Vegetables are, with a few exceptions, more difficult of digestion than animal food; but a due proportion of both, with the addition of acids, during the summer months, is alike grateful and conducive to health. On the whole,

the flesh of young quadrupeds is less nutritive than after they have attained a proper age; though it will, in general, be more easily converted into alimentary matter. In a salted state, meat not only loses a considerable part of its gelatinous and spirituous particles, but it likewise becomes oppressive to the digestive organ, and imparts a degree of acrimony to the human fluids, which has a remarkable tendency to generate putrid diseases, such as the scurvy of mariners. Hence it would be a desirable object to ascertain, by accurate experiments, whether beef, pork, &c. might not be kept fresh at sea for many months, merely by burying it in charcoal-powder, of which it could be easily divested by proper ablution. Such is our decided opinion, and we venture to recommend this important subject to the farther researches of patriotic inquirers. With respect to the quantity of food, there is one general rule, which ought never to be disregarded; namely, to cease eating, when the first cravings of appetite are satisfied, so as to renovate the waste which the body has apparently sustained. By a strict adherence to this principle, many of those distressing complaints arising from intemperance, might be effectually obviated; and our fashionable watering-places would not be so frequently crowded by the victims of luxury.

FOOD OF PLANTS, an expression in agriculture and gardening, by which is understood whatever tends to increase the growth, or affords nourishment to vegetable productions. The proper choice and distribution of this food, in such manner as to ensure the greatest advantage to vegetation, is an object deserving the most attentive exertion of every skilful husbandman. The component parts of the nourishment of plants are supposed to be air, heat, water, earth, and nitre; but it is by no means ascertained, which of these ingredients principally contributes to their growth and reproduction. Various opinions have been held respecting the existence of an aerial acid spirit; but, from the late discoveries in chemistry, this invisible agent appears to be no other than what is now termed oxygen gas, or the acidifying principle, by the powerful influence of which even iron is oxidated, or converted into rust: and, as this vital gas is an essential constituent of the atmosphere, all plants necessarily partake of its animating properties. Thus nitre is said to nourish them; because it contains a large portion of oxygen; though it is certain that saltpetre only prepares other substances to effect that purpose: thus, if nitre, in a solid or liquid state, be applied to the root of a plant, it will destroy it; but if it be placed at a distance, it attenuates, and decomposes, the viscous and naturally pernicious matters contained in the earth, so as to render them fit for supplying vegetables with nutriment. Water contributes to the growth of plants in a very material degree: hence arose the art of floating land in dry seasons, without which vegetables would perish for want of moisture. See IRRIGATION. Air, on account of its elasticity, is absolutely necessary to the increment of vegetables; warmth is of equal importance, because no plant can thrive without some degree of heat. But, doubtless, the chief article is earth; which, being prepared by the nitrous, and other volatile salts, such as are generated in dung, not less than by water and air, is assimilated to the nature of plants; constitutes a part of them; and is inseparable from them: but, if water, air, and heat, be taken away, the plant will still exist; though, from the want of those elements, it has ceased to vegetate. The excess of nitre, air, water, and heat, however, is a proof that these articles do not constitute the proper, or only food of plants. Thus, too great a proportion of nitre, or other salts, corrodes, and deprives them of vegetable life; too much water drowns them; too great a degree of air dries their roots: and too much heat shrivels and burns them; but there cannot be too large a proportion of earth, unless the plant be too deeply buried under it, so as to exclude the salutary influence of the other elements; in which case it must necessarily perish. Many experiments have lately been made with factitious gases, in order to ascertain whether the growth of plants might be forwarded by such artificial agents; but, though some of these elastic airs, such as oxygen have been found remarkably to promote vegetation, yet the expence and trouble, which these applications would occasion in the great way, will ever be insuperable objections to their general introduction. From recent attempts to fertilize and stimulate the soil itself, as the growing medium, with chemical solutions, it appears that water very slightly impregnated with camphor, or, according to others, with

the phosphoric acid, has produced uncommon effects on the earth of vegetables, and accelerated their rapid growth in a very evident manner. Farther experiments, however, will decide how far such means are practicable, and whether the nature of plants thus forced, is materially changed or affected.

FOOSHT, an island in the Red Sea; situated, according to the observations of Mr. Bruce, in N. lat. $15^{\circ} 59' 43''$.

FOOT, that part of the body on which animals stand and walk. The principal cause of the lameness and distortion observable among many children, especially of the poorer class, is owing to an improper management of them, during their infancy. Instead of being carried on the nurses' arms, in a posture which contracts and palsies the lower extremities, they ought to be supported in such a direction that the legs and feet may be at liberty. Nor should they be confined too early in narrow shoes, with a view to render their feet small and taper: those necessary parts of our dress ought to be wide enough to allow sufficient room for motion, and might be fastened with strings, which are preferable to buckles. It will also be proper to adapt the shoes to the form of each foot, by means of separate lasts; in the same manner as those of the fashionable classes are made at present. A kind of half-boots, however, such as may be laced above the ankles, are superior to shoes, as they not only have the advantage of fitting the leg, but are likewise not easily trodden down at the heels; besides children are enabled to walk more firmly in them than in shoes. With respect to the feet of adults, we would recommend always to adapt the shoe to their size and shape, and utterly to disregard the prevalence of an absurd fashion, which is often attended with inconvenience. Animals are distinguished, with respect to the number of their feet, into bipedes, two-footed; such are men and birds: quadrupedes, four-footed; such are most land-animals: and multipedes, or many-footed, as insects. The reptile-kind, as serpents, &c. have no feet; the crab-kind of fish have gotten feet, but most other fishes have no feet at all: the spider, mites, and polypuses, have eight; flies, grasshoppers, and butterflies, have six feet. Animals destined to swim, and waterfowl, have their toes webbed together, as the phocæ, goose, duck, &c. The fore-feet of the mole, rabbit, &c. are wonderfully formed for digging and scratching up the earth, in order to make way for their head.

Foot, in anatomy. See **ANATOMY**.

Foot, in the Latin and Greek poetry, a measure, composed of a certain number of long and short syllables. They are commonly reckoned 28: of these some are simple, as consisting of two or three syllables, and therefore called dissyllabic or trissyllabic feet; others compound, consisting of four syllables, and therefore called tetrasyllabic feet. The dissyllabic feet are four in number, viz. the pyrrhichius, spondeus, iambus, and trocheus. See **PYRRHICHIVS**, &c. The trissyllabic feet are eight in number, viz. the dactylus, anapestus, tribrachys, molossus, amphibrachys, amphimacer, bacchius, and antibacchius. See **DACTYLUS**, &c. The tetrasyllabic are 16 in number, viz. the procleumaticus, spondeeus, choriambus, antispastus, diambus, dichoreus, ionicus a minore, ionicus a minore, epitritus primus, secundus, tertius, et quartus, pæon primus, secundus, tertius, et quartus. See **PROCLESMATICUS**, &c.

Foot, a long measure containing 12 inches: it is divided by geometricians into 10 digits, and the digit into 10 lines. See **MEASURE**.

Foot of a Horse, in the manege, the extremity of the leg, from the coronet to the lower part of the hoof. See **FARRIERY**.

Foot, Solid or Cubic, is the same measure in all the three dimensions, length, breadth, and depth or thickness, containing 1728 cubic inches.

Foot, Square, is the same measure both in breadth and length, containing 144 square or superficial inches.

FOOTE, SAMUEL, an English dramatic writer and actor, was born at Truro, in Cornwall, in 1722. His father was a justice of peace for that county, and his mother sister to Sir John Dinely Goodere, of Herefordshire. Foote was educated at Worcester College, Oxford, from whence he removed to the Temple; but as the dryness of this study did not suit the liveliness of his genius, he soon relinquished it. He married a young lady of a good family and some fortune; but their tempers not agreeing, harmony did not long subsist between them. He now launched into gaming and all the fashionable follies of the age; and in a few years spent his whole fortune. His necessities led him to the stage, and

he made his first appearance in *Othello*. In 1747 he opened the little theatre in the Haymarket, with a dramatic piece of his own, called, *The Diversions of the Morning*, which succeeded very well. The exhibition next season, was called *An Auction of Pictures*, in which he took off some of the most noted characters of the day. He still continued to play at one or the other of the theatres, and frequently produced new pieces. In 1760 he brought out the *Minor* at his own house in the Haymarket. In 1766 he had the misfortune to break his leg, which was obliged to be amputated. The duke of York, out of compassion, procured for him a patent for life for the theatre in the Haymarket. In 1776 he attacked the duchess of Kingston in a piece, which was suppressed by authority. Soon after this a man-servant, whom he had dismissed, charged him with an unnatural offence; of which he was honourably acquitted. He died at Dover, on his way to France for his health, in Oct. 1777. His remains were interred in Westminster abbey. Foote had an infinite fund of comic humour, both in writing and conversation; but he took unwarrantable liberties in taking off persons merely on account of natural failings and peculiarities of manner. His farces have procured him the title of the English *Aristophanes*.

Foot-Halt, a disorder incident to sheep. It takes its source from an insect, which, when it comes to a certain maturity; resembles a worm of 2, 3, or 4 inches in length. The first appearance of this malady is, when the sheep gives signs of lameness, which increase to so high a degree as to prevent grazing; when, with want of sufficient food, and pain, the poor animal suffers greatly, and lingers till it dies, if not cured by extracting the insect or worm. The sooner this is done the better, as it is easily performed. As soon as the lameness is perceived, let the foot that is lame be examined between the close of the claws, and it will be found that in the skin where the close separates is a small hole (not natural,) through which the insect, when yet small, gets its entrance, and by degrees has worked itself upwards along the leg, between the outward skin and bone, and obtains its largest magnitude. Proportionally it finds its nourishment, when it is left undisturbed. This worm must be extracted by moving the claws backward and forward in contrary directions: when the under part of the worm will soon make its appearance at the above-mentioned small hole, and continuing the same operation of moving the claws, the whole worm will work itself out. This is better than at its first appearance to draw it out with danger of breaking off; lest part of it should remain in the sheep's leg, and, by rotting there, prove hurtful. This easy operation will be effectual without any application whatever, and the channel, which the worm hath made along the leg, will cure of itself. This malady is in some years more prevalent than in others, particularly in wet seasons; and is oftener observed to begin in spring and autumn than in summer and winter; notwithstanding sheep suffer more by the wet in winter than in any of the other seasons. In high grounds, they are less liable to it than in low marshy and meadow grounds; from all which circumstances it may be supposed, that this insect, in its first state, has for its most natural element either the earth, water, or air; and only gets accidentally between the close of the claws of the sheep, and finds there what is sufficient for its nourishment and security.

Foot-Geld, or **FAUT-GELD**, in our old customs, an amercement laid upon those who live within the bounds of a forest, for not lawing or cutting out the ball of their dog's feet. To be free of a foot-geld, was a privilege to keep dogs unclawed, within the bounds of a forest.

Foot-Level, among artificers, an instrument that served as a foot-rule, a square, and a level. See **LEVEL**, **RULE**, and **SQUARE**.

Foot-Pace, or **HALF-PACE**, among carpenters, a pair of stairs, whereon, after four or six steps, you arrive at a broad place, where you may take two or three paces before you ascend another step. The design of which is to ease the legs in ascending the rest of the steps.

Foot-Rot, a disease to which sheep are subject, and which is said to be contagious. The first symptom of the disorder is manifest, when the animal affected begins to limp; though no injury will be perceptible on examining the foot, which is extremely hot. The second stage of the distemper is a yellowish-white spot, that appears in the cleft of the hoof, spreads gradually, and becomes livid; destroying the hair, which in sound animals covers the foot. At this period, the diseased part acquires a disagreeable smell,

smell, and the lameness increases. In the third stage, the malady sinks into the frog of the foot; the shell of the hoof loosens, and the frog is filled with fetid matter, that oozes out when pressed by the hand: a small tumor sometimes breaks out in the front of the leg, about one inch above the hoof, which, however, is easily dispersed. In the last stage, the foot is so completely mortified by the cancerous humour corroding every part of it, as to become incurable; in which case, the skin is the only valuable part of the animal. Through these different periods, the sheep affected retain their appetite, and feed apparently as well as when in health; but they very soon fall away, and continue to decline, till they have lost all their fat. Notwithstanding their rapid decay, at the end of the second and the commencement of the third stage, they are so eager for food, that they even crawl on their knees for sustenance. For the cure of this infectious disorder, different remedies have been prescribed; from which we select the following: the first was invented by the late Mr. Bakewell, the other by Mr. George Culley, of Fenton, Northumberland. 1. Take 3 oz. of verdigrise; of vitriol, and common alum, 4 oz. each; white mercury $1\frac{1}{2}$ oz. and white copperas, 1 oz. The whole is to be finely pulverized, and dissolved in a quart of white-wine vinegar. 2. Let 4 oz. of the best honey; 2 oz. of burnt alum reduced to powder, and $\frac{1}{2}$ lb. of pulverized Armenian bole, be mixed in as much train or fish-oil as will convert these ingredients into the consistence of salve: the honey ought first to be gradually dissolved, when the Armenian bole should be properly stirred in, after which the alum and train-oil are to be added. The parts affected may be rubbed with either of these compositions; unless the distemper has become incurable; but in the opinion of Mr. Arthur Young, the red salve of Mr. Culley, is more efficacious than Mr. Bakewell's liquid; having cured one or two diseased feet, where the latter had failed: yet Mr. Young always employs the liquid, previously to anointing the animals with the salve. This malady, in general, arises from long grass in wet seasons; but, if sheep be suffered to lie upon their own dung, a fermentation will take place, and occasion either the foot-rot, or the foot-halt: to prevent which fatal disorders, those animals should be well littered, and kept with a strict attention to cleanliness.

FORADADA, a small island in the Mediterranean, near Majorca.

FORAGE, in military affairs, implies hay, straw, and oats, for the subsistence of the army horses. It is divided into rations, of which one is a day's allowance for a horse, and contains 20lb. of hay, 10lb. of oats, and 5lb. of straw. When cavalry is stationed in barracks in Great Britain, the number of rations of forage is, to field-officers four, supposing them to have four effective horses; to captains three; to staff-officers two; to quarter-masters, non-commissioned officers, and privates, each one. On foreign service, this article is governed by circumstances.

FORAMEN, in anatomy, a name given to several apertures or perforations in divers parts of the body; as, 1. The external and internal foramina of the cranium or skull. 2. The foramina in the upper and lower jaw. 3. Foramen lachrymale. 4. Foramen membranae tympani. See **ANATOMY**.

FORBES, DUNCAN, Esq. of Culloden, an eminent Scots lawyer and judge, born in 1685. In his early life, he was brought up in a family remarkable for hospitality; which, perhaps, led him afterwards to a free indulgence in social pleasures. His natural disposition inclined him to the army, but, as he soon discovered a superior genius, by the advice of his friends he applied himself to the civil law; in which he made a quick progress, and, in 1709, was admitted an advocate. From 1722 to 1737, he represented the boroughs of Inverness, Fortrose, Nairn, and Forres. In 1725, he was made king's advocate; and in 1737, Lord President. In 1714 and 1745 he espoused the royal cause, but conducted himself with so much prudence and moderation, that not a whisper was at any time heard to his prejudice. The glory he acquired in advancing the prosperity of his country, and in contributing to re-establish peace and order, was his only reward. He died in 1747. His lordship was a man of great piety and learning, and well versed in the Hebrew scriptures, as appears from his Letter to a Bishop on Hutchinson's Writings and Discoveries, in 1732; Thoughts concerning Religion, natural and revealed, 1735; and Reflections on Incredulity; the whole collected into one volume, 12mo. 1750. His works have since been published in two vols. 8vo.

FORBES, PATRICK, bishop of Aberdeen, was born in 1554, when the affairs of the church of Scotland were in much confusion; to the settlement of which he greatly contributed. As chancellor of the university of Aberdeen, he improved that seat of learning by repairing the fabric, augmenting the library, and reviving the professorships. He published a Commentary on the Revelation at London, 1613; and died in 1635.

FORBES, JOHN, the son of Patrick, but of much more extensive learning than his father, was perhaps excelled by none of his age, which will be allowed by those who read his Historical and Theological Institutes. He was also bishop of Aberdeen; but was expelled by the Covenanters, and forced to fly beyond sea. He continued in Holland two years; and, upon his return, lived privately on his estate at Corse, till he died in 1648. His works were printed in two vols. folio at Amsterdam in 1703.

FORCALQUIER, a town of France in the department of the Lower Alps, on the Laye, 20 miles N. E. of Aix.

FORCE, in philosophy, denotes the cause of the change in the state of a body, when being at rest, it begins to move, or has a motion which is either not uniform or not direct. While a body remains in the same state, either of rest or of uniform and rectilinear motion, the cause of its remaining in such a state is in the nature of the body, and it cannot be said that any extrinsic force has acted on it; if two equal and opposite forces be applied, they destroy each other. This internal cause or principle is called Inertia. Mechanical forces may be reduced to two sorts; one of a body at rest, the other of a body in motion. The force of a body at rest, is that which we conceive to be in a body lying still, on a table, or hanging by a rope, or supported by a spring, &c. and this is called by the names of pressure, tension, force, or vis mortua, sollicitatio, conatus movendi, conamen, &c. To this class also of forces we must refer Centripetal, and Centrifugal forces, though they reside in a body in motion; because these forces are homogeneous to weights, pressures, or tensions of any kind. The force of a body in motion is a power residing in that body so long as it continues its motion; by means of which it is able to remove obstacles lying in its way; to lessen, destroy, or overcome, the force of any other moving body, which meets it in an opposite direction; or to surmount any dead pressure or resistance, as tension, gravity, friction, &c. for some time; but which will be lessened or destroyed by such resistance as it lessens or destroys the motion of the body. This is called vis motrix, moving force, and by some late writers vis viva, to distinguish it from the vis mortua spoken of before; and by these appellations, however different, the same thing is understood by all mathematicians, viz. that power of displacing, of withstanding opposite moving forces, or of overcoming any dead resistance, which resides in a moving body, and which, in whole or in part, continues to accompany it, so long as the body moves. See **MECHANICS**.

FORCE, COMPARATIVE OF MEN AND HORSES. There are several curious as well as useful observations in Desagulier's Experimental Philosophy, concerning the comparative forces of men and horses, and the best way of applying them. A horse draws with the greatest advantage when the line of direction is level with his breast; in such a situation, he is able to draw 200lb. 8 hours a-day, walking about two miles and an half an hour. And if the same horse be made to draw 240lb. he can work but six hours a-day, and cannot go quite so fast. On a carriage, indeed, where friction alone is to be overcome, a middling horse will draw 1000 lb. But the best way to try a horse's force is by making him draw up out of a well, over a single pulley or roller; and in such a case, one horse with another will draw 200lb. Five men are found to be equal in strength to one horse, and can, with as much ease, push round the horizontal beam of a mill, in a walk 40 feet wide; whereas three men will do it in a walk only 19 feet wide. The worst way of applying the force of a horse, is to make him carry or draw up hill; for if the hill be steep, three men will do more than a horse, each man climbing up faster with a burden of 100lb. weight, than a horse that is loaded with 300lb. a difference which is owing to the position of the parts of the human body, being better adapted to climb than those of a horse. On the other hand, the best way of applying the force of a horse, is in an horizontal direction, wherein a man can exert least force; thus a man, weighing 140lb. and drawing a boat along by means of a rope coming over his shoulders, cannot draw above 27lb. or exert above one-seventh part of the force of a horse employed on the same

same purpose. The very best and most effectual posture in a man, is that of rowing; wherein he not only acts with more muscles, at once for overcoming the resistance, than in any other position; but as he pulls backwards, the weight of his body assists by way of lever. See Desaguliers, Exp. Phil. vol. i. p. 241, where we have several other observations relative to force acquired by certain positions of the body, from which that author accounts for most feats of strength and activity. See also a Memoir on this subject by M. de la Hire, in Mem. Roy. Acad. Sc. 1629; or in Desaguliers, Exp. &c. p. 267, &c. who has published a translation of part of it with remarks.

FORCE, ACCELERATIVE, or RETARDIVE FORCE, is that which respects the velocity of the motion only, accelerating or retarding it; and it is denoted by the quotient of the motive force, divided by the mass or weight of the body. So, if m denote the motive force, and b the body, or its weight, and f the accelerating or retarding force, then is $f = \frac{m}{b}$. Again, forces are either constant or va-

riable. Constant forces are such as remain and act continually the same for some determinate time. Such, for example, is the force of gravity, which acts constantly the same upon a body, while it continues at the same distance from the centre of the earth, or from the centre of force, wherever that may be. In the case of a constant force F , acting upon a body b , for any time t , we have these following theorems; putting $f =$ the constant accelerating force $= F \div b$; $v =$ the velocity at the end of the time t ; $s =$ the space passed over in that time, by the constant action of that force on the body: and $g = 16\frac{1}{2}$ feet, the space generated by gravity in 1 second, and calling the accelerating force of gravity 1; then is

$$s = \frac{1}{2}tv = gft^2 = \frac{v^2}{4gf}; v = 2gft = \frac{v^2}{t} = \sqrt{4gfs}; t = \frac{v}{2gf}$$

$$= \frac{2s}{v} = \sqrt{\frac{s}{gf}}; f = \frac{s}{2gt} = \frac{v^2}{4gs}$$

FORCES, VARIABLE, are such as are continually changing in their effect and intensity; such as the force of gravity at different distances from the centre of the earth, which decreases in proportion as the square of the distance increases. In variable forces, theorems similar to those above may be exhibited, by using the fluxions of quantities, and afterwards taking the fluents of the given fluxional equations. And herein consists one of the great excellencies of the Newtonian or modern analysis, by which we are enabled to manage and compute the effects of all kinds of variable forces, whether accelerating or retarding. Thus, using the same notation as above for constant forces, viz. f , the accelerating force at any instant; t , the time a body has been in motion by the action of the variable force; v , the velocity generated in that time; s , the space run over in that time; and $g = 16\frac{1}{2}$ feet; then is

$$s = \frac{v^2}{2gf} = vt; v = \frac{v^2}{v} = 2gft; t = \frac{v}{2gf}; f = \frac{v^2}{2gs}$$

In these four theorems, the force f , though variable, is supposed to be constant for the indefinitely small time t ; and they

are to be used in all cases of variable forces, as the former ones in constant forces; viz. from the circumstances of the problem under consideration, deduce a general expression for the value of the force f , at any indefinite time t ; then substitute it in one of these theorems, which shall be proper to the case in hand; and the equation thence resulting will determine the corresponding values of the other quantities in the problem. It is also to be observed, that the foregoing theorems equally hold good for the destruction of motion and velocity, by means of retarding or resisting forces, as for the generation of the same by means of accelerating forces.

FORCE, in law, signifies any unlawful violence offered to things or persons, and is divided into simple and compound.

I. FORCE, COMPOUND, is where some other violence is committed with such an act which of itself alone is criminal; as if one enters by force into another's house, and there kills a person, or ravishes a woman. There is likewise a force implied in law, as in every trespass, rescue, or disseisin, and an actual force with weapons, number of persons, &c.—Any persons may lawfully en-

ter a tavern, inn, or victualling house; so may a landlord his tenant's house to view repairs, &c. But if, in these cases, the person that enters commits any violence or force, the law will intend that he entered for that purpose.

II. FORCE, SIMPLE, is what is so committed, that it has no other crime attending it; as where a person by force enters on another's possession, without committing any other unlawful act.

FORCELLAR, a town of Naples, in the province of Abruzzo Ultra, 3 miles E. of Teramo.

FORCEPS, a pair of nippers, or pinchers, for laying hold of and pulling out any thing forced into another body.

FORCEPS, in surgery, &c. a pair of scissors for cutting off, or dividing, the fleshy or membranous parts of the body. See **SURGERY**.

FORCER, or **FORCING-PUMP**, in mechanics, is a kind of pump in which there is a forcer or piston without a valve. See **PUMP**.

FORCIBLE DETAINER, in law, is where one by violence withholds the possession of lands, &c. so that the person who has a right of entry is barred, or hindered, therefrom.

FORCIBLE ENTRY is, a violent and actual entry into houses or lands. At common law, any person that had a right to enter into lands, &c. might retain possession of it by force. But this liberty being abused, to the breach of the peace, it was therefore found necessary that the same should be restrained: Though, at this day, he who is wrongfully dispossessed of goods may by force retake them. By statute, no persons shall make an entry on any lands or tenements, except where it is given by law, and in a peaceable manner, even though they have title of entry, on pain of imprisonment: and where a forcible entry is committed, justices of peace are authorized to view the place, and enquire of the force by a jury, summoned by the sheriff of the county; and they may cause the tenements, &c. to be restored, and imprison the offenders till they pay a fine. A writ of forcible entry also lies, where a person seised of a freehold, is by force put out thereof.

FORCIBLE MARRIAGE, of a woman of estate, is felony. For by the statute 3 Hen. 7. c. 2, it is enacted, "That if any persons shall take away any woman having lands or goods, or that is heir apparent to her ancestor, by force, and against her will, and marry or defile her; the takers, procurers, abettors, and receivers, of the woman taken away against her will, and knowing the same, shall be deemed principal felons; but as to procurers and accessories, they are, before the offence be committed, to be excluded the benefit of clergy, by 39 Eliz. c. 9. The indictment on the statute 3 H. 7. is expressly to set forth, that the woman taken away had lands or goods, or was heir apparent; and also that she was married or defiled, because no other case is within the statute; and it ought to allege that the taking was for lucre." It is no excuse that the woman at first was taken away with her own consent: for if she afterwards refuse to continue with the offender, and be forced against her will, she may from that time properly be said to be taken against her will; and it is not material whether a woman so taken away be at last married or defiled with her own consent or not, if she were under force at the time; the offender being in both cases equally within the words of the act. Those persons who, after the fact, receive the offender, are but accessories after the offence, according to the rules of common law; and those that are only privy to the damage, but not parties to the forcible taking away, are not within the act, H. P. C. 119. A man may be indicted for taking away a woman by force in another country; for the continuing of the force in any country amounts to a forcible taking there. Ibid. Taking away any woman-child under the age of 16 years and unmarried, out of the custody and without the consent of the father or guardian, &c. the offender shall suffer fine and imprisonment; and if the woman agree to any contract of matrimony with such person, she shall forfeit her estate during life, to the next of kin to whom the inheritance should descend, &c. Stat. 4 & 5. P & M. c. 8. This is a force against the parents: and an information will lie for seducing a young man or woman from their parents, against their consents, in order to marry them, &c. See **MARRIAGE**.

FORCING, in gardening, a method of producing ripe fruits from trees before their natural season. The method of doing it is this: A wall should be erected ten feet high; a border must be marked out on the south side of it, of about four feet wide, and some stakes must be fastened into the ground all along the edge of the

the border; these should be four inches thick. They are intended to rest the glass lights upon, which are to slope backwards to the wall, to shelter the fruit as there shall be occasion: and there must be, at each end, a door to open either way, according as the wind blows. The frame should be made moveable along the wall, that when a tree has been forced one year, the frame may be removed to another, and so on, that the trees may each of them be forced only once in three years, at which rate they will last a long time. They must be always well-grown trees that are chosen for forcing; for young ones are soon destroyed, and the fruit that is produced from them is never so well tasted. The fruits most proper for this management are the avant or small white nutmeg, the albermarle, the early Newington, and the brown nutmeg peaches; Mr. Fairchild's early, and the elrugo and Newington nectarines; the masculine apricot, and the may-duke and may-cherry. For grapes, the white and black sweet-water are the properest; and of gooseberries the Dutch white, the Dutch early green, and the walnut goose-berry; and the large Dutch white and large Dutch red currants. The dung, before it is put to the wall, should be laid in a heap for five or six days, that it may heat thoroughly; and when thus prepared it must be laid four feet thick at the base of the wall, and go sloping up till it is two feet thick at the top. It must be laid at least within three or four inches of the top of the wall; and when it sinks, as it will sink two or three feet, more dung must be laid on; for the first heat will do little more than just swell the blossom buds. The covering of the trees with glasses is of great service; but they should be taken off to admit the benefit of gentle showers to the trees, and the doors at the ends should be either left entirely open, or one or both of them opened, and a mat hung before them, at once to let the air circulate and keep off the frosts. The dung is never to be applied till towards the end of November; and three changes of it will be sufficient to ripen the cherries, which will be very fine in February. As to the apricots, grapes, nectarines, peaches, and plums, if the weather be milder, the glasses are to be opened to let in sunshine or gentle showers. If a row or two of scarlet strawberries be planted at the back of the frame, they will ripen in February or the beginning of March; the vines will blossom in April, and the grapes will ripen in June. It should be carefully observed, not to place early and late ripening fruits together, because the heat necessary to force the late ones will be of great injury to the early ones after they have fruited.

FORCING, in the wine trade, a term used by the wine coopers, for the fining down wines, and rendering them fit for immediate draught.

FORDSAND, a small island of Denmark, near the coast of Sleswick. Lon. 8. 35. E. Lat. 55. 1. N.

FORDWICH, a town of Kent, called in the Domesday Book "the little Borough of Fordwich," is a member of the port of Sandwich, and was anciently incorporated by the style of the barons of the town of Fordwich, but more lately by the name of the mayor, jurats, and commonalty, who enjoy the same privileges as the cinque-ports. It is famous for excellent trouts, taken in the Stour.

FORDYCE, DAVID, an elegant and learned writer of the 18th century, was professor of philosophy in the Marischal college, Aberdeen. He was originally designed for the ministry; to prepare himself for which was the whole aim of his ambition, and for a course of years the whole purpose of his studies. How well he was qualified to appear in that character, appears from his Theodorus, a dialogue concerning the art of preaching. After having finished this work, he went abroad on his travels, to obtain fresh stores of knowledge: but after a successful tour through several parts of Europe, he was unfortunately cast away in a storm on the coast of Holland. He wrote also Dialogues on Education, 8vo. and a Treatise of Moral Philosophy, published in the Preceptor. The third edition of his Theodorus was published in London, after his untimely death, by his brother, the Rev. Mr. James Fordyce, an eminent dissenting minister, in 1755.

FORE, applied to a ship, denotes that part of her frame and machinery which lies near the stern.

FORE AND AFT is used for the whole ship's length, or from end to end.

FORE-CASTLE OF A SHIP, that part where the fore-mast stands. It is divided from the rest by a bulk-head. See the article SHIP.

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FORE-CLOSED, in law, signifies the being shut out, and excluded, or barred, the equity of redemption on mortgages, &c.

FORE-FOOT, in the sea-language, signifies one ship's lying, or sailing, cross another's way: as if two ship's being under sail, and in ken one of another, one of them lying in her course with her stem so much a weather the other, that holding on their several ways, neither of them altering their courses, the windward ship will run a-head of the other: then it is said, such a ship lies with the other's forefoot.

FOREIGN, in the English law, is used in various significations. Thus,

1. **FOREIGN ATTACHMENT**, is an attachment of the goods of foreigners found within a city or liberty, for the satisfaction of some citizen to whom the foreigner is indebted; or it signifies an attachment of a foreigner's money in the hands of another person.

2. **FOREIGN KINGDOM**, a kingdom under the dominion of a foreign prince. At the instance of an ambassador or consul, any offender against the laws here may be sent for hither from a foreign kingdom to which he hath fled. And, where a stranger of Holland, or any foreign country, buys goods at London, for instance, and there gives a note under his hand for payment, and then goes away privately into Holland; in that case, the seller may have a certificate from the lord mayor, on the proof of the sale and delivery of such goods, whereupon a process will be executed on the party in Holland.

3. **FOREIGN OPPOSER**, or **APPOSER**, an officer in the exchequer that opposes or makes a charge on all sheriffs, &c. of their green wax; i. e. fines, issues, amerciaments, recognizances, &c.

4. **FOREIGN PLEA**, signifies an objection to the judge of the court, by refusing him as incompetent, because the matter in question is not within his jurisdiction.

5. **FOREIGN SEAMEN**, serving two years on board British ships, whether of war, trade, or privateers, during the time of war, shall be deemed natural-born subjects.

FOREIGNERS, though made denizens, or naturalized, are disabled to bear any office in government, to be of the privy council, or members of parliament, &c. This is by the acts of the settlement of the crown. Such persons as are not freemen of a city or corporation, are also called foreigners, to distinguish them from the members of the same.

FOREJUDGER, a judgement whereby a man is deprived, or put out, of the thing in question.

FOREJUDGED THE COURT, is when an officer or attorney of the court of common-pleas is expelled the same for some offence, or for not appearing to an action by bill filed against him; and in the latter he is not to be re-admitted till he shall appear. By 2 Hen. IV. c. 8, he shall lose his office and be fore-judged the court.

FORELAND, NORTH, a promontory of England on the N. E. extremity of the isle of Thanet, in Kent, ascertained by act of parliament to be the most southern part of the port of London, which is thence extended N. in a right line to the point, called the Nase on the coast of Essex, and forms the mouth of the Thames. A round brick tower near 80 feet high, was erected here, as a sea-mark, by the Trinity House corporation. It has a light house on its top, in which lights are kept burning every night. The sea gains so much upon the land here by the winds at S. W. that, within the memory of persons still living, about 30 acres of land have been lost in one place. It is $2\frac{1}{2}$ miles S. E. of Margate. Longitude of the light-house, $1^{\circ} 26' 22''$ E. from Greenwich. Latitude of the same, $51^{\circ} 22' 40''$ N.

FORELAND, SOUTH, a promontory of England on the E. coast of Kent, between Dover and Deal, which forms the east point of the Kentish shore, and is called South, in respect to its bearing from the other Foreland, and is about six miles to the N. Their situation is of great security to the noted road between them, called the Downs, which would be very dangerous for ships; did not this point break the sea off, that would otherwise come rolling up from the W. to the Flats or sand-banks, which for three leagues together, and a about a league and a half from the shore, run parallel with it, and are dry at low water. Lon. $1^{\circ} 22' 6''$ E. Lat. $51^{\circ} 8' 21''$ N.

FORELAND, SOUTH, a cape on the W. coast of North America, in Cook's river. Lon. $121. 20. W.$ Lat. $60. 50. N.$

FORELOCKS, in the sea-language, little flat wedges made of E.

with iron, used at the ends of bolts to keep them from flying out of their holes.

FORE-MAST OF A SHIP, a large round piece of timber, placed in her fore-part, or fore-castle, and carrying the fore-sail and fore-top-sail yards. Its length is usually eight-ninths of the main-mast, and the fore-top-gallant-mast is one-half the length of the fore-top.

FORE-MAST MEN, are those on board a ship that take in the top sails, sling the yards, furl the sails, bowse, trice, and take their turn at the helm, &c.

FORE-REACH, in the sea-language: a ship is said to fore-reach upon another, when both sailing together, one sails better, or out-goes the other.

FORESCHOK, in our old authors, signifies the same with forsaken, and is particularly used in one of our statutes for lands or tenements seised by the lord for want of services performed by his tenant, and quietly held by such lord above a year and a day, without any due course of law taken by the tenant for recovery thereof; here he does in presumption of law disavow or forsake all the rights he has thereto, for which reason those lands shall be called foreschoke.

FORESKIN, in anatomy. See **PREPUCE**.

FOREST, in geography, a huge wood; or, a large extent of ground covered with trees. The word is formed of the Latin *foresta*, which first occurs in the capitulars of Charlemagne, and which itself is derived from the German *frost*, signifying the same thing. Spelman derives it from the Latin *foresta restat*, by reason forests are out of towns. Others derive *foresta* from *feris*, q. d. *Foresta, quoad sit tuta statio ferarum*, as being a safe station or abode for wild beasts. The principal forests in this country are those of Sherwood, Windsor, the New Forest, that of Dean, on the north of the river Severn, and Epping Forest, in the county of Essex. There are, besides, several smaller forests, the total extent of which, together with those just enumerated, amounts to about 300,000 acres. The utility of forests, to a commercial nation, is very great; as, by the quantity of timber they afford, a considerable expence may be saved, which must otherwise be incurred by the importation of materials for ship-building. Independently of these considerations, forests of a moderate extent are a national ornament, especially if they do not occupy such lands as could be more usefully employed in agriculture. Formerly, England abounded with woods, and was celebrated for its lofty and majestic oak, which, however, of late years has become scarce. On the contrary, various large tracts of uncultivated ground might now be advantageously planted with larch, fir, and other trees; but, as these expensive undertakings are beyond the ability of private individuals, it is to be hoped that the commissioners of the land revenue will be able speedily to carry so patriotic a measure into effect.

FORESTS, in law, are waste grounds belonging to the king, replenished with all manner of beasts of chase or venery, which are under the king's protection, for the sake of his royal recreation and delight; and to that end, and for preservation of the king's game, there are particular laws, privileges, courts, and officers, belonging to the king's forests. 1 Black. 279. The forest-courts are, the courts of attachments, of regard, of swainmote, and of justice-seat. The court of attachments is to be held before the verderers of the forest, once in every forty days, to enquire of all offenders against the king's deer, or covert for the game, who may be attached by their bodies, if found in the very act of transgression, otherwise by their goods; and in this court the foresters are to bring in their attachment, or presentments of vert and venison: and the verderers are to receive the same, and to inroll them, and to certify them under their seals, to the court of justice-seat, or swainmote; for this court can only inquire of, but not convict, offenders. The court of regard or survey of dogs is to be holden every third year, for the lawing or expeditating of mastiffs, which is done by cutting off the claws of the fore-feet, to prevent them from running after deer. No other dogs than mastiffs were permitted to be kept within the king's forests, it being supposed that the keeping of these, and these only, was necessary for the defence of a man's house. The court of swainmote is to be holden before the verderers as judges, by the steward of the swainmote, thrice in every year, the swains or freeholders within the forest composing the jury. The jurisdiction of this court is, to enquire into the oppressions and grievances committed by the officers of the forest,

and to receive and try presentments certified from the court of attachments, against the offenders in vert and venison; and this court may not only enquire, but convict also, which conviction shall be certified to the court of justice-seat, under the seals of the jury, for this court cannot proceed to judgement. The court of justice-seat, is the principal court; which is held before the chief justice in eyre, or chief itinerant judge, or his deputy, to hear and determine all trespasses within the forest, and all claims of franchises, liberties, and privileges, and all pleas and causes whatsoever therein arising. It may also proceed to try presentments made in the inferior courts of the forest, and to give judgement upon the convictions that have been made in the swainmote courts. It may be held every third year. This court may fine and imprison, it being a court of record; and a writ of error lies to the court of king's bench. 1 Black. 289. 2 Black. 38. 3 Black. 71. But the forest-laws have long ago ceased to be put in execution. 1 Black. 289.

FORESTS, ANTIQUITY OF. Forests are of such antiquity in England, that, excepting the New Forest in Hampshire, erected by William the Conqueror, and Hampton Court, erected by Henry VIII. it is said, that there is no record or history which makes any certain mention of their erection, though they are mentioned by several writers and in several statutes. Ancient historians tell us, "that New forest was raised by the destruction of 22 parish-churches, and many villages, chapels, and manors, for the space of 30 miles together, which was attended with divers judgements on the posterity of William I. who erected it."

FOREST, BLACK, or SCHWARTZWALD, an extensive forest of Germany, in Suabia, on the right side of the Rhine, consisting chiefly of mountains, which run across the greatest part of Suabia from N. to S. and from E. to W. This forest lies chiefly between the late Helvetic republic, the Rhine, and the kingdom of Wurtemberg.

FOREST TOWNS, in geography, four towns of Germany, in Suabia, lying along the Rhine, and the confines of Switzerland, and subject to the house of Austria. Their names are Rhinefeld, Seckingen, Lausenbourg, and Waldshut.

FORE-STAFF, an instrument used at sea for taking the altitudes of heavenly bodies, so called, because the observer, in using it, turns his face towards the object; in contradistinction to the back-staff, where he turns his back to the object. The fore-staff, or cross-staff, represented in Plate LXX, fig. 12, consists of a straight square staff, A B, graduated like a line of tangents and four crosses or vanes, F F, E E, D D, C C, which slide thereon. The first and shortest of these vanes, F F, is called the ten cross, or vane, and belongs to that side of the instrument whereon the divisions begin at 3° and end at 10°. The next longer vane, E E, is called the thirty cross, belonging to that side where the divisions begin at 20° and end at 30°, called the thirty scale. The next vane, D D, is called the sixty cross, and belongs to that side where the divisions begin at 20° and end at 60°. The last and longest, C C, called the ninety-cross, belongs to the side whereon the divisions begin at 30° and end at 90°. The great use of this instrument is to take the height of the sun and stars, or the distance of two stars; and the 10, 30, 60, or 90, crosses, are to be used according as the altitude is greater or less; that is, if the altitude be less than 10°, the ten cross is to be used; if above ten, but less than thirty, the thirty cross is to be used, &c. For altitudes greater than 30°, this instrument is not so convenient as a quadrant or semicircle. To observe an altitude by this instrument, apply the flat end of the staff to your eye, and look at the upper end of the cross for the centre of the sun or star, and at the lower end for the horizon, as represented in fig. 13. If you see the sky instead of the horizon, slide the cross a little nearer the eye: and if you see the sea instead of the horizon, slide the cross farther from the eye: and thus continue moving till you see exactly the sun or star's centre by the top of the cross, and the horizon by the bottom thereof. Then the degrees and minutes, cut by the inner edge of the cross upon the side of the staff peculiar to the cross you use, give the altitude of the sun or star. If the meridian altitude be wanted, continue your observation as long as you find the altitude increase, still moving the cross nearer to the eye. By subtracting the meridian altitude thus found from 90°, you will have the zenith-distance. To work accurately, an allowance must be made for the height of the eye above the surface of the sea, viz. for one English foot, 1 minute; for 5 feet, 2½; for 10 feet, 3½; for 20 feet, 5; for 40 feet,

feet, 7, &c. These minutes subtracted from the altitude, and added to the zenith-distance observed, give the true altitude and zenith-distance. To observe the distance of two stars, or that of the moon from a star, apply the instrument to the eye, and looking to both ends of the cross, move it nearer or farther from the eye till you see the two stars, the one on the one end, and the other on the other end of the cross; then the degrees and minutes cut by the cross, on the side proper to the vane in use, give the star's distance.

FORE-STALLING, is the buying of, or bargaining for, corn, cattle, or other merchandize, in its passage to fairs, or markets, for sale, with an intent to dispose of them again at an advanced price. The punishment for this offence, on conviction by two or more witnesses is, for the first time, two months imprisonment, and forfeiture of the goods, or their value; for the second, the offender incurs an imprisonment of six months, and loses double the value of the articles; and, for the third offence, he is liable to imprisonment during the king's pleasure; to a forfeiture of all his property; and is to be sentenced to stand in the pillory. Severe, however, as these regulations appear, they have hitherto not been attended with the desired effect. Notwithstanding all the arguments and invectives that have been employed against this growing evil, in printed works, and in the courts of justice, we are persuaded that it will never be crushed, till national councils adopt proper and effectual measures for preventing this iniquitous practice.

FORESTERS, officers of the forest, appointed by the king's letters patent, and sworn to walk the forest at all hours, and watch over the vert and venison; also to make attachments and true presentments, of all trespasses committed within the forest. If a man comes into a forest by night, a forester cannot lawfully beat him before he makes some resistance; but in case such a person resists the forester, he may justify a battery. And a forester shall not be questioned for killing a trespasser that, after the peace cried to him, will not surrender himself, if it be not done on any former malice; though, where trespassers in a forest, &c. kill a person that opposes them, it is murder in all, because they were engaged in an unlawful act, and therefore malice is implied to the person killed.

FORETS, a department of France, formed out of the late province of Austrian Luxemburg. Luxemburg is the chief city.

FOREZ, a late province of France, bounded on the N. by Burgundy and Bourbonnois, E. by Lyonnais, S. by Velais and Vivarois, and W. by Auvergne. It now forms, with the Lyonnais, the department of Rhone and Loire.

FORFAR, ANGUS, or FORFAR-SHIRE, a county of Scotland. See **ANGUS**.

FORFAR, an ancient royal burgh of Scotland, capital of the county. It lies 14 miles W. of Montrose, and 14 N. of Dundee. Lon. 2. 54. W. Lat. 56. 35. N.

FORFEITURE, originally signifies a transgression or offence against some penal law. The word is formed of the base Latin *forisfactura*: whence *forisfactura* and *forfactura*, and the French *forfait*. *Forisfactura* comes of *forisfacere*; which, according to Isidore, signifies to hurt or offend; *facere contra rationem*; and which is not improbably derived of *foris*, out, and *facere*, to do, *q. d.* an action out of rule, or contrary to the rules. Borel will have *forfait* derived from the using of force or violence: Lobbineau in his glossary will have *forisfact* properly to signify a mulct or amend, not a forfeit; which last he derives from the base British *aforfed*, a penalty. But it is now more frequently used for the effect of such transgression; or the losing some right, privilege, estate, honour, office, or effects, in consequence thereof, than for the transgression itself. Forfeiture differs from confiscation, in that the former is more general; while confiscation is particularly applied to such things as become forfeited to the king's exchequer; and goods confiscated are said to be such as nobody claims. Forfeitures may be either in civil or criminal cases.

I. FORFEITURE IN CIVIL CASES. A man who has an estate for life or years, may forfeit it many ways, as well as by treason or felony; such as alienation, claiming a greater estate than he hath, or affirming the reversion to be in a stranger, &c. When a tenant in tail makes leases not warranted by statute; a copyholder commits waste, refuses to pay his rent, or do suit of court; and where an estate is granted upon condition, on non-performance whereof, &c. they will make a forfeiture. Entry for a forfeiture

ought to be by him who is next in reversion, or remainder, after the estate forfeited. As if the tenant for life or years commits a forfeiture, he who has the immediate reversion or remainder ought to enter, though he has the fee, or only an estate tail.

II. FORFEITURE IN CRIMINAL CASES, is two-fold; of real, and personal estates.

1. FORFEITURE OF PERSONAL ESTATES. The forfeiture of goods and chattels accrues in every one of the high kinds of offence; in high treason, or misprision thereof, petit treason, felonies of all sorts whether clergyable or not, self-murder, or felony de se, petty larceny, standing mute, &c. For flight also, on an accusation of treason, felony, or even petit larceny, whether the party be found guilty or acquitted, if the jury find the flight, the party shall forfeit his goods and chattels; for the very flight is an offence, carrying with it a strong presumption of guilt, and is at least an endeavour to elude and stifle the course of justice prescribed by the law. But the jury very seldom find the flight; forfeiture being looked upon, since the vast increase of personal property of late years, as too large a penalty for an offence to which a man is prompted by the natural love of liberty. There is a remarkable difference or two between the forfeiture of lands, and of goods and chattels. (1.) Lands are forfeited upon attainder, and not before; goods and chattels are forfeited by conviction. Because in many of the cases where goods are forfeited, there never is any attainder; which happens only where judgement of death or outlawry is given; therefore, in those cases, the forfeiture must be upon conviction, or not at all; and being necessarily upon conviction in those, it is so ordered in all other cases, for the law loves uniformity. (2.) The forfeiture of lands has relation to the time the fact was committed, so as to avoid all subsequent sales and incumbrances; but the forfeiture of goods and chattels has no relation backwards; so that those only which a man has at the time of conviction shall be forfeited. Therefore a traitor or felon may bona fide sell any of his chattels, real or personal, for the sustenance of himself and family between the fact and conviction; for personal property is of so fluctuating a nature, that it passes through many hands in a short time; and no buyer could be safe, if he were liable to return the goods which he had fairly bought, provided any of the prior vendors had committed a treason or felony. Yet if they be collusively and not bona fide parted with, merely to defraud the crown, the law (and particularly the statute 13 Eliz. c. 5.) will reach them; for they are all the while truly and substantially the goods of the offender; and as he, if acquitted, might recover them himself, as not parted with for a good consideration; so, in case he happens to be convicted, the law will recover them for the king.

2. FORFEITURE OF REAL ESTATES. By attainder in high treason, says Blackstone, a man forfeits to the king all his lands and tenements of inheritance, whether fee-simple or fee-tail; and all his rights of entry on lands and tenements, which he had at the time of the offence committed, or at any time afterwards, to be for ever vested in the crown; and also the profits of all lands and tenements, which he had in his own right for life or years, so long as such interest shall subsist. This forfeiture relates backwards to the time of the treason committed; so as to avoid all intermediate sales and incumbrances, but not those before the fact; and therefore a wife's jointure is not forfeitable for the treason of her husband; because settled upon her previous to the treason committed. But her dower is forfeited, by the express provision of statute 5 and 6 Edw. VI. c. 11. And yet the husband shall be tenant by the courtesy of the wife's lands, if the wife be attainted of treason; for that is not prohibited by the statute. But, though after attainder the forfeiture relates back to the time of the treason committed, yet it does not take effect unless an attainder be had, of which it is one of the fruits; and therefore, if a traitor dies before judgement pronounced, or is killed in open rebellion, or is hanged by martial law, it works no forfeiture of his lands: for he never was attainted of treason. But if the chief justice of the king's bench (the supreme coroner of all England) in person, upon the view of the body of him killed in open rebellion, records it and returns the record into his own court, both lands and goods shall be forfeited. The natural justice of forfeiture or confiscation of property, for treason is founded on this consideration: that he who hath thus violated the fundamental principles of government, and broken his part of the original contract between king and people,

ple, hath abandoned his connections with society, and hath no longer any right to those advantages which before belonged to him purely as a member of the community; among which social advantages, the right of transferring or transmitting property to others is one of the chief. Such forfeitures, moreover, whereby his posterity must suffer as well as himself, will help to restrain a man, not only by the sense of his duty, and dread of personal punishment, but also by his passions and natural affections; and will interest every dependent and relation he has to keep him from offending: according to that beautiful sentiment of Cicero, "*nec vero me fugit quam sit acerbum, parentum scelera filiorum panis lui: sed hoc præclare legibus comparatum est, ut caritas liberorum amiciores parentes reipublica redderet.*" And therefore Aulus Cascellius, a Roman lawyer in the time of the triumvirate, used to boast that he had two reasons for despising the power of the tyrants; his old age and his want of children: for children are pledged to the prince of the father's obedience. Yet many nations have thought, that this posthumous punishment savours of hardship to the innocent; especially for crimes that do not strike at the very root and foundation of society, as treason against the government expressly does. And therefore, although confiscations were very frequent in the times of the earlier emperors, yet Arcadius and Honorius, in every other instance but that of treason, thought it more just, *ibi esse penam, ubi et noxa est*; and ordered, that "*peccata suos teneant auctores, nec ulterius progrediatur metus quam reperiatur delictum.*" and Justinian also made a law to restrain the punishment of relations; which directs the forfeiture to go, except in the case of crimen majestatis, to the next of kin to the delinquent. On the other hand, the Macedonian laws extended even the capital punishment of treason, not only to the children, but to all the relations of the delinquent; and of course their estates must be also forfeited, as no man was left to inherit them. And in Germany, by the famous golden bull (copied almost verbatim, from Justinian's code), the lives of the sons of such as conspire to kill an elector are spared, as it is expressed, by the emperor's particular bounty. But they are deprived of all their effects and rights of succession, and are rendered incapable of any honour ecclesiastical and civil: to the end that, being always poor and necessitous, they may for ever be accompanied by the infamy of their father; may languish in continual indigence; and may find (says this merciless edict) their punishment in living, and their relief in dying." In England, forfeiture of lands and tenements to the crown for treason is by no means derived from the feudal policy, but was antecedent to the establishment of that system in this island; being transmitted from their Saxon ancestors, and forming a part of the ancient Scandinavian constitution. But in certain treasons relating to the coin (which seem rather a species of the crimen falsi than the crimen læsæ majestatis,) it is provided by some of the modern statutes which constitute the offence, that it shall work no forfeiture of lands, save only for the life of the offenders; and by all, that it shall not deprive the wife of her dower. And, in order to abolish such hereditary punishment entirely, it was enacted by statute 7 Ann. c. 21, that, after the decease of the late pretender, no attainder for treason should extend to the disinheriting of any heir, nor to the prejudice of any person, other than the traitor himself. By which the law of forfeitures for high treason would by this time have been at an end, had not a subsequent statute intervened to give them a longer duration.

FORFEX, in Roman antiquity, a way of drawing up an army in the form of a pair of shears. It was intended to receive the cuneus or wedge, if the enemy should make use of that figure. For when the forfex opened to admit the wedge, they had an opportunity of defeating their design, and cutting them in pieces.

FORFICULA, the **EAR-WIG**, in zoology, a genus of insects of the order coleoptera. Antennæ bristly; feelers unequal; elytra dimidiated; wings covered; tail forked. This genus of insects is one of the best known, the forceps at the extremity of their abdomen forming a very distinctive character. It is this seeming weapon that has occasioned those insects to be called forficula; and the formidable name of ear-wigs has been given them in English, from a notion that the insect frequently introduces itself into the ears, causing great pain and even death. Mr. Barbut, however, assures us, that the forceps which the ear-wig carries at his tail, and with which he seems provided for his defence, is not so formida-

ble as it at first appears, being destitute of strength sufficient to produce the least sensible impression. The larva differs very little from the perfect insect. Ear-wigs are very mischievous vermin in gardens, especially where carnations are preserved; for they are so fond of these flowers, that if care be not taken to prevent them, they will entirely destroy them, by eating off the sweet parts at the bottom of the leaves. To prevent which, most people have stands erected, which have a bason of earth or lead round each supporter, which is constantly kept filled with water. Others hang the hollow claws of crabs and lobsters upon sticks in divers parts of the garden into which those vermin get; and by often searching them, one will destroy them without much trouble, which will be of great service to the wall-fruit. This genus has eighteen species.

FORGE, properly signifies a little furnace, wherein smiths and other artificers of iron or steel, &c. heat their metals red-hot, to soften them, and render them more malleable and manageable on the anvil. An ordinary forge is nothing but a pair of bellows, the nozzle of which is directed upon a smooth area, on which coals are placed. The nozzle of a pair of bellows may be also directed to the bottom of any furnace, to excite the combustion of the coals placed there, by which a kind of forge is formed. In laboratories, there is generally a small furnace consisting of one cylindrical piece, open at top, which has at its lower side a hole for receiving the nozzle of a double bellows. This kind of forge furnace is very convenient for fusions, as the operation is quickly performed, and with few coals. In its lower part, two inches above the hole for receiving the nozzle of the bellows, may be placed an iron plate of the same diameter, supported upon two horizontal bars, and pierced near its circumference with four holes diametrically opposite to each other. By this disposition, the wind of the bellows, pushed forcibly under this plate, enters at these four holes; and thus the heat of the fire is equally distributed, and the crucible in the furnace is equally surrounded by it. This contrivance is used in the forge furnaces for melting copper, with this difference only, that, these furnaces are square, which is a matter of no consequence. As the wind of bellows strongly and rapidly excites the action of the fire, a forge is very convenient when a great heat is to be applied quickly: but it is not suitable when the heat is to be gradually increased. The forge, or blast of bellows, is used in several operations in small; as to fuse salts, metals, ores, &c. It is also much used in works in the grate, which require strong heat, without much management; and chiefly in the smelting of ores, and fusion of metallic matters.

FORGE, is also used for a large furnace, wherein iron ore, taken out of the mine, is melted down: or it is more properly applied to another kind of furnace, wherein the iron ore, melted down and separated in a former furnace, and then cast into sows and pigs, is heated and fused over again, and beaten afterwards with large hammers, and thus rendered more soft, pure, ductile, and fit for use.

FORGE, in the train of artillery, is generally called a travelling forge, and may not be improperly called a portable smith's shop; at this forge all manner of smith's work is made, and it can be used upon a march as well as in camp. Formerly they were very ill contrived, with two wheels only, and wooden supporters to prop the forge for working when in the park. Of late they are made with four wheels, which answers their purpose much better.

FORGE FOR RED-HOT BALLS, is a place where the balls are made red-hot before they are fired off: it is built about five or six feet below the surface of the ground, of strong brick-work, and an iron grate, upon which the balls are laid, with a very large fire under them.

FORGERY, in law, is the fraudulent imitation of a name, or alteration of a writing to the prejudice of another man's right. By statute 5 Eliz. c. 14, to forge or make, or knowingly to publish or give in evidence, any forged deed, court-roll, or will, with intent to affect the right of real property, either freehold or copyhold, is punished by a forfeiture to the party aggrieved of double costs and damages; by standing in the pillory, and having both his ears cut off, and his nostrils slit, and seared; by forfeiture to the crown of the profits of his lands, and by perpetual imprisonment. For any forgery relating to a term of years or annuity bond, obligation, acquittance, release, or discharge, of any debt, or demand of any personal chattels, the same forfeiture is given to the

the party grieved; and on the offender is inflicted the pillory, loss of one of his ears, and half a year's imprisonment: the second offence, in both cases, being felony without benefit of clergy. Besides this general act, a multitude of others, since the revolution, when paper credit was first established, have inflicted capital punishment on the forging, altering, or uttering, as true, when forged, of any bank bills or notes, or other securities; of bills of credit issued from the exchequer; of south-sea bonds, &c.; of lottery tickets or orders; of army or navy debentures; of East India bonds; of writings under the seal of the London or royal exchange assurance; of the hand of the receiver of the prebends, or of the accountant-general and certain other officers of the chancery; of a letter of attorney or other power to receive or transfer stock or annuities; and on the personating a proprietor thereof, to receive or transfer such annuities, stock, or dividends: also on the personating, or procuring to be personated, any seaman or other person, entitled to wages or other naval emoluments, or any of his personal representatives; and the taking, or procuring to be taken, any false oath in order to obtain a probate or letters of administration, in order to receive such payments; and the forging, or procuring to be forged, and likewise the uttering or publishing, as true, of any counterfeited seaman's will or power: to which may be added, though not strictly reducible to this head, the counterfeiting of Mediterranean passes, under the hands of the lords of the admiralty, to protect one from the piratical states of Barbary; the forging or imitating of any stamps to defraud the public revenue; and the forging of any marriage register or licence: all which are, by distinct acts of parliament, made felonies without benefit of clergy. By statutes 13 Geo. III. c. 52 and 59, forging or counterfeiting any stamp or mark, to denote the standard of gold and silver plate, and certain other offences of the like tendency, are punished with transportation for fourteen years. By statute 12 Geo. III. c. 48, certain frauds on the stamp duties, therein described, principally by using the same stamps more than once, are made single felony, and liable to transportation for seven years. And the same punishment is inflicted by statute 13 Geo. III. c. 38, on such as counterfeit the common seal of the corporation for manufacturing plate glass (thereby erected), or knowingly demand money of the company by virtue of any writing under such counterfeit seal. There are also two other general laws with regard to forgery; the one 2 Geo. II. c. 25, whereby the first offence in forging or procuring to be forged, acting or assisting therein, or uttering or publishing as true, any forged deed, will, bond, writing obligatory, bill of exchange, promissory note, indorsement, or assignment thereof, or any acquittance or receipt for money or goods, with intention to defraud any person (or corporation), is made felony without benefit of clergy. And by statute 7 Geo. II. c. 22, it is equally penal to forge, or cause to be forged, or utter as true, a counterfeit acceptance of a bill of exchange, or the number of any accountable receipt for any note, bill, or any other security for money, or any warrant or order for the payment of money, or delivery of goods. So that through the number of these general and special provisions, there is now hardly a case possible to be conceived, wherein forgery that tends to defraud, whether in the name of a real or fictitious person, is not made a capital crime.

FORGES, a town of France, in the department of the Lower Seine, famous for its medicinal springs, 60 miles N. W. of Paris.

FORGING, in law, the act of forgery, which see.

FORGING, in smithery, the beating or hammering of iron on the anvil, after having first made it red-hot in the forge, to extend it into various forms, and fashion it into works. See **FORGE**. There are two ways of forging and hammering iron. One is by the force of the hand, in which there are usually several persons employed, one of them turning the iron and hammering likewise, and the rest only hammering. The other is by the force of a water-mill, which raises and works several huge hammers beyond the force of man; under the strokes whereof the workmen present large lumps of iron, which are sustained at one end by the anvils, and at the other by iron chains fastened to the ceiling of the forge. See **MILL**. This last way of forging is only used in the largest works, as anchors for ships, &c. which usually weigh several thousand pounds. For light works, a single man holds, beats, and turns, with one hand, while he hammers with the other. Each purpose the work is designed for requires its proper heat; for if it be too cold, it will not feel the weight of the hammer, as the smiths call it, when it will not batter under the hammer; and if it

be too hot, it will red-sear, that is, break or crack under the hammer. The several degrees of heat the smiths give their iron are, 1. a blood-red heat; 2. a white flame heat; and 3. a sparkling or welding heat.

FORISFAMILIATE, or **FORISFAMILIATION**, in law. When a child, upon receiving a portion from his father, or otherwise, renounces his legal title to any further share of his father's succession, he is said to be forisfamiliarized.

FORK, [*furca*, Lat. *fjorch*, Welsh; *fourche*, Fr.] an instrument divided at the end into two or more points or prongs, used on many occasions.

FORKS, though now indispensable, did not come into use in England till the reign of James I, as we learn from a remarkable passage in Coryat; wherein he describes with no small solemnity, the manner of using them "in all parts of Italy;" and adds, "Hereupon I myself thought good to imitate the Italian fashion by this forked cutting of meat, not only while I was in Italy, but also in Germany, and oftentimes in England since I came home."

FORKS, in geography, the branches of a river, divided and projecting, like the prongs of a fork.

FORLI, a town of Italy, in the province of Romagna, 10 miles S. E. of Faenza, and 45 N. E. of Florence.

FORLI, a fertile and healthy territory of Romagna, of which the above town is the capital.

FORLIMPOPOLI, a town of Italy, in the province of Romagna.

FORLORN-HOPE, in the military art, signifies men detached from several regiments, or otherwise appointed, to make the first attack in day of battle, or at a siege, to storm the counterscarp, mount the breach, &c.

FORM, [*forma*, Lat.] denotes the external appearance or surface of a body, or the disposition of its parts, as to the length, breadth, and thickness.

FORM, in law, the rules established and requisite to be observed in legal proceedings. The formal part of the law, or method of proceeding, cannot be altered but by parliament; for if once these outworks were demolished, there would be an inlet to all manner of innovation in the body of the law itself.

FORM, among mechanics, a sort of mould whereon any thing is fashioned or wrought. Thus, the

1. **FORM, HATTER'S**, is a large block or piece of wood, of a cylindrical figure: the top thereof rounded, and the bottom quite flat. Its use is, to mould or fashion the crown of the hat, after the matter thereof has been beaten and fulled.

2. **FORM, PAPER-MAKER'S**, is the frame or mould wherein the sheets are fashioned. See **PAPER**.

3. **FORM, PRINTER'S**, an assemblage of letters, words, and lines, ranged in order, and so disposed into pages by the compositor; from which, by means of ink and a press, the printed sheets are drawn. Every form is enclosed in an iron chase, wherein it is firmly locked by a number of pieces of wood; some long and narrow, and others like wedges. There are two forms required for every sheet, one for each side; and each form consists of more or fewer pages, according to the size of the book.

FORM, in physics, denotes the manner of being peculiar to each body; or that which constitutes it such a particular body, and distinguishes it from every other. Mr. Harris uses the term form likewise in another sense, as an efficient animating principle; "These animating forms (says he) are of themselves no objects either of the ear or of the eye; but their nature or character is understood in this, that were they never to exert their proper energies on their proper subjects, the marble on which the sculptor exercises his art would remain for ever shapeless, and the harp from which the harper calls forth sounds would remain for ever silent;" that is, in plain language, the former would have no peculiar form and the latter no sound. Then why waste words and render language unintelligible, by such an ambiguous use of the word form? Philosophy, we humbly apprehend, can never be advanced by confounding cause and effect, as Mr. Harris seems to do in the following definition: "The animating form of a natural body is neither its organization nor its figure, nor any other of those inferior forms which make up the system of its visible qualities: but it is the power, which is yet able to produce, preserve, and employ these." If words conveying so very different and opposite ideas, as form and power, are to be thus used synonymously, there will soon be an end of all accuracy in philosophical language.

Philosophers

Philosophers generally allow two principles of bodies : matter, as the common basis or substratum of all ; and form, as that which specifies and distinguishes each ; and which, added to a quantity of common matter, determines or denominates it this or that ; wood, or fire, or ashes, &c. Substantial forms seem to have been first broached by the followers of Aristotle, who thought matter, under different modes or modifications, not sufficient to constitute different bodies ; but that something substantial was necessary to set them at a greater distance : and thus introduced substantial forms, on the footing of souls, which specify and distinguish animals. What led to this erroneous notion was the circumstances of life and death : For observing, that as soon as the soul was departed out of a man, all motion, respiration, nutrition, &c. immediately ceased, they concluded, that all these functions depended on the soul, and consequently that the soul was the form of the animal body, or that which constituted it such : that the soul was a substance, independent of matter, nobody doubted ; and hence the forms of other bodies were concluded equally substantial. But to this it is answered, that though the soul be that by which a man is man, and consequently is the form of the human body, as human ; yet it does not follow, that it is properly the form of this body of ours, as it is a body ; nor of the several parts thereof, considered as distinct from each other : For those several parts have their proper forms so closely connected with their matter, that it remains inseparable therefrom long after the soul has quitted the body : thus, flesh has the form of flesh, bone of bone, &c. long after the soul is removed, as well as before. The truth is, the body does not become incapable of performing its accustomed functions because the soul has deserted it ; but the soul takes its leave, because the body is not in a condition to perform its functions. The ancient and modern corpuscular philosophers, therefore, with the Cartesians, exclude the notion of substantial forms ; and shew, by many arguments, that the form is only the *modus*, or manner of the body it is inherent in. And as there are only three primary modes of matter, viz. figure, rest, and motion, with two others arising therefrom, viz. magnitude and situation, the form of all bodies they hold to consist therein ; and suppose the variations these modes are capable of, sufficient to present all the variety observable in bodies. Forms are usually distinguished into essential and accidental.

1. **FORMS, ACCIDENTAL**, are those really inherent in bodies, but in such a manner as that the body may exist in all its perfection without them. Such is whiteness in a wall, heat in water, a figure of a man in wax, &c.

2. **FORMS, ESSENTIAL**. Though the five modes above mentioned, generally taken, be adventitious ; yet to this or that body, to e.g. fire or water, they are essential : thus, it is accidental to iron, to have this or that magnitude, figure, or situation, since it might exist in different ones : yet to a knife or hammer, the figure, magnitude, and position of parts which constitute it a hammer or knife, are essential ; and they cannot exist or be conceived without them. Hence it is inferred, that though there be no substantial, there are essential, forms, whereby the several species of bodies become what they are, and are distinguished from all others.

FORM OF SYLLOGISMS, or **SYLLOGISTIC FORM**, among logicians, a just disposition both of the terms, in respect of predicate and subject, and of the propositions, in respect of quantity and quality : by which is only meant a disposition wherein the conclusion follows duly and legitimately from the two premises ; there being no form, where there is no conclusion. See **SYLLOGISM**, and **LOGIC**.

FORM, in theology, is said to be one of the essential parts of the sacraments ; being that which gives them their sacramental nature and efficacy, and consisting in certain words, which the priest pronounces in administering them.

FORM is also used, in a moral sense, for the manner of being or doing a thing according to rules : thus we say, a form of government, a form of argument, &c.

FORM, in carpentry, is used to denote the long seats or benches in the choirs of churches or in schools, for the priests, prebends, religious, or scholars, to sit on. At schools, the word form is frequently applied to what is otherwise termed a class.

FORMA, [Lat.] a form or shape. See **FORM**. In the life of St. William of Roschild, *forma* is used for a seat of an ecclesiastic in a choir.

FORMA PAUPERIS, is when a person has just cause of suit, but is so poor that he cannot defray the usual charges of suing at law or in equity ; in which case, on making oath that he is not worth five pounds in the world, on all his debts being paid, and producing a certificate from some lawyer that he has good cause of suit, the judge will admit him to sue in *forma pauperis* ; that is, without paying any fee to counsellors, attorneys, or clerk : the statute 11 Hen. VII. c. 12, having enacted, that counsel and attorneys, &c. shall be assigned to such poor persons gratis. Where it appears that any pauper has sold or contracted for the benefit of his suit, whilst it is depending in court, such cause shall be thenceforth totally dismissed ; and a person suing in *forma pauperis* shall not have a new trial granted him, but is to acquiesce in the judgement of the court.

FORMALITIES, in matter of law, are frequently used for the formulas themselves, or the rules prescribed for judiciary proceedings. In contracts of strict law, all the formalities must be strictly observed ; an omission of the least formality may ruin the whole convention.

FORMALITY, as defined in the schools, is any manner wherein a thing is conceived ; or a manner in any object, importing a relation to the understanding, whereby it may be distinguished from another object. Thus, animality and rationality are formalities.

FORMATION, in grammar, signifies the manner of forming one word from another : thus accountship is formed from accountant, and this last from account.

FORMEDON, in law, (*breve de forma donationis*), a writ that lies for a person who has a right to lands or tenements, by virtue of any entail, arising from the statute of Westm. 2 Ch. II. This writ is of three kinds, viz.

1. **FORMEDON IN DESCENDER** lies where a tenant in tail in feoff a stranger, or is disseised and dies, and the heir may bring this writ to recover the lands.

2. **FORMEDON IN REMAINDER** lies where a man gives lands, &c. to a person in tail, and, for default of issue of his body, the remainder to another in tail : here if the tenant in tail die without issue, and a stranger abates and enters into the land, he in remainder shall have this writ.

3. **FORMEDON IN REVERTER** lies where lands are entailed on certain persons and their issue, with remainder over for want of issue ; and, on that remainder failing, then to revert to the donor and his heirs : in this case, if the tenant in tail dies without issue, and also he in remainder, the donor and his heirs, to whom the reversion returns, may have this writ for the recovery of the estate, though the same be alienated, &c.

FORMERIE, a town of France, in the department of Oise, 9 miles W. of Grandvilliers.

FORMIA, or **FORMIE**, in ancient geography, a maritime town of the Adjected, or New Latium, on the S. E. of Cajeta ; now in ruins, near Mola.

FORMIANI, the people of Formia, who were admitted to the liberty of the city the very year in which Alexandria was built ; but not to the right of suffrage till long after the second Punic war.

FORMIC ACID. It has long been known that ants contain a strong acid, which they occasionally emit ; and which may be obtained from the ants either by simple distillation or by infusion of them in boiling water and subsequent distillation of as much of the water as can be brought over without burning the residue. This has now lost its rank as a separate acid, and it has been shewn by Fourcroy and Vauquelin to be a compound of the malic and acetic.

FORMICA, in natural history, the **ANT** or **EMMET**, a genus of insects of the order hymenoptera. Feelers four, unequal, with cylindrical articulations, placed at the tip of the lip, which is cylindrical and nearly membranaceous ; antennæ filiform ; a small erect scale between the thorax and abdomen ; females and neuters armed with a concealed sting ; males and females with wings, but neuters have no wings. According to Linnæus there are eighteen species. The insects of this genus live in large societies, somewhat in the manner of bees and wasps, and are like them divided into males, females, and neutrals, which latter constitute the great or general assortment, and appear to conduct the business of the nest, which is usually placed at a small distance from the surface in some slight elevation either prepared by the insects themselves,

or previously formed by some other animals, as moles, &c. They feed both on animal and vegetable substances, devouring the smaller kind of insects, caterpillars, &c. as well as fruits of different kinds. They are particularly attracted by sweets; and for this reason they ascend such trees as are infested with aphides, in order to obtain the saccharine substance discharged by those animals; and hence seems to have arisen the idea of their enmity against the genus aphid. Some species of ants are furnished with a sting, while others are destitute of that part. The largest of the European ants is the formica herculeana, or great wood-ant, of a chesnut-colour, with the abdomen measuring two lines or more in length. This species is chiefly found in dry woods of pine or fir, where it inhabits a large conical nest or hillock, composed of dry vegetable fragments, chiefly of fir-leaves: the nest is internally distributed into several paths or tubes, converging towards the central part, and opening externally: in the middle or centre reside the young, or larvæ, which are nursed by the neutral ants, and are occasionally brought to the surface, in order to be more within the influence of the air and sunshine for a certain time, after which they are again conveyed to the bottom or centre. When full-grown, they envelop themselves in oval, white, silken cases, in which they undergo their change into chrysalis, and at length emerge in their complete form. The males and females are winged, and the females are much larger than the males. The common or black ant, formica nigra Lin. is a well-known inhabitant of our fields and gardens, residing in great numbers beneath mole-hills and other elevated spots. It is of a brownish-black colour, and of a glossy or polished surface. Ants are very industrious in collecting and laying up hoards of wheat and other corn; and lest the corn should sprout by the moisture of the subterraneous cells, they gnaw off the end which would produce the blade. The ants are often seen pushing along grains of wheat or barley much larger than themselves. The stores thus obtained are for their evening repasts, and for their support during a rainy season, &c. About the beginning of August the males and females may be observed in the nests: these differ from the neutrals in being furnished with wings, and the female is far larger than the male, the body equalling in size that of the common window-fly, and the upper wings being very long and large. At this time of the year the males and females emigrate in vast numbers; sometimes flying at a considerable height, and sometimes creeping along the surface. It is not uncommon to see them enter houses at this period, attracted by sweets in particular, either moist or dry. After the breeding season the males live but a very short time, and the females return to their nests in order to deposit their eggs. During the winter this species, like the rest of the European ants, remains in a state of torpor, without laying up provisions for that season, as erroneously supposed; and during the spring emerges from its concealment, and recommences its labours. Ants feed both on animal and vegetable substances of various kinds. Their fondness for animal substances is often turned to good account by anatomists, who, when they wish to obtain the skeleton of any animal too small or delicate to admit of being prepared the usual way, dispose the animal in a proper position in a small box, with perforations in the lid, and deposit it in a large ant-hill; in consequence of which, after a certain space, the whole of the softer parts are eaten away by these insects, and the skeleton remains in its proper position. It is thus that very elegant skeletons of frogs, snakes, &c. may be obtained. The formica rufa is black; thorax compressed; and with legs ferruginous. See Plate LXXXVI.

FORMING A SIEGE, is the making lines of circumvallation to fortify the camp, and disposing things for the attack of a place in form.

FORMING A SQUADRON OR BATTALION is to range the soldiers in form of a squadron, &c.

FORMING THE LINE, is drawing up infantry, cavalry, and artillery, into line of battle.

FORMOSA, an island of the Pacific Ocean, about 100 miles E. of Canton in China, separated from the province of Fokien by a strait about 60 miles broad. It is subject to the Chinese; who, however knew not of its existence until 1430. It is about 85 leagues long, and 25 broad. This island presents extensive and fertile plains, watered by great number of rivulets that fall from the eastern mountains. The air is pure and wholesome, and the soil produces in abundance corn and rice, with most other grains, and Indian fruits; such as oranges, bananas, pine-apples, guavas, pa-

paws, cocoa-nuts; as well as many of Europe. Tobacco, sugar, pepper, camphire, and cinnamon, are also common. Horses, sheep, goats, and hogs, are very rare in this island. Domestic fowls, geese, and ducks, are in great plenty; pheasants also are sometimes seen; but monkeys and stags have multiplied so much, that they wander through the country in large flocks. The inhabitants rear a great number of oxen, which they use for riding, from a want of horses and mules. Formosa lies between 119° and 122° Lon. E. and between 22° 5' and 25° 28' Lat. N.

FORMOSA, an island in the Atlantic, near the coast of Africa, about 6 miles long, and 3 broad. The soil is fertile and covered with trees, but the island is deficient in good water. Lon. 14. 20. W. Lat. 11. 29. N.

FORMULA, or **FORMULARY**, a rule or model, or certain terms prescribed or decreed by authority, for the form and manner of an act, instrument, proceeding, or the like.

FORMULA, in church history and theology, signifies a profession of faith.

FORMULA, in medicine, imports the constitution of medicines, either simple or compound, both with respect to their prescription and consistence.

FORMULA, a theorem or general rule or expression for resolving certain particular cases of some problem, &c. So $\frac{s}{2} + \frac{d}{2}$

is a general formula for the greater of two quantities whose sum is

s and difference d ; and $\frac{s}{2} - \frac{d}{2}$ is the formula, or general value

for the less quantity. Again $\sqrt{ax - x^2}$ is the formula or general value of the ordinate to a circle, whose diameter is d , and absciss x .

FORNACALIA, or **FORNICALIA**, in Roman antiquity, a festival instituted by Numa, in honour of the goddess Fornax; wherein certain cakes were made, and offered in sacrifice before the ovens.

FORNAX, the goddess of ovens.

FORNICATION, [*fornicatio*, Lat. from the fornices in Rome, where the lewd women prostituted themselves for money.] Formerly court-leets had power to inquire of and punish fornication and adultery; in which courts the king had a fine assessed on the offenders, as appears by the book of Domesday. In 1650, not only incest and wilful adultery were made capital crimes, but also the repeated act of keeping a brothel, or committing fornication, was (upon a second conviction) made felony without benefit of clergy. But at the restoration, it was not thought proper to renew a law of such unfashionable rigour. And these offences have been ever since left to the feeble coercion of a spiritual court, according to the rules of the canon law; a law which has treated the offence of incontinence, nay, even adultery itself, with a great degree of tenderness and lenity; owing perhaps to the constrained celibacy of its first compilers. The temporal courts therefore take no cognizance even of the crime of adultery, otherwise than as a private injury. See **ADULTERY**. The evils of fornication, which too many wish to consider as no sin, may be judged of from the following particulars: 1. The malignity and moral quality of each crime is not to be estimated by the particular effect of one offence, or of one person's offending, but by the general tendency and consequence of crimes of the same nature. Let the libertine consider, what would be the consequence, if the same licentiousness in which he indulges were universal? or what should hinder its becoming universal, if it be innocent or allowable in him? 2. Fornication supposes prostitution; and by prostitution the victims of it are brought to almost certain misery. It is no small quantity of misery in the aggregate, which between want, disease, and insult, is suffered by those outcasts of human society who infest populous cities; the whole of which is a general consequence of fornication, and to the increase and continuance of which every act and instance of fornication contributes. 3. Fornication produces habits of ungovernable lewdness, which introduce the more aggravated crimes of seduction, adultery, violation, &c. The criminal indulgences between the sexes prepare an easy admission for every sin that seeks it: they are, in low life, usually the first stage in men's progress to the most desperate villanies; and in high life, to that lamented dissoluteness of principle, which manifests

manifests itself in a profligacy of public conduct, and a contempt of the obligations of religion and moral probity. 4. Fornication perpetuates a disease, which may be accounted one of the sorest maladies of human nature, and the effects of which are said to visit the constitutions of even distant generations. The passion being natural, proves that it was intended to be gratified; but under what restrictions, or whether without any, must be collected from different considerations. In the Scriptures, fornication is absolutely and peremptorily condemned. 'Out of the heart proceedeth evil thoughts, murders, adulteries, fornications, &c. these are the things which defile a man.' These are Christ's own words; and one word from him upon the subject is final. The apostles are more full upon this topic. One well-known passage in the Epistle to the Hebrews may suffice, because, admitting the authority by which the apostles wrote, it is decisive. 'Marriage and the bed undefiled is honourable amongst all men, but whoremongers and adulterers God will judge;' which was a great deal to say, at a time when it was not agreed even amongst philosophers that fornication was a crime. Mr. Paley adds the following just observations, in his "Moral and Political Philosophy," p. 246. "The Scriptures give no sanction to those austerities which have been since imposed upon the world under the name of Christ's religion, as the celibacy of the clergy, the praise of perpetual virginity, the prohibito concubitus cum gravida uxore; but with a just knowledge of, and regard to, the condition and interest of the human species, have provided in the marriage of one man with one woman an adequate gratification for the propensities of their nature, and have restrained them to that gratification. The avowed toleration, and in some countries the licensing, taxing, and regulating, of public brothels, has appeared to the people, an authorizing of fornication, and has contributed, with other causes, so far to vitiate the public opinion, that there is no practice of which the immorality is so little thought of, or acknowledged, although there are few in which it can more plainly be made out. The legislators who have patronized receptacles of prostitution ought to have foreseen this effect, as well as considered, that whatever facilitates fornication, diminishes marriages. And as to the usual apology for this relaxed discipline, the danger of greater enormities if access to prostitutes were too strictly watched and prohibited; it will be time enough to look to that, after the laws and the magistrates have done their utmost. The greatest vigilance of both will do no more, than oppose some bounds and some difficulties to this intercourse. And after all, these pretended fears are without foundation in experience. The men are in all respects the most virtuous in countries where the women are most chaste. If fornication be criminal, all those incentives which lead to it are accessaries to the crime; as lascivious conversation, whether expressed in obscene, or disguised under modest phrases; also wanton songs, pictures, books; the writing, publishing, and circulation of which, whether out of frolic or for some pitiful profit, is productive of so extensive a mischief from so mean a temptation, that few crimes within the reach of private wickedness have more to answer for, or less to plead in their excuse. Indecent conversation, and by parity of reason all the rest, are forbidden by St. Paul, Eph. iv. 29, 'Let no corrupt communication proceed out of your mouth;' and again, Col. iii. 8, 'Put filthy communications out of your mouth.' The invitation or voluntary admission of impure thoughts, or the suffering them to get possession of the imagination, falls within the same description, and is condemned by Christ, Matt. v. 28, 'Whosoever looketh on a woman to lust after her, hath committed adultery with her already in his heart.' Christ, by thus enjoining a regulation of the thought, strikes at the root of the evil."

FORNIX, in anatomy, part of the corpus callosum in the brain; so called, because of a distant resemblance it hath to the arches of ancient vaults when viewed in a particular manner.

FORSKOHLEA, in botany, a genus of the pentagynia order, and decandria class. Calyx four or five-leaved, longer than the corolla; petals ten, roundish before, with a linear base. There are three species.

FORSTER, JOHN REINHOLD, a celebrated naturalist, was born in Prussia in 1729. He made, when young, a great progress in the learned and modern languages. In 1748 he entered the university of Halle, where he studied divinity: from thence he removed to Dantzic, and commenced preacher. He afterwards

went to Russia, in expectation of considerable preferment; but being disappointed, he proceeded to England, where for some time he was tutor in the French and German languages at Warrington. In 1772 he accompanied Captain Cook on his voyage round the World. He returned to England in 1775, and was honoured by the university of Oxford with the degree of LL. D. Having published, contrary to the engagement entered into with government, a botanical account of plants discovered in this voyage, he was treated with such coolness, that he quitted England and went to Halle, where he was made professor of natural history. He died in 1798. He was the author of Observations made in a Voyage round the World; History of Voyages and Discoveries in the North; on the Byssus of the Ancients; several Papers in the Philosophical Transactions, &c.

FORSTA, a town of Lusatia, on the Neiss, 54 miles N. N. E. of Dresden.

FORSTERA, in botany, a genus of the diandria order, and gynandria class of plants. Perianthium double; exterior one beneath, three-leaved; interior one above, six-cleft; corolla tubular.

FORSTER'S HARBOUR, a bay in Hudson's Strait, Hudson's Bay. Lon. 73. 30. W. Lat. 62. 18. N.

FORT, in the military art, a small fortified place, environed on all sides with a moat, rampart, and parapet. Its use is to secure some high ground, or the passage of a river, to make good an advantageous post, to defend the lines and quarters of a siege, &c. Forts are made of different figures and extents, according as the ground requires. Some are fortified with bastions, others with demi-bastions. Some again are in form of a square, others of a pentagon. A fort differs from a citadel, as this last is built to command some town.

FORTALICE, in Scots law, signified anciently a small place of strength, originally built for the defence of the country; and which on that account was formerly reckoned inter regalia, and did not go along with the lands upon which it was situated, without a special grant from the crown. Now, fortalices are carried by a general grant of the lands; and the word is become synonymous with manor-place, messuage, &c.

FORTESCUE, Sir JOHN, lord high chancellor of England, under Henry VI. was descended from an ancient family in Devonshire. He studied the municipal law in Lincoln's Inn, of which he was made a governor, in the fourth and seventh years of Henry VI. In 1430, he was made a serjeant at law, and, in 1441, king's serjeant. In 1442 he was made lord chief justice of the king's bench; and afterwards lord high chancellor. During the reign of Edward IV. he was many years in exile with Queen Margaret and Prince Edward her son. When they returned to England, Sir John Fortescue accompanied them, but soon after the decisive battle of Tewksbury, he was thrown into prison and attainted, with other Lancastrians; but was pardoned by Edward IV. He wrote, 1. A Commentary on the Politic Laws of England; to one edition of which Mr. Selden wrote notes. 2. The difference between an absolute and a limited Monarchy, as it more particularly regards the English Constitution (which was published, with some remarks, by John Fortescue, afterwards Lord Fortescue, in 8vo. in 1714; and a second edition was published, with amendments, in 1719;) and several works which still remain in MS. He died, near 90 years of age, and was buried in the parish-church of Ebburton, where a monument was erected to his memory in 1677.

FORTH, in geography, one of the finest rivers in Scotland. It takes its rise near the bottom of Lomond hills; and running from W. to E. receives in its passage many considerable streams, deriving their waters from the eminences in the midland counties of North Britain. Below Alloa the river expands itself to a great breadth between the counties of Lothian and Fife, till at Queensberry it is contracted by promontories shooting into it from both coasts; so that, from being four or five miles broad, it is not above two miles.

FORTH AND CLYDE NAVIGATION. By these rivers, Scotland is almost divided into two parts. The Forth falls into the E. sea below Edinburgh, and the Clyde falls into the Atlantic Ocean, below Glasgow, and the neck of land between them amounting scarcely to 24 miles, gave rise to the idea of a junction, so as to open a communication across the kingdom, an object of vast utility; and which was at last happily completed, on the 28th July, 1790.

FORTIFICATION.

FORTIFICATION, may be defined the science of military architecture; and when applied to a city, town, or other place, it consists in the art of putting any of these in such a posture of preparation by means of ramparts, parapets, ditches, and outworks, that each individual part defends, and is defended by; some other parts, so that a small number of men within may be able to defend themselves, for a considerable time, against the assaults of a numerous army without. The origin of fortification is doubtless to be ascribed to that rapacious principle, which has influenced too many of mankind in all ages and nations, to invade the rights and properties of those whom they considered as weak or defenceless. In the first ages of the world, men were dispersed over the earth in separate families, as is recorded in the patriarchal histories of the Jews and Scythians, who wandered from place to place, in search of pasture for their cattle. These families became so numerous as to form large communities, which settled all together in one place; from whence villages and towns had their origin: but they found it necessary, for the common security, to surround those towns with walls and ditches, to prevent all violences and sudden surprises from their neighbours. This was sufficient for some time, till offensive weapons were invented, and conquering became a fashion. Then walls with loop-holes were made at proper distances, in order to screen the defenders against the arrows of the assailants: but finding that, as soon as the enemy got once close to the walls, they could from no part be discovered or repulsed; for this reason they added square towers at proper distances from each other, so that every part of the wall might be defended by the adjacent sides of the towers. However, this manner of the inclosing of towns was found to be imperfect, because there remained still one of the faces of the towers which fronted the field that could not be seen from any other part, and therefore could not be defended. To remedy this, they made the towers round instead of square, imagining this figure to be the strongest to resist the battering engines, as well as to be better defended from the other parts of the wall. Notwithstanding the superiority of this method above the former, there still remained a part of these towers unseen and incapable of being defended; which made them change the figure of the towers again; *i. e.* they made them square as before; but, instead of presenting a face to the field as formerly, they presented an angle; and thus they effectually found out such a disposition of their works, that no part could be attacked without being seen or defended from some other part. This last method was long in use, and would in all probability have continued to this day, if gun-powder had not been invented: but the violence of the guns and mortars soon convinced the world, that such towers and walls were but a weak defence against these thundering engines; and that, as the nature of the attack was entirely changed, it was also necessary to change the mode of defence. Ramparts were therefore added to the walls; the towers enlarged into bastions, and all sorts of outworks have been since added; such as ravelins, counterguards, horn and crown works, and others of the like nature, to render the defence in some measure equivalent to the attack. But in spite of all the improvements which have been made in the art of fortifying, since the invention of gunpowder, that of attacking is still superior to it: engineers have tried in vain to render the advantages of fortification equal to those of the attack; the superiority of the besiegers' fire, together with the greater number of men, generally obliges the besieged to submit sooner or later. The greatest improvement made in the art of attacking happened in 1697, when M. Vauban first made use of ricochet firing at the siege of Ath, whereby the besieged placed behind the parapets were as much exposed to the fire of the besiegers as if there had been no parapets; whereas, before, they had been secure as long as the parapet was not demolished: and the worst is, that there can be no remedy found to prevent this enfilading; without falling into inconveniences almost as bad as those which we endeavour to avoid.

Definitions. 1. In the plan and profile, Plate LXXIII. fig. 1, the part N C D E F represents a bank of earth called the parapet, its use is to cover the troops from the fire of the enemy. 2. The part D E is called the talus or plunge, and is a little sloping toward the further side; it does not rise perpendicularly but slopes on each side as represented by C D and E F. 3. When the height of the parapet exceeds $4\frac{1}{2}$ feet which is generally the case, a part A B C is raised to elevate the men sufficiently to fire over the parapet; this is called the banquette or foot-bank, it rises to the flat part B C by a gentle slope A B; sometimes there are two banquettes. 4. H I represents the ditch behind the parapet, having the slope G H, towards the parapet, called the scarp, and I K on the opposite side called the counterscarp. 5. The flat part F G is called berme, and serves to lodge the loose earth that may fall from the parapet. 6. K L represents the glacis, which is generally in a line with the talus D E. 7. In Plate LXXIV. fig. 1, the part F E A L N is called the bastion. 8. A E, A L, the faces of the bastion. 9. E F, L N, the flanks. 10. F G, the curtain. 11. F N, the gorge of the bastion. 12. A G, B F, the lines of defence. 13. A B, the exterior side of the polygon. 14. C D, the perpendicular. 15. Any line which divides a work into two equal parts is called the capital of that work. 16. *a, b, c*, the counterscarp of the ditch. 17. A, M, the flanked angles. 18. H, E, L, the angles of the shoulder, or shoulder only. 19. G, F, N, the angles of the flank. 20. Any angle whose point turns from the place is called salient angle, such as A, M: and any angle whose point turns towards the place, re-entering angle, such as *b, F, N*. 21. If there be drawn two lines parallel to the principal or outline, the one at three toises distance, and the other at eight from it, then the space *y x* included between the principal one and that farthest distant is called the rampart. And the space *x*, contained by the principal line and that near to it, and which is generally stained black, is called the parapet. There is a fine line drawn within four feet of the parapet, which expresses the step called banquette. All works have a parapet of three toises thick, and a rampart of from 8 to 10, besides their slopes. The rampart is elevated more or less above the level of the place, from 10 to 20 feet, according to the nature of the ground, and the particular constructions of engineers. 22. The body of the place is all that which is contained within this first rampart; for which reason it is often said to construct the body of the place: which means, properly, the construction of the bastions and curtains. 23. All the works which are constructed beyond the ditch, before the body of the place, are called outworks.

GENERAL PRINCIPLES, OR MAXIMS.

1. The plan of every place that is to be fortified, ought first to be circumscribed with one of the most convenient polygonal figures, that can be fitted to that place, and this polygon is to be fortified.
2. The more regular the circumscribing polygon is, the better.
3. It is a disadvantage, to be necessitated to extend the works about a fortress.
4. Every side of the polygon, as much as is possible, should be equally fortified, that the enemy may not have it in his choice to attack a part more weak than the rest.
5. All works ought as much as possible to be easy to build, hard to destroy, and not difficult to be repaired.
6. The works about a fortress should be so contrived, as to cover the defendants, discover the approaches to the enemy, and adapted to the common weapons of defence.
7. Each work should be defended from as many as may be and liable to be attacked from as few places as possible.
8. These works, made to defend one another, should be sufficiently large to contain the troops and cannon necessary for that defence.
9. Works which are to flank one another ought not to be at a greater distance than the point bank flight of a musket-shot.
10. The works farthest distant from the body of the place should

should be lowest, that they may be commanded by those that are nearer.

11. None of the works should, if it can be helped, be beyond the point bank reach of the cannon within the town.

12. Wet ditches are preferable for small places, dry ones for large places.

13. Bastions with large flanks and large gorges are much esteemed.

14. The flanked angles of bastions should not be much less than a right one, but are better when obtuse not exceeding 120 or 130 degrees.

15. The faces of bastions should in length not differ much from 100 yards.

16. A curtain should not be much longer than 180 yards, nor much shorter than 100 yards.

17. The angle of the curtain should be between the limits of 90 and 100 degrees.

The art of fortification is divided into two parts; regular and irregular.

OF REGULAR FORTIFICATION.

Regular Fortification is that built in a regular polygon, the sides and angles of which are all equal, being commonly about a musket-shot from each other. Although authors agree as to the general form in the present manner of fortifying, yet they mostly differ in particular constructions of the parts. As it would be superfluous to treat of all the different methods hitherto proposed, we shall explain those only which are most esteemed by the best judges, and have been most generally practised.

CONSTRUCTION OF THE MEAN FORTIFICATION, ACCORDING TO M. VAUBAN'S METHOD.

Vauban's method is divided into little, mean, and great; the

little is chiefly used in the construction of citadels, the mean in that of all sorts of towns, and the great in particular cases only. We shall give the construction of the mean, as being most useful; and refer the reader to the following table, for those dimensions which are different in these several fortifications. Inscribe in a circle a polygon of as many sides as the fortification is designed to have fronts; let AB, fig. 1. Plate LXXIV, be one of the sides of half a hexagon, which bisect by the perpendicular CD; divide half of it AC into nine equal parts, and one of these into 10 others; then these divisions will serve as a scale to construct all the parts of the fortification, and each of them is supposed to be a toise or fathom, that is, six French feet, or somewhat more than $5\frac{1}{2}$ English feet; and therefore the whole side AB is supposed to be 180 toises. As the dividing of a line into so many equal parts is very troublesome, it is much easier to have a scale of equal parts by which the works may be constructed. If therefore, in this case, the radius is taken equal to 180 toises, and the circle described with that radius being divided into six equal parts, or the radius being carried six times round, we will have an hexagon inscribed; AB being bisected by the perpendicular CD, as before, set off 30 toises from C to D, and draw the indefinite lines ADG, BDF; in which take the parts AE, BH, each equal to 50 toises; from the centre E describe an arc through the point H, meeting AD in G, and from the centre H describe an arc through the point E, meeting BD in F; or which is the same, make each of the lines EG, HF, equal to the distance EH; then the lines joining the points A, E, F, G, H, B, will be the principal or outline of the front. If the same construction be performed on the other sides of the polygon, we will have the principal or outline of the whole fortification. If, with a radius of 20 toises, there be described circular arcs, from the angular points B, A, M, T, and lines are drawn from the opposite angles, E, H, &c. so as to touch these arcs, their parts *a, b, c*, &c. together with these arcs, will represent the outline of the ditch.

TABLE OF DIMENSIONS.

	Forts.						Little Fortification.				Mean.		Great.	
Sides of Polygons,.....	80	90	100	110	120	130	140	150	160	170	180	190	200	260
Perpendiculars,.....	10	11	12 $\frac{1}{2}$	14	15	16	20	21	23	25	30	31	25	22
Faces of Bastions,.....	22	25	28	30	33	35	40	42	45	47	50	35	55	60
Capital of Ravelin,.....	25	28	30	35	38	40	45	50	50	52	55	55	60	50

In the first vertical column are the numbers expressing the lengths of the exterior sides from 80 to 260. In the second, the perpendiculars answering to these sides. In the third, the lengths of the faces of bastions; and in the fourth, the lengths of the capitals of the ravelins. The forts are mostly, if not always, squares: for which reason, the perpendiculars are made one-eighth of the exterior sides; because if they were more, the gorges of the bastions would become too narrow. The little fortification is chiefly designed for citadels, which are commonly pentagons; the perpendiculars are made one-seventh of the exterior side: the mean is used in all kinds of fortifications, from an hexagon upwards to any number of sides; and the great is seldom used but in an irregular fortification, where there are some sides that cannot be made less without much expence; or in a town which lies near a great river, where the side next the river is made from 200 to 260 toises: and as that side is less exposed to be attacked than any other, the perpendicular is made shorter, which saves much expence. The faces of the bastions are all two-sevenths of the exterior sides, or nearly so, because the fractions are neglected. In general, in all squares the perpendicular is one-eighth of the exterior side, and all pentagons one-seventh, and in all the rest upward one-sixth.

OF THE CONSTRUCTION OF ORILLONS AND RETIRED FLANKS.

Describe the front MPQRST as before, and divide the flank into three equal parts, of which suppose *Sr* to be one; from the opposite flanked angle *M* draw a line *Mr*, in which take the part *mr* of five toises; take likewise *Rn* in the line of defence *MR*,

produced, equal to five toises, and join *nm*, upon which as a base describe the equilateral triangle *n p m*, and from the angle *p*, opposite to the base as centre, is described the circular flank *n m*. And if *Sr* be bisected by a perpendicular, and another be erected upon the face *ST*, at *S*; the intersection of these two perpendiculars will be the centre of the arc which forms the orillon. The orillons are very useful in covering the retired flanks, which cannot be seen but directly in the front; and as these orillons are round, they cannot be so easily destroyed as they would be if they were of any other figure.

CONSTRUCTION OF RAVELINS OR HALF-MOONS.

Fig. 1. No. 1. Set off 55 toises, from the re-entering angle *O* of the counterscarp, on the capital *OL*, or on the perpendicular produced; and from the point *L* draw lines to the shoulders *AB*; whose parts *LM*, *LN*, terminated by the counterscarp, will be the faces, and *MO*, *ON*, the semi-gorges of the ravelin required. This is Mr. Vauban's method of constructing ravelins, according to some authors: and others will have the faces of the ravelin to terminate on those of the bastions within three toises of the shoulders; which seems to be the best way, for these ravelins cover the flanks much better than the others. The ditch before the ravelin is 12 toises, its counterscarp parallel to the faces of the ravelins; and is made in a circular arc, before the salient angle; as likewise all ditches are in general. When the ravelins are made with flanks, as in fig. 2, the faces should terminate on those of the bastions, at least five toises from the shoulders. The flanks are made by setting off 10 toises from the extremities of the faces, from *f* to *h*, and from

from *m* to *l*; and from the points *h*, *l*, the flanks *hk*, *lp*, are drawn parallel to the capital LO of the ravelin. There are sometimes redoubts made in the ravelin, such as in fig. 1. No. 1. which is done by setting off 16 toises from the extremities of the faces on the semi-gorges from *N* to *b*, and from *M* to *a*; and from the points *b*, *a*, the faces are drawn parallel to those of the ravelin; the ditch before the redoubt is six toises, and its counterscarp parallel to the faces.

CONSTRUCTION OF TENAILLES.

A *tenaille* is a work made in the ditch before the curtains, the parapet is only two or three feet higher than the level ground of the ravelin. There are three different sorts; the first are those, as in fig. 3, which are made in the direction of the lines of defence, leaving a passage of three toises between their extremities and the flanks of the bastions, as likewise another of two in the middle for a bridge of communication to the ravelin. The second sort are those, as in fig. 4. Their faces are in the lines of defence, and 16 toises long, besides the passage of three toises between them and the flanks of the bastion; their flanks are found by describing arcs from one shoulder of the *tenaille* as centre through the other, or on which are set 10 toises for the flanks desired. The third sort are those as in fig. 5. Their faces are 16 toises, as in the second sort, and the flanks are parallel to those of the bastions. The use of *tenailles* in general, is to defend the bottom of the ditch by a grazing fire, as likewise the level ground of the ravelin, and especially the ditch before the redoubt within the ravelin, which can be defended from no where else so well, as from them. The first sort do not defend the ditch so well, as the others, as being too oblique a defence; but as they are not subject to be enfiladed, M. Vauban has generally preferred them in the fortifying of places, as may be seen in the citadel of Lille, Landau, New Brisac, and in many other places. The second sort defend the ditch much better than the first, and add a low flank to those of the bastions; but as these flanks are liable to be enfiladed, they have not been much put in practice. This defect might however be remedied, by making them so as to be covered by the extremities of the parapets of the opposite ravelins, or by some other work. As to the third sort, they have the same advantage as the second, and are likewise liable to the same objections; for which reason, they may be used with the same precautions which have been mentioned in the second. *Tenailles* are esteemed so necessary, that there is hardly a place fortified without them; and with reason: For when the ditch is dry, the part behind the *tenailles* serves as a place of arms, from which the troops may sally, and destroy the works of the enemy and the ditch, oppose their descent, and retire with safety; and the communication from the body of the place to the ravelin becomes easy and secure, which is a great advantage; for by that means the ravelin may be a much better defence, as it can be supplied with troops and necessaries at any time. And if the ditch is wet, they serve as harbours for boats, which may carry out armed men to oppose the passage over the ditch whenever they please; and the communication from the *tenailles* to the ravelin, becomes likewise much easier than it would be without them.

CONSTRUCTION OF LUNETTES.

Fig. 1. No. 2. Lunettes are placed on both sides of the ravelin, such as B, to increase the strength of a place: they are constructed, by bisecting the faces of the ravelin with the perpendicular LN; on which is set off 30 toises from the counterscarp of the ditch, for one of its faces; the other face, PN, is found by making the semigorge, TP, of 25 toises; the ditch before the lunette is 12 toises, the parapet three, and the rampart eight, as in the ravelin. There is sometimes another work made to cover the salient angle of the ravelin, such as A, called *bonnet*, whose faces are parallel to those of the ravelin, and when produced, bisect those of the lunettes; the ditch before is 10 toises. There are likewise lunettes, such as D in fig. 6, whose faces are drawn perpendicular to those of the ravelin, within a third part from the salient angle; and their semi-gorges are only 20 toises. These kinds of works may make a good defence, and cost no very great expence; for as they are so near the ravelin, the communication with it is very easy, and one cannot well be maintained till they are all three taken.

CONSTRUCTION OF TENAILLONS.

Fig. 1. No. 3. Produce the faces of the ravelin beyond the

counterscarp of the ditch, at a distance MN of 30 toises, and take on the counterscarp of the great ditch 15 toises from the re-entering angle *q* to *p*, and draw Np; then pNMq will be the *tenailles* required; its ditch is 12 toises, that is, the same as that of the ravelin. Sometimes a retired battery is made in the front of the *tenailles*, as in B; this battery is 10 toises from the front to which it is parallel, and 15 toises long. Retrenchments are commonly made in the *tenailles*, such as O; their parapets are parallel to the fronts MN, and bisect the side pN; the ditch before the retrenchment is three toises; and there is a banquette before the parapet next to the ditch of about eight feet, called *berin*; which serves to prevent the earth of the parapet (which seldom has any revetment) from falling into the ditch. The ravelin, before which *tenailles* are constructed, must have its salient angle much greater than the former construction makes them; otherwise the salient angles of the *tenailles* become too acute; for which reason we made the capital of this ravelin 45 toises, and the faces terminate within three toises of the shoulders.

CONSTRUCTION OF COUNTER-GUARDS.

When the counterguard is placed before the ravelin, fig. 7, set off 40 toises on the capital of the ravelin from the salient angle A to the salient angle B, of the counterguard; and 10 from C to D; on the counterscarp of the ditch. When the counterguard is before the bastion, such as in fig. 8, its salient angle F is 50 toises from the salient angle E of the bastion, and the breadth near the ditch of the ravelin 10 toises as before. The ditch before the counterguards is 12 toises, and its counterscarp parallel to the faces. Counterguards are made before the ravelin on some particular occasions only; but are frequently constructed before the bastions, as covering the flanks wonderfully well. Some authors, as Mr. Blondel and Mr. Coehorn, will have them much narrower than they are here.

CONSTRUCTION OF HORN-WORKS.

Fig. 1. No. 4. Produce the capital of the ravelin beyond the salient angle A, at a distance AB of about 80 toises; draw DBE at right angles to AB; in which take BD, BE, each equal to 55 toises; and on the exterior side DE, trace a front of a polygon in the same manner as that of the body of the place, making the perpendicular BF 10 toises, and the faces 30. The branches Da, Ed, of the horn-work, when produced, terminate on the faces of the bastions, within five toises of the shoulders. The ditch of the horn-work is 12 toises, and its counterscarp parallel to the branches; and in the front terminates at the shoulders, in the same manner as the great ditch before the bastions. The capital of the ravelin before the front of the horn-work is 35 toises, and the faces terminate on the shoulders, or rather two or three toises beyond them: and the ditch before the ravelin is eight toises. Retrenchments are sometimes made within the horn-works, such as S, S; which are constructed by erecting perpendiculars to the faces of the ravelins, within 25 toises of their extremities. This retrenchment, like all others, has a parapet turfed only with a berm of eight feet before it; as likewise a ditch from three to five toises broad. When a horn-work is made before the bastion, the distance, No. 5, of the front from the salient angle of the bastion is 100 toises, and the branches terminate on the faces of the adjacent ravelins within five toises from their extremities; all the rest is the same as before.

CONSTRUCTION OF CROWN-WORKS.

From the salient angle, A, fig. 9, of the ravelin, as a centre, describe an arc of a circle with a radius of about 120 toises, cutting the capital of the ravelin produced at C; from the point C, set off the chords CB, CF, each of them equal to 110 toises; and on each of which, as an exterior side, construct a front of polygon of the same dimensions as in the horn-work; that is, the perpendicular should be 18 toises, the faces 30, and the branches terminate on the faces of the bastions within 25 toises of the shoulders. The ditch is 12 toises, the capital of the ravelins 35, and its ditch 8; that is, the same as in the horn-work. Sometimes the crown-work is made before the bastion, as in fig. 10. The arc is described from the salient angle A of the bastion, with a radius of 120 toises, as before; and the branches terminate on the faces of the adjacent ravelins within 25 toises of their extremities: the rest of the dimensions and constructions are the same as before. Horn-works, as well as crown-works, are never made but when a large spot of ground

ground falls beyond the fortification, which might be advantageous to an enemy in a siege, or to cover some gate or entrance into a town.

CONSTRUCTION OF COVERT-WAYS AND GLACIS.

Although we have not hitherto mentioned the covert-way, nevertheless all fortifications whatsoever have one; for they are esteemed to be one of the most essential parts of a modern fortification; and it is certain, the taking of the covert-way, when it is in good condition and well defended, is generally the most bloody action of the siege. After having constructed the body of the place, and all the outworks which are thought necessary, lines are drawn parallel to the utmost counterscarp of the ditches, at six toises distance from it; and the space mn , $m n$, Plate LXXV, fig. 1, included between that line and the counterscarp, will be the covert-way required. There is in every re-entering angle of the counterscarp a place of arms, m : which is found by setting off 20 toises from the re-entering angle a , on both sides from a to b , and from a to c ; and from the points b, c , as centres, arcs are described with a radius of 25 toises, so as to intersect each other in d ; then the lines drawn from this intersection to the point b, c , will be the faces of the places of arms. If lines are drawn parallel to the lines which terminate the covert-way, and the places of arms, at 20 toises distant from them, the space x, x, z , between these lines and those which terminate the covert-way, will be the glacis. At the extremities of the places of arms, are traverses made, such as r , which serve to inclose them; these traverses are three toises thick, and as long as the covert-way is broad, and a passage is cut in the glacis round them, of about six or eight feet, in order to have a free communication with the rest of the covert-way. There are also traverses of the same dimensions before every salient angle of the bastion and out-works, and are in the same direction as the faces of those works produced; and the thickness lies at the same side as the parapets. The passages round these last traverses are likewise from six to eight feet wide. In each place of arms are two sally-ports z, z , which are 10 or 12 feet wide, for the troops to sally out; in time of a siege they are shut up, with barriers of gates.

CONSTRUCTION OF ARROWS AND DETACHED REDOUBTS.

An arrow is a work made before the salient angles of the glacis, such as A , fig. 1. It is composed of a parapet of three toises thick, and 40 long; and the ditch before it five toises, terminating in a slope at both ends. The communication from the covert-way into these arrows is four or five toises wide; and there is a traverse, r , at the entrance, of three toises thick, with a passage of six or eight feet round it. A detached redoubt is a kind of work much like a ravelin, with flanks placed beyond the glacis; such as B ; they are made to occupy some spot of ground which might be advantageous to the besiegers; likewise to oblige the enemy to open their trenches farther off than they would do otherwise. Their distance from the covert-way ought not to exceed 120 toises, that it may be defended by musket-shot from thence. The gorge ab is 40 toises; the flanks ac, bf , which are perpendicular to the gorge, 10; and the faces cd, fd , 30: the ditch before it is six toises, ending in slopes at both ends; the covert-way four; the branches of the covert-way 42 toises long, or thereabouts; the faces of the places of arms y, y , which are perpendicular to the branches, 10; and the other, which is parallel to them, 14. The communication from the covert-way into the redoubt, is five or six toises wide; a traverse is made just at the entrance, and another in the middle when it is pretty long. The parapets of this communication terminate in a slope or glacis. If these redoubts are above 50 toises distant from the covert-way, the besiegers carry their trenches round, and enter through the gorge; by which means the troops that are in them are made prisoners of war, if they do not retire betimes; to prevent which, some other outworks should be made to support them.

CONSTRUCTION OF SECOND DITCHES AND COVERT-WAYS.

Plate LXXV, fig. 2. When the ground is low, and water to be found, there is often a ditch about 10 or 12 toises made round the glacis; and opposite to the places of arms are constructed lunettes, beyond the ditch: such as D , whose breadth on the counterscarp of the ditch is 10 toises, from b to a and from c to d ; and the faces $a L, d L$, are parallel to those of the places of arms; the ditch be-

fore them is from eight to ten toises wide. The second covert-way is four toises, the semi-gorges of the places of arms, m , about 15, and the faces perpendicular to the counterscarp; the second glacis is from 15 to 18 toises broad. This second covert-way has traverses every where, in the same manner as the first.

CONSTRUCTION OF PROFILES.

A PROFILE is the representation of a vertical section of a work; it serves to shew those dimensions which cannot be represented in plans, and is necessary in the building of a fortification. Profiles are generally constructed upon 30 feet to an inch. It would be endless to describe all their particular dimensions; we shall therefore lay down the principal rules only, given by M. Vaudan, on this subject. Every work ought to be at least six feet higher than that before it, so that it may command those before it; that is, that the garrison may fire from all the works at the same time, with great and small arms, at the besiegers in their approaches. Notwithstanding this specious pretence, several authors object against it. For, say they, if you can discover the enemy from all the works, they can discover, by the same reason, all the works from their batteries; so that they may destroy them without being obliged to change their situation, and thereby dismount all the guns of the place before they come near it. But if all the works were of the same height, those within cannot be destroyed, till such time as those before them are taken: guns might be placed in the covert-way and outworks to obstruct the enemy's approach; and when they come near the place, they might be transported into the inner works: and as the body of the place would be much lower, the expence would be considerably diminished. But when works are low, they are easily enfiladed by the ricochet batteries, which is a kind of firing with a small quantity of powder, by giving the gun an elevation of 10 or 12 degrees: this might, however, be partly prevented, by making the parapets near the salient angles, for the space of eight toises on each side, five or six feet higher than the rest of the works. 2. The covert-way should be lower than the level ground, otherwise the body of the place must be raised very high, especially where there are several outworks: this is to be understood only when the works exceed each other in height, otherwise it need not be below the level. 3. The bases of all inward slopes of earth should be at least equal to the height, if not more. 4. The bases of all outward slopes of earth, two-thirds of their heights. 5. The slopes of all walls or revetments should be one-fifth of their height; or one-sixth might perhaps be sufficient; the height of a wall is estimated from the bottom of the ditch, and not from the beginning of its foundation. 6. The slopes of all parapets and traverses are one-sixth of their breadth; that is, three feet towards the field; or the inside, where the banquettes should be three feet higher than the outside. 7. When the revetment of a rampart goes quite up to the top, four feet of the upper part is a vertical wall of three feet thick, with a square stone at the top of it projecting six inches; and a circular one below, or where the slope begins, of eight or ten inches diameter: they go quite round the rampart, and the circular projection is called the cordon. Where the straight part of the wall ends and the slope begins, the wall is always made five feet thick; and the counterforts or buttresses reach no higher than that place. 8. When the rampart is partly walled and partly turfed, then one-fifth of the height which is turfed must be added to five feet, to get the thickness of the wall above. And having the thickness of any wall above, by adding one-fifth of its height from the bottom of the ditch, the sum will be the thickness of the wall at the bottom; but if a sixth part is only taken for the slope, then a sixth part must be added. For instance, suppose a rampart of 30 feet high from the bottom of the ditch, and that 10 of these are to be turfed, then the fifth part of 10, which is 2, added to 5, gives 7 for the wall above; and as this wall is 20 feet high, the fifth of which added is 4, and 4 to the thickness 7 above, gives 11 for the thickness near the foundation. In fig. 1, Plate LXXIII, AL represents the horizontal line of a profile, in which the principal elevations and depressions are exhibited as explained in the definitions; fig. 2, 3, and 4 represent, in military perspective, the profiles of the body of a place, the ravelin and covert-way; which gives a clear idea of what is meant by a profile, and from which those of all other works may be easily conceived.

OF IRREGULAR FORTIFICATION.

IRREGULAR FORTIFICATION is that where the sides and angles are not uniform, equidistant, or equal; owing to the irregularity of the ground, hills, valleys, rivers, and the like. The most essential principle in fortification consists in making all the fronts of a place equally strong, so that the enemy may find no advantage in attacking either of the sides. This can happen no otherwise in a regular fortification situated in a plain or even ground: but as there are but few places which are not irregular either in their works or situations, and the nature of the ground may be such as makes it impracticable to build them regular without too great expence; it is so much the more necessary to shew in what consists the strength or weakness of a town irregularly fortified, so that the weakest part may be made stronger by additional outworks; as likewise, if such a place is to be attacked, to know, which is the strongest or weakest part.

CONSTRUCTION OF AN IRREGULAR PLACE IN AN OPEN COUNTRY.

If the place to be fortified is an old town inclosed by a wall or rampart, as it most frequently happens, the engineer is to consider well all the different circumstances of the figure, situation, and nature, of the ground; and to regulate his plan accordingly, so as to avoid the disadvantages and gain all the advantages possible; he should examine, whether by cutting off some parts of the old wall or rampart, and taking in some ground, the place can be reduced into a regular form, or nearly so; for if that can be done without increasing the expence considerably, it should by no means be omitted. Old towns have often towers placed from distance to distance, as Douay, Tournay, and many other places, which are generally made use of, and meaded when it may be done. If there be a rampart without bastions or towers, it must be well considered whether bastions may not be added, or if it is not better to make only some outworks; if the ditch about this rampart is not too wide and deep, it would be advantageous to make detached bastions; otherwise ravelins and counterguards must be constructed. Special care must be taken to make all the sides of the polygon as nearly equal as possible, and that the length of the lines of defence do not exceed the reach of a musket-shot; but if that cannot be done, those sides which are on the narrowest part should be made the longest. If some of the sides be inaccessible or of very difficult approach, either on account of some precipice, marshy ground, or inundation, they may be made much longer than the others which are easy of access, and the flanks need not be so large as the rest; by doing so some expence will be saved, which may be used in making the other sides stronger by adding more outworks. There are few situations but what are more advantageous in some parts than in others; it is therefore the business of an engineer to distinguish them, and to render those sides strong by art which are not so by nature. If the situation be low and watery, lunettes or tenailions, and such other small outworks, should be constructed; because they are not of any great expence, and may make a very good defence. But if one side of the place only be low, and running water is to be had, a second ditch and covert-way with lunettes may be made, by observing, that if the first glacis is made to slope, so as to become even with the level of the water in the second ditch; or if the water can be swelled by means of dykes or sluices, so as to overflow the best part of the glacis, it should be done: for by doing this these works will be able to make very good defence, since the besiegers will find it a difficult matter to lodge themselves upon this glacis; which cannot be done but within a few toises of the first covert-way, where the besieged are ready to receive them, and to destroy their works with great advantage; whereas the enemy cannot support their workmen but from the second covert-way, which is too far off to be of any great service to them. But if the situation be dry, without any water about it, caponiers should be made in the great ditch, from the curtains to the ravelin, and batteries raised in the entrance of the ditch before the ravelin, whose parapet must slope off into a glacis, so as to afford no cover for the enemy behind them. Arrows and detached redoubts are likewise very proper to be used in such a case; and sometimes horn or crown works, if it should be thought convenient; but these works should never be constructed without an absolute necessity, either to oc-

cupy a spot of ground which might be advantageous to the enemy, or to cover some gate or entrance in the town; for they are of great expence, and their defence seems not to be answerable to it. Most of the places in Flanders are fortified with horn-works, such as Ypres, Fournay, Lille, and others. If the place to be fortified is new, and the situation will not admit of a regular construction, particular care must be taken in choosing such a spot of ground as is most advantageous, and least liable to any disadvantages either in the building or in maintaining it. All hills or rising grounds should be avoided, which might command any part of the works; marshy grounds, because such situations are unwholesome; or lakes and standing waters for the same reason, excepting a lake is or may be made navigable. Good water should be had either within the place or near it, for it is absolutely necessary for men and cattle: the air should be wholesome; otherwise the continual sickness that may reign in such a place might prevent people from coming to live in it, and the garrison would not be in a condition to defend themselves as they ought to do. In short, all the different circumstances attending such an undertaking should be maturely considered before a resolution is taken to fortify any place. When a situation is fixed upon, the next thing to be considered is, the bigness of the town and the number of its outworks; which must absolutely depend upon the consequence such a place is of to a nation. If it is only to guard a pass or entrance into a country, it need not be so large: but if it is to be a place either to promote or to protect trade, it should be large and commodious; the streets should be wide, and the buildings regular and convenient. As to what regards the fortification, its construction should depend on the nature of the situation, and the number of works on the funds or expence a prince or nation will be at; which, however, ought to be according to the benefit arising from such a place: for as such undertakings are of very great expence, an engineer cannot be too sparing in his works; on the contrary, the greatest economy should be used both in regard to the number of works and to their construction. The body of the place may have revetments quite up to the top, or only in part, and the rest turfed; but as to the outworks they should have half-revetments, or they may be made with turf only; as being not so necessary to prevent the place from being surprised, which may nevertheless make a good defence. Plate LXXIII. fig. 5, is the plan of an octagon, one-half of which is similar and equal to the other half. The exterior sides are each 180 toises, and the works are constructed according to our method; but because the sides AB, EF, are weaker than the rest, we have added tenailles, redoubts in the ravelins, and lunettes, to render them nearly equal in strength with the others; and if counter-guards were made before the bastions A and B, it would effectually secure that front. Instead of lunettes, any other works may be made, as may be thought convenient and according to the nature of the ground. If it should be judged necessary to add other outworks to the ravelins all round the place, care must be taken to add likewise more to the fronts AB, EF, in order to render the advantages and disadvantages of attacking on either side equal.

CONSTRUCTION OF AN IRREGULAR FORTIFICATION ON A HILL OR ROCK.

In the construction of such places, care must be taken that no neighbouring hill commands any part of the works. The town should always be built on the highest part; but if it should be thought more convenient to place it lower, then the upper part must be fortified with a fort. The situation should be made as nearly level as possible, by removing the earth from some places to fill up others; and if it cannot well be levelled without extraordinary expence, works must be made on the highest part, so as to command and protect the lower. The works ought to occupy all the upper part of the hill; but if it should be too extensive to be all inclosed, or so irregular as not to be fortified without great inconvenience, the parts which fall without should be fortified with some detached works, and a communication with the place must be made either above or below the ground. There should be no cavity or hollow roads within cannon-shot round about the place, where the enemy might be able to approach under cover. If there be a spring near the top of the hill, it should be inclosed in the fortification; or if that cannot be done, by some work or other; for there is nothing more necessary, and at the same time

6 H.

more scarce, in such situations, than water for which reason they cannot be too much care taken to provide it: several cisterns should be made to receive the rain-water, and to preserve it; wells should be dug likewise, though ever so deep, the water of which will serve for common use. Fortified towns built on hills or rocks should never be large; for their use is generally to guard passes or inlets into a country, as they are seldom useful in traffic; and it is a difficult matter to provide for a large garrison in such situations, neither should any such place be built without some very material reasons: but when it is absolutely necessary, great care and precaution should be taken to render the works as perfect as the situation will admit of, and at the same time to be as frugal in the expence as possible.

CONSTRUCTION OF IRREGULAR FORTIFICATIONS NEAR RIVERS, LAKES, OR THE SEA.

As the intent of building these kinds of places is chiefly to facilitate and protect trade, they are of more importance than any other kind, especially in maritime countries, where the principal strength and power of the state depends on them: for which reason we shall treat of this construction the more largely. The first thing to be considered is their situation, which ought to be such as to afford a good harbour for shipping, or a safe and easy entrance in stormy weather; but as it is hardly possible to find any harbour, where ships may go in and lie secure with all winds, care should be taken to make them safe to enter with those winds which are most dangerous: but it is not sufficient that the harbour is safe against stormy weather; it should likewise be so against an enemy both by land and water; for it often happens that ships are destroyed where it was imagined they were secure, which is of too great consequence not to be provided against; for which reason, forts or batteries must be built in the most convenient places, to prevent the enemy's ships from coming too near, so as to be able to cannonade those in the harbour, or fling shells amongst them; and if there is any danger of an enemy's approach by land, high ramparts and edifices must be built, so as to cover them. When a river is pretty large, and it is not convenient to make a harbour without great expence, the ships may ride along the shore; which, for that reason, must be made accessible for ships of burden: this may be done by advancing the quay into the river if the water is too shallow, or by digging the river sufficiently deep for that purpose. And to prevent an enemy from coming up to the river, forts must be built on both sides, especially when there are any turnings or windings. Antwerp is such a place: for the Scheld is sufficiently deep to carry ships of great burden, which may come quite near the town-wall; and several forts are built below it on both sides, so that it would not be an easy matter for an enemy to come up the river. When the river is small, so that no ships of burden can come through it, it is sufficient to make it run through some of the works, where proper landing places are contrived, from whence the goods may be carried into the place; as at Sarre-Louis, where a horn-work is built beyond the Sarre, in the George of which the goods are landed. If the breadth of the river do not exceed 200 yards, it commonly passes through the middle of the town, and proper quays are made on each side; in such a case, the fortification is so contrived, as that the river passes through the curtain, in order to have a bastion on each side to

defend the coming in and going out. When M. Vauban fortified near rivers, he made always the exterior side near the water much longer than any of the others; such as Huningen on the Rhine, and Sarre-Louis on the Sarre; but for what reason he fortified these places in that manner, has not been told by any author. But it is plain that the sides which terminate at the river are the weakest; because the besiegers' trenches being secured by the river, they may draw most of their troops off, and act therefore with more vigour and strength on the other side: besides, as the strength of a side increases in proportion as the angle of the polygon is greater, by making the side next the river longer, the angles at its extremities become wider, and consequently the adjacent sides stronger. There are other advantages, besides those mentioned, which arise from the lengthening of that side; for if the river is deep so as not to be fordable, that side is not liable to be attacked; and by increasing its length, the capacity of the place increases much more in proportion to the expence, than if more sides were made; the centre of the place will be likewise nearer the river, which makes it more convenient for transporting the goods from the water-side to any part of the town. To illustrate this method of M. Vauban's, we have given the plan of Huningen. See Plate LXXIII. fig. 6. This place was built for the sake of having a bridge over the Rhine, for which reason he made it only a pentagon; the side AB next to the river is 200 toises, and each of the others but 180. About the space abc , which lies before the front AB, is a stone-wall; and the passages are shut up with sluices, to retain the water in the ditches in the dry seasons: and to prevent an enemy from destroying the sluice near the point c , whereby the water would run out and leave the ditches dry, the redoubt y was built in the little island hard by, in order to cover that sluice; without which precaution the place might be insulted from the river-side, where the water is shallow in dry seasons. The hornwork K beyond the Rhine was built to cover the bridge; but as this work cannot be well defended, across the river, the hornwork H was made to support the other. Before finishing the description of this plan, we shall shew how to find the long side AB. After having inscribed the two sides GE, GF, in a circle, draw the diameter CD, parallel to the line joining the points EF. On this diameter set off 100 toises on each side of the centre; from these points draw two indefinite perpendiculars to the diameter: then if from the points EF, as centres, two arcs are described with a radius of 180 toises, their intersections A and B with the said perpendiculars, will determine the long side AB, as likewise the other two FB and EA. In like manner may be found the long or short side of any polygon whatsoever. When a town near a river is to be fortified for the safety of commerce, particular care should be taken in leaving a good space between the houses and the water-side, to have a key or landing-place for goods brought by water; it should also be contrived to have proper places for ships and boats to lie secure in stormy weather, and in time of a siege; and as water-carriage is very advantageous for transporting goods from one place to another, as well as for bringing the necessary materials, not only for building the fortifications but also the place itself, the expences will be lessened considerably when this convenience can be had; for which reason, places should never be built any where else but near rivers, lakes, or the sea; excepting in extraordinary cases, where these advantages cannot be obtained.

FORTINS, FORTELETS, or FIELD-FORTS, are little forts, whose flanked angles are generally 120 fathoms distant from one another. The extent and figure of fortins are different, according to the situation and nature of the ground; some having whole bastions, and others demi-bastions. They are used only for a time, either to defend the lines of circumvallation, or to guard some passage or dangerous post.

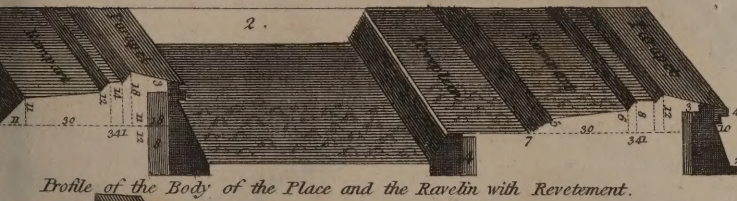
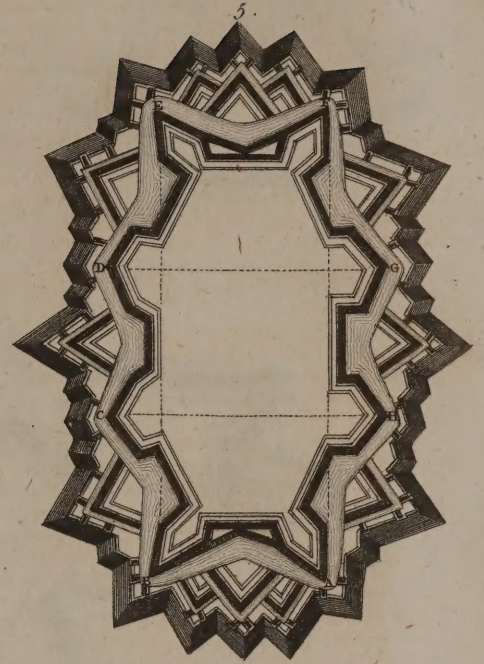
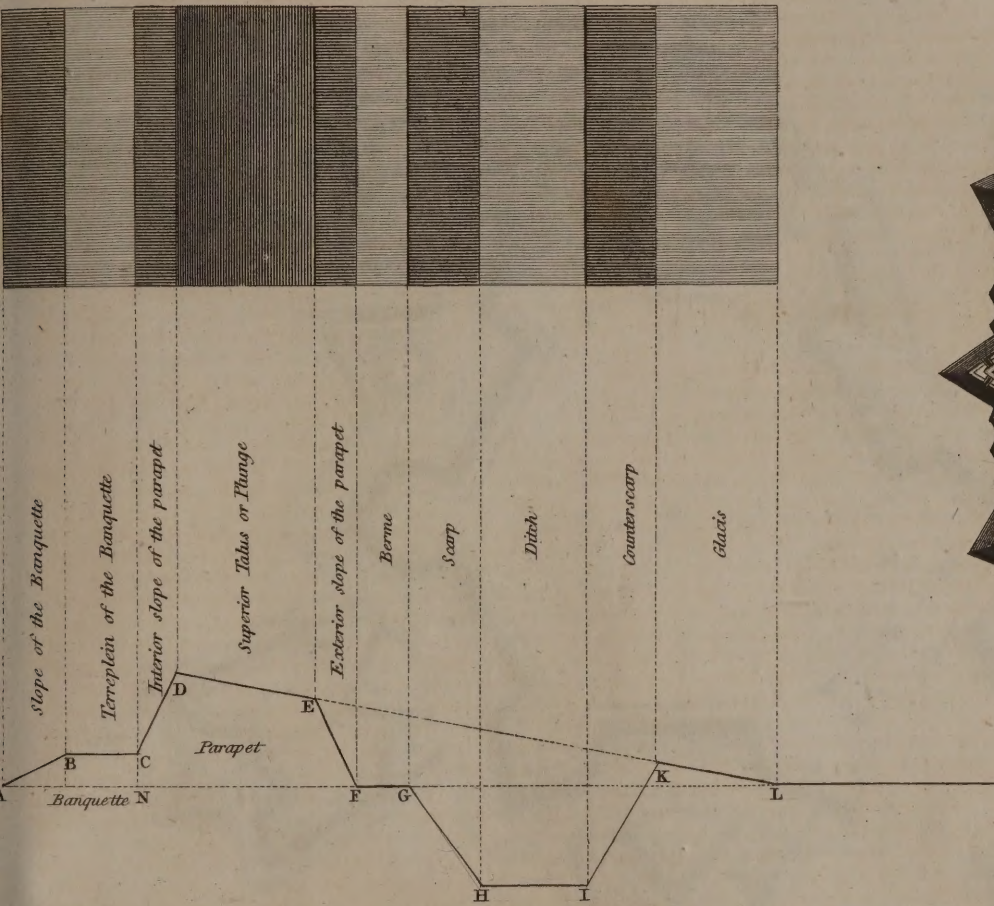
FORTISSIMO, in music, sometimes denoted by FFF, or *fff*, signifies to sing or play very loud or strong.

FORTITUDE, is generally considered as the same with courage, but in a more accurate view they are clearly distinguishable: Courage may be a virtue or vice, according to circumstances:

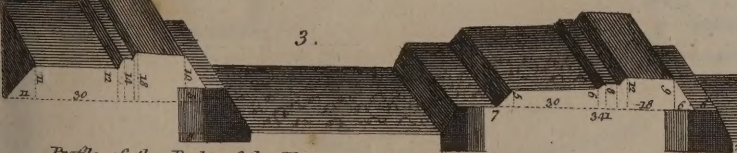
fortitude is always a virtue: we speak of desperate courage, but not of desperate fortitude. A contempt or neglect of danger, without regard to consequences, may be called courage; and this some brutes have as well as we: in them it is the effect of natural instinct chiefly; in man it depends partly on habit, partly on strength of nerves, and partly on want of consideration. But fortitude is the virtue of a rational and considerate mind, and is founded in a sense of honour and a regard to duty. There may be courage in fighting a duel: though that folly is more frequently the effect of cowardice: there may be courage in an act of piracy or robbery: but there can be no fortitude in perpetrating a crime. Fortitude implies a love of equity and of public good; for, as

Plato

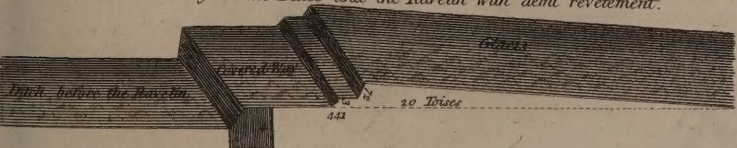
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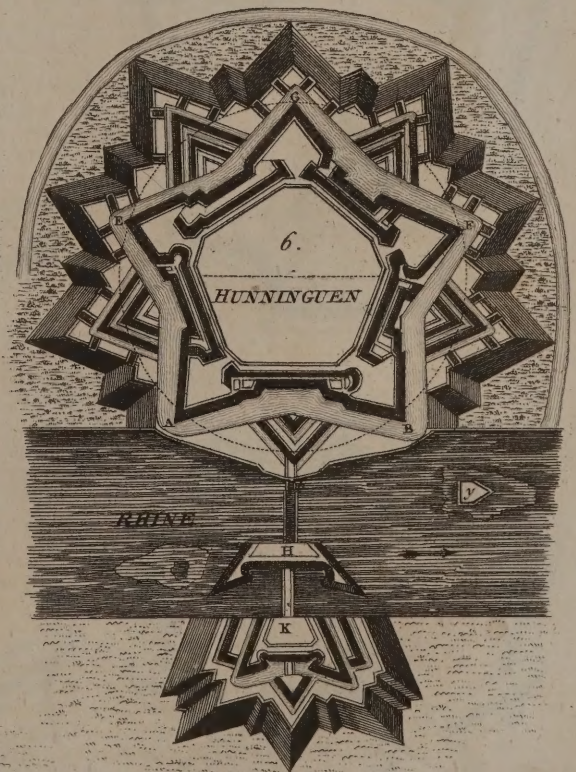
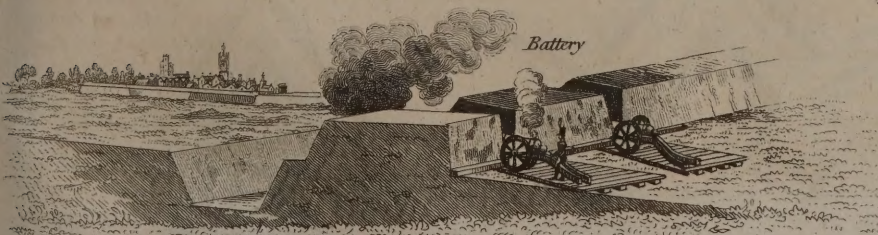
Profile of the Body of the Place and the Ravelin with Revetement.



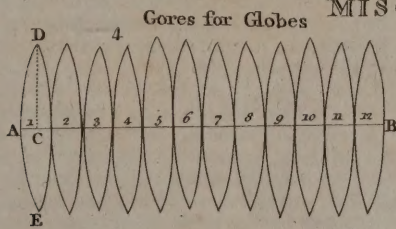
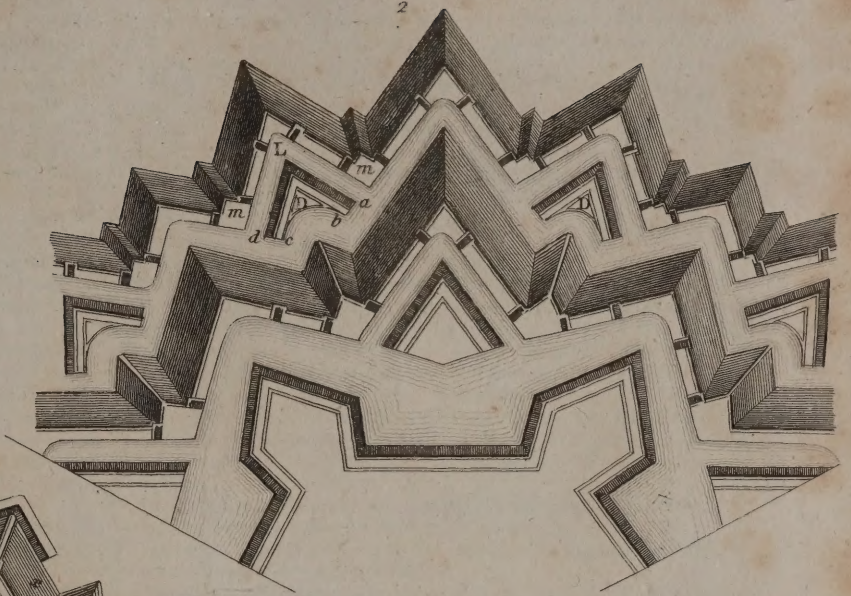
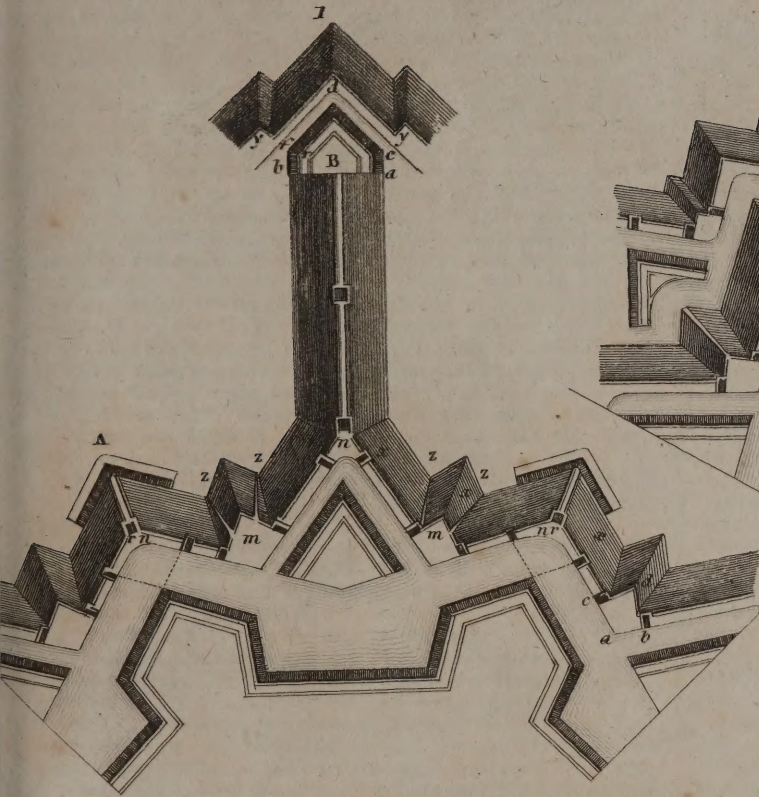
Profile of the Body of the Place and the Ravelin with demi-revetement.



4.

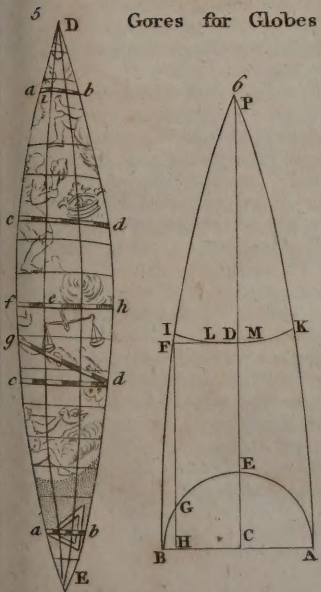




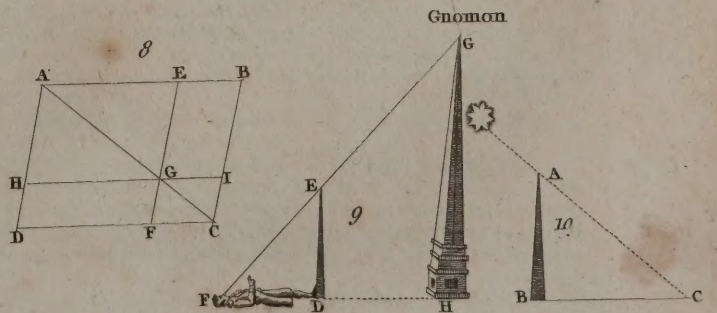
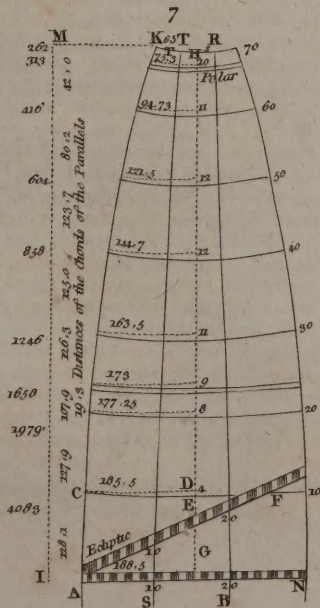


Gores for Globes

MISCELLANIES.



Gores for Globes



W. R. Newman 1854

Plato and Cicero observe, courage exerted for a selfish purpose, or without a regard to justice, ought to be called audacity rather than fortitude. This virtue takes different names, according as it acts in opposition to different sorts of evil; but some of those names are applied with considerable latitude. With respect to danger in general, fortitude may be termed intrepidity; with respect to the dangers of war, valour; with respect to pain of body or distress of mind, patience; with respect to labour, activity; with respect to injury, forbearance; with respect to our condition in general, magnanimity. The motives to fortitude are many and powerful. This virtue tends greatly to the happiness of the individual, by giving composure and presence of mind, and keeping the other passions in due subordination. To public good it is essential; for without it, the independence and liberty of nations would be impossible. It gives to a character that elevation which poets, orators, and historians, have in all ages vied with one another to celebrate. Nothing so effectually inspires it as rational piety; the fear of God is the best security against every other fear. A true estimate of human life; its shortness and uncertainty; the numberless evils and temptations to which by a long continuance in this world we must unavoidably be exposed; with many similar considerations which Christianity affords, and especially the assurances of the Divine favour, are the only certain foundations of genuine fortitude in all exigencies.

FORTROSE, a town of Scotland in Ross-shire, on the Frith of Moray, nearly opposite to Fort George, 10 miles N. E. of Inverness.

FORTUNA, a goddess worshipped with great devotion by the ancient Greeks and Romans; who believed her to preside over human affairs, and to distribute wealth and honour at her pleasure. See **FORTUNE**.

FORTUNATE ISLANDS, in ancient geography, certain islands, concerning the situation of which authors are not agreed; famous in the mythology, for the golden apples of the Hesperides. The common opinion is, that they are the Canary Islands.

FORTUNE, [τοχμή], a name which among the ancients seems to have denoted a principle of fortuity, whereby things came to pass, without being necessitated thereto: but what and whence that principle is, they do not seem to have ever precisely thought. Hence their philosophers often intimate, that men only framed the phantom Fortune to hide their ignorance; and that they call Fortune whatever befalls a man without his knowing for what purpose. Hence Juvenal (Sat. x. ver. 366,) affirms, they were men who made a deity of Fortune: and Mr. Spence says, that he has seen an ancient gem, in which Cybele, the mother of the gods, is represented as turning away her head from Fortune, in attitude of disowning and rejecting her; (Polymetis, p. 150, 154, &c.) In the opinion of the heathens, therefore, fortune was only the arrival of things in a sudden and unexpected manner, without any apparent cause or reason: so that the philosophical sense of the word coincides with what is vulgarly called chance. But in religion it had a farther force; altars and temples in great numbers were consecrated to Fortune, as a deity. This intimates, that the heathens had personified, and even deified, Chance; and conceived her as a sort of goddess, who disposed of the fate of men at her pleasure. Hence that innovation of Horace, *O diva, gratum quæ regis Antium*, in the 35th ode of the first book, where he recommends Augustus, then preparing for a visit to Britain, to her protection. From these different sentiments it may be inferred, that the ancients at one time took Fortune for a peremptory cause, bent upon doing good to some, and persecuting others; and at others for a blind inconstant cause, without any view or determination at all. If then the word fortune had no certain idea in the mouth of those who erected altars to her, much less can it be ascertained what it denotes in the minds of those who now use the word in their writings. Horace paints Fortune preceded by Necessity, holding nails and wedges in her hands, with a cramp-iron and melted lead to fasten it; rarely accompanied with Fidelity, unless when she abandons a family; for in that case Fidelity never fails to depart with her, as well as friends. She is disrespectfully spoken of by most of the Roman writers, and represented as blind, inconstant, unjust, and delighting in mischief. The most celebrated temple of Fortune was at Præneste. Statius speaks of several Fortunes there, and calls them the Prænestinae sorores. Lib. i. Sylv. iii. ver. 80.

FORTUNE ISLAND, or **GOOD FORTUNE ISLAND**, an isle in the Indian sea, S. W. of Sumatra. Lon. 20. 25. E. Lat. 1. 35. S.

FORTUNETELLER, one who cheats common people, by pretending to the knowledge of futurity. Fortune-tellers are to be punished with a year's imprisonment, and standing four times on the pillory. Stat. 9 Geo. II. cap. 5.

FORTY-DAYS COURT, the court of attachment or woodmote, held before the verderors of the forest once every 40 days, to inquire concerning all offenders against vert and venison. See **ATTACHMENT**.

FORUM, in Roman antiquity, was a public place within the city, where causes were judicially tried, and orations delivered to the people.

FORUM was also used for a place of traffic, answering to our market-place. These were generally called *fora venalia*; in contradistinction to the former, which were called *fora civilia*. The Grecian *Αγορα* exactly correspond with the Roman *fora*, being places where courts and markets were held. At Athens they had many *fora*, but the chief of them were the old and the new.

FORUM is also used among casuists, &c. for jurisdiction; as, *In foro legis*, &c. The following metaphorical uses of the word are also common in the Classics, as Cicero, Suetonius, Florus, &c.

1. **FORUM AGERE**, denoted the bringing on causes out of Rome, in a Roman province; signifying the same with *agere conventum*.

2. **FORUM INDICERE**, was the act of the prator appointing the place in Rome where causes were to be tried.

FORUM, in ancient geography, prefixed to a proper name, denoted a market-town or borough.

FORUM APPII, a town of the Volsci, in Latium, on the Via Appia, a little beyond the *Tres Tabernæ*; mentioned by St. Luke, as well as by Cicero.

FORUM DOMITII, a town of Gallia Narbonensis; now Frontignan, or Frontigniac, in Languedoc.

FORUM FULVII, a town of Liguria, surnamed *Valentinum*; from which it is conjectured that it is now Valenza in the duchy of Milan.

FORUM TIBERII, a town of Gallia Belgica, on the left or W. side of the Rhine: Now called *Kaysersbuhl*.

FORUM VULCANI, the *Campi Phlegræi* of Pliny: a place in Campania, near Puteoli, and distant from it two miles towards Naples. It is now called *Solfatara*.

FOS, a marquisate of Italy, in Tuscany.

FOS DI NOVA, the capital of the above marquisate: four miles E. of Sarzana.

FOSS, in fortification, a hollow place, commonly full of water, lying between the scarp and counterscarp, below the rampart; and turning round a fortified place or a post that is to be defended.

FOSSA, in our ancient customs, was used to signify a ditch full of water, wherein women, convicted of felony, were drowned.

FOSS-WAY, one of the four principal high-ways of England, that anciently led through the kingdom; supposed to be made by the Romans, having a ditch upon one side.

FOSSANO, a town of Italy in Piedmont, seated on the Stura; famed for its medicinal springs; whence its ancient name *Fons Sanus*, since corrupted into its modern one. It lies five miles E. of Savigliano.

FOSSARH, in antiquity, officers in the eastern church, whose business was to inter the dead.

FOSSE, in geography, a town of Germany, in Westphalia, lately in the bishopric of Liege. It is seven miles W. of Namur.

FOSSE, the name of two rivers of England; viz. 1. in Lancashire, running into *Leven Sands*: 2. in Yorkshire, running into the *Ouse* near York.

FOSSIL, [*fossilis*, Lat. *fossile*, Fr.] in natural history, denotes in general all things dug out of the earth: whether they be natives thereof, as metals, stones, salts, earths, and other minerals; or extraneous, reposit in the bowels of the earth by some extraordinary means, as earthquakes, the deluge, &c. See **METAL**, **STONE**, **SHELL**, &c.

FOSSOMBRONE, a town of Italy, in the duchy of Urbino, 16 miles S. W. of Pesaro.

FOSTER, JAMES, D. D. a most distinguished and popular dissenting minister, born at Exeter in 1697. He began to preach in 1718; and strong disputes arising soon after, among the dissenters, concerning the Trinity and subscription to tests, his judgement determining him to the obnoxious opinions, the clamour grew loud

loud against him, and occasioned more than one removal. His talents were hid among obscure country congregations, until 1724; when he was chosen to succeed Dr. Gale in Barbican, where he laboured as pastor above 20 years. The Sunday evening lecture, begun in the Old Jury meeting-house in 1728, which he conducted with uncommon applause for more than twenty years, indisputably shewed his abilities as a preacher. Persons of all persuasions and ranks in life flocked to hear him: and Mr. Pope has honoured him with a commendatory couplet to his satires; which, however, his commentator laboured to destroy the intention of, by a frivolous note. In 1746 he attended Lord Kilmarnock, at his execution on Tower-hill; an office which his friends thought had made too deep an impression on his sympathizing spirit, as his vivacity abated from that time. He died in 1753; after having published several valuable compositions and sermons; particularly, 1. A Defence of Christianity, against Tindal's Christianity as old as the Creation. 2. An Essay on Fundamentals. 3. Four volumes of Sermons. 4. Discourses on Natural Religion and Social Virtue, in 4to.

FOSTER, SAMUEL, an ingenious mathematician of the 17th century, and astronomical professor in Gresham college, was one of that learned association which met for cultivating the new philosophy, during the political confusions, and which Charles II. established into the Royal Society. He died, however, in 1652, before this incorporation took place: but wrote several mathematical and astronomical treatises.

FOTHERGILL, JOHN, an eminent physician, born in 1712 at Car End in Yorkshire of reputable parents who were quakers. He took his doctor's degree at Edinburgh, in 1736. In the same year he became a pupil in St. Thomas's hospital, and in 1740 went abroad. On his return he settled in London: and in 1748 acquired a great reputation, by a tract, intitled, an Account of the Sore Throat attended with Ulcers. This disease was at that time very prevalent and fatal. In 1754 he became a member of the Edinburgh College of Physicians; and in 1763 a fellow of the Royal Society. When the differences broke out between this country and the American colonies, he laboured much to prevent hostilities, and had conferences with Dr. Franklin for that purpose. Dr. Fothergill was a man of amiable manners, a skilful physician, a great encourager of learning, and an excellent botanist. He died in 1780. His works have been printed in 3 vols. 8vo. with his life prefixed. He was at the expence of printing Purver's translation of the Bible, and an edition of Percy's Key to the New Testament, for a seminary of Quakers in Yorkshire. His brother Samuel was a considerable preacher among the Quakers, and died in 1773.

FOTHERGILLA, in botany, a genus of the polyandria digynia class and order. Calyx ament, ovate; scales one-flowered; corolla calyx-form, one-petaled, five-cleft. There is but one species.

FOTHERING, a peculiar method of endeavouring to stop a leak in the bottom of a ship while she is afloat, either under sail or at anchor. A basket is filled with ashes, cinders, and chopped rope-yarns, and loosely covered with a piece of canvas; to this is fastened a long pole, by which it is plunged repeatedly into the water, as close as possible to the place where the leak is conjectured to lie. The oakum or chopped rope-yarns being thus gradually shaken through the twigs, or over the top of the basket, are frequently sucked into the hole along with the water, so that the leak becomes immediately choked; and the future entrance of the water is thereby prevented.

FOTHERINGAY, a town of Northamptonshire, about four miles from Staneford, situated on the Avon.

FOUAN, a town of Asia, in Corea.

FOU-CHAN, a town of China, in the province of Chang-tong; 25 miles S. E. of Teng-tcheon.

FOUCHARMONT, a town of France, in the department of the Lower Seine; nineteen and an half miles S. of Dieppe, and three N. E. of Neufchatel.

FOUE, a large town of Egypt on the Nile, 25 miles S. of Rosetta, and 40 E. of Alexandria.

FOUESNANT, a town of France, in the department of Finistère, seven and a half miles S. of Quimper.

FOUGADE, [French,] in the art of war, a sort of little mine in the manner of a well, scarce more than ten feet wide, and twenty deep, dug under some work of fortification, and charged with barrels or sacks of gunpowder to blow it up, and covered over with earth.

FOUGERES, a town of France, in the department of Maine and Loire. It is 24 miles N. E. of Rennes.

FOUL, in sea-language, is used when a ship has been long untrimmed, so that the grass weeds, or branches, grow on her sides under water. It is also used for the running of one ship against another. This happens sometimes by the violence of the wind, and sometimes by the carelessness of the people on board, to ships in the same convoy, and to ships in port by means of others coming in. The damages occasioned by running foul, are of the nature of those in which both parties must bear a share. They are usually made half to fall upon the sufferer, and half upon the vessel which did the injury; but in cases where it is evidently the fault of the master of the vessel, he alone is to bear the damage.

FOUL, in husbandry, a disease in cattle, proceeding from blood, and a waterish rheum that falls down into the legs, and makes them swell.

FOUL WATER. A ship is said to make foul water, when, being under sail, she comes into such shoal-water, that though her keel do not touch the ground, yet it comes so near it, that the motion of the water under her raises the mud from the bottom.

FOULA, or FOUL ISLAND, one of the Shetland isles, lying between six and seven leagues W. from the main land.

FOULNESS, in geography, an island of England the S. E. coast of Essex, six miles E. of Rochford.

FOULNEY, an island on the coast of Lancashire, S. W. of the Sands.

FOULOU-SOUSOU, a town of Chinese Tartary, on the Saghalien, nine miles N. E. of Telden.

FOULSHAM, a town of Norfolk, 16 miles N. W. of Norwich.

FOUNDATION, in architecture, is that part of a building which is under ground. See ARCHITECTURE and BUILDING.

FOUNDATION, denotes also a donation or legacy, either in money or lands, for the maintenance and support of some community, hospital, school, &c.

FOUNDER, in a general sense, the person who lays a foundation, or endows a church, school, religious-house, or other charitable institution. The founder of a church may preserve to himself the right of patronage, or presentation to the living.

FOUNDER, also implies, an artists who cast metals, in various forms, for different uses, as guns, bells, statues, printing characters, candle-sticks, buckles, &c. whence they are denominated gun-founders, bell-founders, figure-founders, letter-founders, founders of small works, &c. See FOUNDRY.

FOUNDER, in glass-making, a term appropriated to the green glass, and is the person there who in the same office in the white-glass-making is called conciator.

FOUNDER, [*fondre*, Fr.] in sea-language is used, when a ship, by an extraordinary leak, or by a great sea breaking in upon her, is so filled with water, that she cannot be freed of it; so that she can neither veer nor steer, but lie like a log; and not being able to swim long, will at last sink.

FOUNDERED FEET. See FARRIERY.

FOUNDERY, a place where figures are formed of melted metal; a casting-house.

FOUNDERY, or FOUNDRY, signifies also the art of casting all sorts of metals into different forms.

FOUNDERY OF BELLS. The metal, it is to be observed, is different for bells from what is for statues; there being no tin in the latter; but there is one-fifth, and sometimes more, in the bell-metal. The dimensions of the core and the wax for bells, if a ring of bells especially, are not left to chance, but must be measured on a scale, or diapason, which gives the height, aperture, and thickness, necessary for the several tones required. It is on the wax that the several mouldings and other ornaments and inscriptions, to be represented in relievio on the outside of the bell, are formed; the clapper or tongue is not properly a part of the bell, but is furnished from other hands. In Europe, it is usually of iron, with a large knob at the extremity; and is suspended in the middle of the bell. In China, it is only a huge wooden mallet, struck by force of arm against the bell; whence they can have but little of that consonancy so much admired in some of our rings of bells. The Chinese have an extraordinary way of increasing the sound of their bells, viz. by leaving a hole under the cannon; which our bell-founders would reckon a defect. The proportions of our bells differ very much from those of the Chinese, as well as their sizes.

In ours, the modern proportions are, to make the diameter 15 times the thickness of the brim, and the height 12 times. The parts of a bell are, 1. The sounding bow, terminated by an inferior circle, which grows thinner and thinner. 2. The brim or that part of a bell whereon the clapper strikes, and which is thicker than the rest. 3. The outward sinking of the middle of the bell, or the point under which it grows wider to the brim. 4. The waist or furniture, and the part that grows wider and thicker quite to the brim. 5. The upper vase, or that part which is above the waist. 6. The pallet which supports the staple of the clapper within. 7. The bent and hollow branches of metal uniting with the cannons, to receive the iron keys, whereby the bell is hung up to the beam, which is its support and counterpoise, when rung out. The business of bell-foundry is reducible to three particulars. 1. The proportion of a bell. 2. The forming of the mould. And, 3. The melting of the metal. There are two kinds of proportions, viz. the simple and the relative; the former are those proportions only that are between the several parts of a bell to render it sonorous; the relative proportions establish a requisite harmony between several bells. The method of forming the profile of a bell, previous to its being cast, in which the proportion of the several parts may be seen, is as follows: the thickness of the brim, Cr, Plate LXX. fig. 14, is the foundation of every other measure, and is divided into three equal parts. First, draw the line HD, which represents the diameter of the bell; bisect it in F, and erect the perpendicular Ff; let DF and HF be also bisected in E and G, and two other perpendiculars Ee, Ga, be erected at E and G: GE will be the diameter of the top or upper vase, i. e. the diameter of the top will be half that of the bell; and it will, therefore, be the diameter of a bell which will sound an octave to the other. Divide the diameter of the bell, or the line HD, into 15 equal parts, and one of these will give Cr, the thickness of the brim; divide again each of these 15 equal parts into three other equal parts, and then form a scale. From this scale take 12 of the larger divisions or two-15ths of the whole scale in the compass, and setting one leg in D describe an arc to cut the line Ee in N; draw ND, and divide this line into 12 equal parts; at the point I erect the perpendicular IC = 10, and CI will be the thickness of the brim = one-15th of the diameter: draw the line CD; bisect DN; and at the point of the bisection 6 erect the perpendicular GK = $\frac{1}{2}$ of the larger divisions on the scale. With an opening of the compass equal to twice the length of the scale or 30 brims, setting one leg in N, describe an arc of a circle, and with the same leg in K and the same opening, describe another arc to intersect the former; on this point of intersection as a centre, and with a radius equal to 30 brims, describe the arc NK; in 6 K produced take KB = $\frac{2}{3}$ of the larger measure of the scale or $\frac{2}{3}$ of the brim, and on the same centre with the radius 30 $\frac{2}{3}$ brims describe an arc AB parallel to NK. For the arc BC, take 12 divisions of the scale or 12 brims in the compass; find a centre, and from that centre, with this opening, describe the arc BC, in the same manner as NK or AB were described. There are various ways of describing the arc Kp; some describe it on a centre at the distance of nine brims from the points p and K; others, as it is done in the figure, on a centre at the distance only of seven brims from those points. But it is necessary first to find the point p, and to determine the rounding of the bell p l. For this purpose, on the point C as a centre, and with the radius C I, describe the arc I p n; bisect the part I, 2, of the line Dn, and erecting the perpendicular p m, this perpendicular will cut the arc I p n in m, which terminates the rounding I p. Some founders make the bendings K a third of a brim lower than the middle of the line DN; others make the part C I D more acute, and instead of making C I perpendicular to DN at I, draw it one-sixth of a brim higher, making it still equal to one brim; so that the line I D is longer than the brim G I. In order to trace out the top-part Na, take in the compass eight divisions of the scale or eight brims, and on the points N and D as centres, describe arcs to intersect each other in 8; on this point 8, with a radius of eight brims, describe the arc N b; this arc will be the exterior curve of the top or crown: on the same point 8 as a centre, and with a radius equal to $7\frac{2}{3}$ brims, describe the arc A e, and this will be the interior curve of the crown, and its whole thickness will be one-third of the brim. As the point 8 does not fall in the axis of the bell, a centre M may be found in the axis by describing, with the interval of 8 brims from the centres D and H, arcs which will intersect in M;

and this point may be made the centre of the inner and outer curves of the crown as before. The thickness of the cap, which strengthens the crown at Q, is about one-third of the thickness of the brim; and the hollow branches or ears about one-sixth of the diameter of the bell. The height of the bell is in proportion to its diameter as 12 to 15, or in the proportion of the fundamental sound to its third major: whence it follows that the sound of a bell is principally composed of the sound of its extremity or brim, as a fundamental of the sound of the crown which is an octave to it, and of that of the height which is a third. The particulars necessary for making the mould of a bell are, 1. The earth: the most cohesive is the best: it must be well ground and sifted, to prevent any chinks. 2. Brick-stone; which must be used for the mine, mould, or core, and for the furnace. 3. Horse-dung, hair, and hemp, mixed with the earth, to render the cement more binding. 4. The wax for inscriptions, coats of arms, &c. 5. The tallow equally mixed with the wax, in order to put a slight lay of it upon the outer mould, before any letters are applied to it. 6. The coals to dry the mould. For making the mould, they have a scaffold consisting of four boards, ranged upon tressels. Upon this they carry the earth, grossly diluted, to mix it with horse-dung, beating the whole with a large spatula. The compasses of construction are the chief instrument for making the mould: They consist of two different legs joined by a third piece. And last of all, the founders' shelves, on which are the engravings of the letters, cartridges, coats of arms, &c. They first dig a hole of a sufficient depth to contain the mould of the bell, together with the case or cannon, under ground; and about six inches lower than the terreplain, where the work is performed. The hole must be wide enough for a free passage between the mould and walls of the hole, or between one mould and another, when several bells are to be cast. At the centre of the hole is a stake erected, that is strongly fastened in the ground. This supports an iron peg, on which the pivot of the second branch of the compasses turns. The stake is encompassed with a solid brick work, perfectly round, about half a foot high, and of the proposed bell's diameter. This they call a mill-stone. The parts of the mould are, the core, the model of the bell, and the shell. When the outer surface of the core is formed, they begin to raise the core, which is made of bricks that are laid in courses of equal height upon a lay of plain earth. At the laying of each brick, they bring near it the branches of the compasses, on which the curve of the core is shaped, so as that there may remain between it and the curve the distance of a line, to be afterwards filled up with layers of cement. The work is continued to the top, only leaving an opening for the coals to bake the core. This work is covered with a layer of cement, made of earth and horse-dung; on which they move the compasses of construction, to make it of an even smoothness every where. The first layer being finished, they put the fire to the core, by filling it half with coals, through an opening that is kept shut during the baking, with a cake of earth that has been separately baked. The first fire consumes the stake, and the fire is left in the core half, or sometimes a whole day: the first layer being thoroughly dry, they cover it with a second, third, and fourth; each being smoothed by the board of the compasses, and thoroughly dried before they proceed to another. The core being completed, they take the compasses to pieces, with intent to cut off the thickness of the model, and the compasses are immediately put in their place to begin a second piece of the mould. It consists of a mixture of earth and hair, applied with the hand on the core, in several cakes that close together. This work is finished by several layers of a thinner cement of the same matter, smoothed by the compasses, and thoroughly dried before another is laid on. The first layer of the model is a mixture of wax and grease spread over the whole. After which are applied the inscriptions, coats of arms, &c. besmeared with a pencil dipped in a vessel of wax in a chafing-dish: this is done for every letter. Before the shell is begun, the compasses are taken to pieces, to cut off all the wood that fills the place of the thickness to be given to the shell. The first layer is the same earth with the rest, sifted very fine; whilst it is tempering in water, it is mixed with cow's hair to make it cohere. The whole being a thin cullis, is gently poured on the model, that fills exactly all the sinuosities of the figures, &c. and this is repeated till the whole is two lines thick over the model. When this layer is thoroughly dried, they cover it with a second

of the same matter, but somewhat thicker; when this second layer becomes of some consistence, they apply the compasses again, and light a fire in the core, so as to melt off the wax of the inscriptions, &c. After this, they go on with the other layers of the shell, by means of the compasses. Here they add to the cow's hair a quantity of hemp, spread upon the layers, and afterwards smoothed by the board of the compasses. The thickness of the shell comes to four or five inches lower than the mill-stone before observed, and surrounds it quite close, which prevents the extravasation of the metal. The wax should be taken out before the melting of the metal. The ear of the bell requires a separate work, which is done during the drying of the several incrustations of cement. It has seven rings: the seventh is called the bridge, and unites the others, being a perpendicular support to strengthen the curves. It has an aperture at the top, to admit a large iron peg, bent at the bottom; and this is introduced into two holes in the beam, fastened with two strong iron keys. There are models made of the rings, with masses of beaten earth, that are dried in the fire, in order to have the hollow of them. These rings are gently pressed upon a layer of earth and cow's hair, one-half of its depth: and then taken out, without breaking the mould. This operation is repeated 12 times for 12 half-moulds, that two and two united may make the hollows of the six rings; the same they do for the hollow of the bridge, and bake them all, to unite them together. Upon the open place left for the coals to be put in, are placed the rings that constitute the ear. They first put into this open place the iron ring to support the clapper of the bell; then they make a round cake of clay, to fill up the diameter of the thickness of the core. This cake, after baking, is clapped upon the opening, and soldered with a thin mortar spread over it, which binds the cover close to the core. The hollow of the model is filled with an earth, sufficiently moist to fix on the place, which is strewed at several times upon the cover of the core; and they beat it gently with a pestle, to a proper height; and a workman smooths the earth at top with a wooden trowel dipped in water. Upon this cover, to be taken off afterwards, they assemble the hollows of the rings. When every thing is in its proper place, they strengthen the outside of the hollows with mortar, in order to bind them with the bridge, and keep them steady at the bottom, by means of a cake of the same mortar, which fills up the whole aperture of the shell. This they let dry, that it may be removed without breaking. To make room for the metal, they pull off the hollows of the rings, through which the metal is to pass, before it enters into the vacuity of the mould. The shell being unloaded of its ear, they range under the mill-stone five or six pieces of wood, about two feet long, and thick enough to reach almost the lower part of the shell; between these and the mould, they drive in wooden wedges with a mallet, to shake the shell off the model whereon it rests, so as to be pulled up and got out of the pit. When this and the wax are removed, they break the model and the layer of earth, through which the metal must run, from the hollow of the rings, between the shell and the core. They smoke the inside of the shell, by burning straw under it, that helps to smooth the surface of the bell. Then they put the shell in the place, so as to leave the same interval between that and the core; and before the hollows of the rings or the cap are put on again, they add two vents, that are united to the rings, and to each other, by a mass of baked cement. After which they put on this mass of the cap, the rings, and the vent, over the shell, and solder it with thin cement, which is dried gradually by covering it with burning coals. Then they fill up the pit with earth, beating it strongly all the time round the mould. The surface has a place for the fire, and another for the metal. The fire-place has a large chimney with a spacious ash-hole. The furnace which contains the metal is vaulted, whose bottom is made of earth, rammed down; the rest is built with brick. It has four apertures; the first, through which the flame revivifies; the second is closed with a stopple that is opened for the metal to run; the others are to separate the dross or scoria of the metal by wooden rakes: through these last apertures passes the thick smoke. The ground of the furnace is built sloping, for the metal to run down.

2. **FOUNDRY OF GREAT GUNS, AND MORTAR-PIECES.** The method of casting these pieces is different from that of bells: they are run massy, without any core, being determined by the hollow of the shell; and they are afterwards bored with a steel trepan, that

is worked either by horses or a water-mill. For the metal, parts, proportions, &c. of these pieces, see GUNNERY.

3. **FOUNDRY OF LETTERS, OR CASTING OF TYPES FOR PRINTING.** In the business of cutting, casting, &c. letters for printing, the letter-cutter must be provided with a vice, hand-vice, hammers, and files of all sorts such as watch-makers use; also gravers and sculptors of all sorts, and an oil-stone, &c. suitable and sizeable to the several letters to be cut: a flat gauge made of box to hold a rod of steel, or the body of a mould, &c. exactly perpendicular to the flat of the using file: a sliding gauge whose use is to measure and set off distances between the shoulder and the tooth, and to mark off from the end, or from the edge of the work, a face-gauge, which is a square notch cut with a file into the edge of a thin plate of steel, iron, or brass, of the thickness of a piece of common tin, whose use is to proportion the face of each sort of letter, viz. long letters, ascending letters, and short letters. So there must be three gauges, and the gauge for the long letters is the length of the whole body supposed to be divided into 42 equal parts. The gauge for the ascending letters Roman and Italic are five-sevenths, or 30 parts of 42, and 33 parts for the English face. The gauge for the short letters is three-sevenths, or 18 parts of 42 of the whole body for the Roman and Italic, and 22 parts for the English face. The Italic and other standing gauges are to measure the scope of the Italic stems, by applying the top and bottom of the gauge to the top and bottom lines of the letters, and the other side of the gauge to the stem; for when the letter complies with these three sides of the gauge, that letter has its true shape. The next care of the letter-cutter is to prepare good steel punches, well tempered, and quite free from all veins of iron; on the face of which he draws or marks the exact shape of the letter with pen and ink if the letter be large, or with a smooth blunted point of a needle if it be small; and then with sizeable and proper-shaped and pointed gravers and sculptors, digs or sculps out the steel between the strokes or marks he made on the face of the punch, and leaves the marks standing on the face. Having well-shaped the inside strokes of his letter, he deepens the hollows with the same tools; for if a letter be not deep in proportion to its width, it will, when used at press, print black, and be good for nothing. This work is generally regulated by the depth of the counter-punch. Then he works the outside with proper files till it be fit for the matrice. Before we proceed to the sinking and justifying of the matrices, we must provide a mould to justify them by. See Plate LXX, fig. 15 and 16. Every mould is composed of an upper and an under part. The under part is delineated in fig. 15. The upper part is marked fig. 16, and is in all respects made like the under part, excepting the stool behind, and the bow or spring also behind; and excepting a small roundish wire between the body and carriage, near the break, where the under part hath a small rounding groove made in the body. This wire, or rather half-wire, in the upper part makes the nick in the shank of the letter, when part of it is received into the groove in the under part. These two parts are so exactly fitted and gauged into one another (viz. the male-gauge marked *c* in fig. 16, into the female marked *g* in fig. 15,) that when the upper part of the mould is properly placed on, and in the under part of the mould, both together make the entire mould, and may be slid backwards for use so far, till the edge of either of the bodies on the middle of either carriage comes just to the edge of the female gauges cut in each carriage: and they may be slid forward so far, till the bodies on either carriage touch each other: and the sliding of these two parts of the mould backwards makes the shank of the letter thicker, because the bodies in each part stand wider asunder; and the sliding them forwards makes the shank of the letter thinner, because the bodies on each part of the mould stand closer together. The parts of the mould are as follows: viz. *a*, The carriage. *b*, The body. *c*, The male gauge. *d e*, The mouth-piece. *f i*, The register. *g*, The female gauge. *h*, The hag. *a a a a*, The bottom-plate. *b b b*, The wood on which the bottom-plate lies. *c c c*, The mouth. *d d*, The throat. *e d d*, The pallet. *f*, The nick. *g g*, The stool. *h h*, The spring or bow. Then the mould must be justified: and first the founder justifies the body, by casting about 20 proofs or samples of letters; which are set up in a composing stick, with all their nicks towards the right hand; and then by comparing these with the pattern-letters, set up in the same manner, he finds the exact measure of the body to be cast. He also tries

if the two sides of the body are parallel, so that the body be no bigger at the head than at the foot, by taking half the number of his proofs and turning them with their heads to the feet of the other half; and if then the heads and the feet be found exactly even upon each other, and neither to drive out nor get in, the two sides may be pronounced parallel. He farther tries whether the two sides of the thickness of the letter be parallel, by first setting his proofs in the composing-stick with their nicks upwards, and then turning one-half with their heads to the feet of the other half; and if the heads and feet lie exactly upon each other, and neither drive out nor get in, the two sides of the thickness are parallel. The mould thus justified, the next business is to prepare the matrices. A matrice is a piece of brass or copper of about an inch and a half long, and of a thickness in proportion to the size of the letter it is to contain. In this metal is sunk the face of the letter intended to be cast, by striking the letter-punch about the depth of an n. After this the sides and face of the matrice must be justified, and cleared with files of all bunnings made by sinking the punch. Every thing thus prepared, it is brought to the furnace; which is built of brick upright, with four square sides, and a stone on the top, in which stone is a wide round hole for the pan to stand in. A foundry of any extent has several of these furnaces in it. As to the metal of which the types are to be cast, this, in extensive foundries, is always prepared in large quantities; but cast into small bars, of about 20 pounds weight, to be delivered out to the workmen as occasion requires. In the letter-foundry which has been long carried on with reputation under the direction of Dr. Alex. Wilson and sons at Glasgow, we are informed, that a stock of metal is made up at two different times of the year, sufficient to serve the casters at the furnace for six months each time. For this purpose, a large furnace is built under a shade, furnished with a wheel-vent, in order the more equally to heat the sides of a strong pot of cast iron, which holds, when full, 15 cwt. of the metal. The fire being kindled below, the bars of lead are let softly down into the pot, and their fusion promoted by throwing in some pitch and tallow, which soon inflame. An outer chimney, which, is built so as to project about a foot over the farthest lip of the pot, catches hold of the flame by a strong draught, and makes it act very powerfully in melting lead; whilst it serves at the same time to convey away all the fumes, &c. from the workmen, to whom this laborious part of the business is committed. When the lead is thoroughly melted, a due proportion of the regulus of antimony and other ingredients are put in, and some more tallow is inflamed to make the whole incorporate sooner. The workmen, having mixed the contents of the pot very thoroughly by stirring long with a large iron ladle, next proceed to draw the metal off into the small troughs of cast iron, which are ranged to the number of 80 upon a level platform faced with stone, built towards the right hand. In the course of a day 15 cwt. of metal can be easily prepared in this manner; and the operation is continued for as many days as are necessary to prepare a stock of metal of all the various degrees of hardness. After this, the whole is disposed into presses according to its quality, to be delivered out occasionally to the workmen. The founder must now be provided with a ladle, which differs nothing from other iron ladles but in its size; and he is provided always with ladles of several sizes, which he uses according to the size of the letters he is to cast. Before the caster begins to cast, he must kindle a fire in the furnace to melt the metal in the pan: therefore he takes the pan out of the hole in the stone, and there lays in coals and kindles them; and, when they are well kindled, he sees the pan in again, and puts in metal into it to melt: if it be a small-bodied letter he casts, or a thin letter of great bodies, his metal must be very hot; nay sometimes red-hot, to make the letter come. Then having chosen a ladle that will hold about as much as the letter and break are, he lays it at the stoking-hole, where the flame bursts out, to heat. Then he ties a thin leather, cut with its narrow end against the face to the leather groove of the matrice by whipping a brown thread twice about the leather groove, and fastening the thread with a knot. Then he puts both halves of the mould together, and puts the matrice into the matrice-cheek, and places the foot of the matrice on the stool of the mould, and the broad end of the leather upon the wood of the upper half of the mould; but not tight up, lest it might hinder the foot of the matrice from sinking close down upon the stool in a train of work. Then laying a little rosin on the up-

per wood of the mould, and having his casting-ladle hot, he with the boiling side of it melts the rosin: and, when it is yet melted, presses the broad end of the leather hard down on the wood, and so fastens it to the wood; all this is the preparation. Now he proceeds to casting; placing the under half of the mould in his left hand, with the hook or lag forward, he clutches the ends of its wood between the lower part of the ball of his thumb and his three hind-fingers; then he lays the upper half of the mould upon the under half, so that the male gauges may fall into the female gauges, and at the same time the foot of the matrice places itself upon the stool; and clapping his left hand thumb strong over the upper half of the mould, he nimbly catches hold of the bow or spring with his right hand fingers at the top of it, and his thumb under it, and places the point of it against the middle of the notch in the back side of the matrice, pressing it both forwards towards the mould, and downwards by the shoulder of the notch close upon the stool; while at the same time with his hinder fingers he draws the under half of the mould towards the ball of his thumb, and thrusts by the ball of his thumb the upper part towards his fingers, that both the registers of the mould may press against both sides of the matrice, and his thumb and fingers press both halves of the mould close together. Then he takes the handle of his ladle in his right hand, and with the boll of it gives a stroke, or two or three, outwards upon the surface of the melted metal, to scum or clear it from the film or dust that may swim upon it; then he takes up the ladle full of metal, and having his mould, as aforesaid, in his left hand, he a little twists the left side of his body from the furnace, and brings the geat of his ladle (full of metal) to the mouth of the mould, and twists the upper part of his right hand towards him to turn the metal into it, while at the same moment of time he jilts the mould in his left hand forwards, to receive the metal with a strong shake (as it is called) not only into the body of the mould, but while the metal is yet hot, running swift and strongly, into the very face of the matrice, to receive its perfect form there, as well as in the shank. Then he takes the upper half of the mould off the under half, by placing his right hand thumb on the end of the wood next his left hand thumb, and his two middle fingers at the other end of the wood; and finding the letter and break lie in the under half of the mould (as most commonly, by reason of its weight, it does) he throws or tosses the letter, break and all, upon a sheet of waste paper laid for that purpose on the bench, just a little beyond his left hand, and is then ready to cast another letter as before; and also the whole number that is to be cast with the matrice. A workman will ordinarily cast about 3000 of these letters in a day. When the casters at the furnace have got a sufficient number of types upon the tables; a set of boys come and nimbly break away the jets from them: the jets are thrown into the pots, and the types are carried away in parcels to other boys, who pass them swiftly under their fingers, defended by leather, upon smooth flat stones, in order to polish their broad sides. This is a very dexterous operation, and is a remarkable instance of what may be effected by the power of habit and long practice; for these boys, in turning up the other side of the type, do it so quickly by a mere touch of the fingers of the left hand, as not to require the least perceptible intermission in the motion of the right hand upon the stone. The types, thus finely smoothed and flattened on the broad sides, are next carried to another set of boys, who sit at a square table, two on each side, and are there ranged up on long rulers, or sticks, fitted with a small projection, to hinder them from sliding off backwards. When these sticks are so filled, they are placed, two and two, upon a set of wooden pins fixed into the wall, near the dresser, sometimes to the amount of an hundred, in order to undergo the finishing operations. This workman, who is always the most expert and skilful in all the different branches carried on at the foundry, begins by taking one of these sticks, and, with a peculiar address, slides the whole column of types off upon the dressing-stick: this is made of well-seasoned mahogany, and furnished with two end-pieces of steel, a little lower than the body of the types, one of which is moveable so as to approach the other by means of a long screw-pin inserted in the end of the stick. The types are put into this stick with their faces next to the back or projection; and after they are adjusted to one another so as to stand even, they are then bound up, by screwing home the moveable end-piece. It is here where the great and requisite accuracy

of the moulds comes to be perceived; for in this case the whole column, so bound up, lies flat and true upon the stick, the two extreme types being quite parallel, and the whole has the appearance of one solid continuous plate of metal. The least inaccuracy in the exact parallelism of the individual type, when multiplied so many times, would render it impossible to bind them up in this manner, by disposing them to rise or spring from the stick by the smallest pressure from the screw. Now, when lying so conveniently with the narrow edges uppermost, which cannot possibly be smoothed in the manner before mentioned by the stones, the workman does this more effectually by scraping the surface of the column with a thick-edged but sharp razor, which at every stroke brings on a very fine smooth skin, like to polished silver; and he thus proceeds till in about half a minute he comes to the further end of the stick. The other edges of the types are next turned upwards and polished in the same manner. It is whilst the types thus lie in the dressing-stick that the operation of bearding or barbing is performed, which is effected by running a plane, faced with steel, along the shoulder of the body next to the face, which takes more or less off the corner, as occasion may require. Whilst in the dressing-stick they are also grooved, which is a very material operation. To understand this, it must be remembered, that when the types are first broken off from the jets some superfluous metal always remains, which would make them bear very unequally against the paper, whilst under the printing-press, and effectually mar the impression. That all these inequalities may, therefore, be taken away, and that the bearings of every type may be regulated by the shoulders imparted to them all alike from the mould, the workman or dresser proceeds in the following manner. The types being screwed up in the stick, as before mentioned, with the jet-end outermost, and projecting beyond the wood about one eighth of an inch, the stick is put into an open press, so as to present the jet-end uppermost, and then every thing is made fast by driving a long wedge, which bears upon a slip of wood, which lies close to the types the whole length: then a plane is applied, which is so constructed as to embrace the projecting part of the types betwixt its long sides, which are made of polished iron. When the plane is thus applied, the steel cutter bearing upon that part between the shoulders of the types where the inequalities lie, the dresser dexterously glides it along, and by this means strips off every irregular part that comes in the way, and so makes an uniform groove the whole length, and leaves the two shoulders standing; by which means every type becomes precisely like to another, as to the height against paper. The types being now finished, the stick is taken out of the press, and the whole column replaced upon the other stick; and after the whole are so dressed, he proceeds to pick out the bad letters, previous to putting them up into pages and papers. In doing this he takes the stick into his left hand, and turning the faces near to the light, he examines them carefully, and whenever an imperfect or damaged letter occurs, he nimbly plucks it out with a sharp bodkin, which he holds in the right hand for that purpose. Those letters which, from their form, project over the body of the type, and which cannot on this account be rubbed on the stones, are scraped on the broad sides with a knife or file, and some of the metal next the face pared away with a penknife, in order to allow the type to come close to any other. This operation is called kerning. The excellence of printing-types consists not only in the due performance of all the operations above described, but also in the hardness of the metal, form, and fine proportion of the character, and in the exact bearing and ranging of the letters in relation to one another.

4. **FOUNDRY OF SMALL WORKS, OR CASTING IN SAND.** The sand used for casting small works is at first of a pretty soft, yellowish, and clammy nature; but it being necessary to strew charcoal-dust in the mould, it at length becomes of a quite black colour. The red-hot metal, by burning part of the sand, contributes also to blacken it. This sand is worked over and over with a roller, on a board placed across a chest to receive it, after it is by these means sufficiently prepared, and freed from small stones or hard lumps of sand. This done, they take a smooth wooden board, of a length and breadth proportional to the things to be cast, and laying the first half of an open mould, or wooden frame, upon it, they place within it, upon the board, either wooden or metal models of what they intend to cast, and then fill it up with the prepared sand, a little moistened to make it cohere properly, pressing it upon the

patterns with the roller, so as to leave their impression in it. Along the middle of the mould is also laid half a small brass cylinder, to make an impression for the chief canal for the metal to run through, when melted, into the models or patterns; and from this chief canal are drawn several others, which extend to each model or pattern placed in the frame. Then placing the other half of the mould over the one with the patterns in it, so that the pins enter into the holes that correspond to them in the other, they proceed to work it in the same manner, so as to make the two cavities of the pattern fall exactly on each other. After both frames of the mould are thus finished, and their backs scraped smooth, they take out the patterns, first loosening them gently all round, that the sand may not give way. The moulds are then carried to the melter; who, after strewing mill-dust over them, dries them in a kind of oven for that purpose. Both parts of the mould being dry, they are again joined together by means of the pins; and to prevent their giving way, by reason of the melting metal passing through the chief cylindrical canal, they are screwed or wedged up in a pair of wooden screws, like a kind of press. When the moulds are thus prepared, the metal is melted in a crucible, of a size proportionate to the quantity of metal intended to be cast, and when brought to a proper heat, is poured into them at the mouth of the chief canal. When the moulds are coolish, the frames are unscrewed, and the cast work taken out of the sand, which is wet and worked over again for other castings.

5. **FOUNDRY OF STATUES.** The casting of statues depends on the due preparation of the pit, the core, the wax, the outer mould, the inferior furnace to melt off the wax, and the upper to fuse the metal. The pit is a hole dug in a dry place something deeper than the intended figure, and made according to the prominence of certain parts thereof. The inside of the pit is commonly lined with stone or brick; or, when the figure is very large, they sometimes work on the ground, and raise a proper fence to resist the impulse of the melted metal. The inner mould, or core, is a rude mass, to which is given the intended attitude and contours. It is raised on an iron grate, strong enough to sustain it, and is strengthened within by several bars of iron. It is generally made either of potter's clay, mixed with hair and horse-dung, or of plaster of Paris, mixed with brick-dust. The use of the core is to support the wax, the shell, and lessen the weight of the metal. The iron bars and the core are taken out of the brass figure through an aperture left in it for that purpose, which is soldered up afterwards. It is necessary to leave some of the iron bars of the core, that contribute to the steadiness of the projecting part, within the brass figure. The wax is a representation of the intended statue. If it be a piece of sculpture, the wax should be all of the sculptor's own hand, who usually forms it on the core: though it may be wrought separately in cavities, moulded on a model, and afterwards arranged on the ribs of iron over the grate; filling the vacant space in the middle with liquid plaster and brick-dust, whereby the inner core is proportioned as the sculptor carries on the wax. When the wax, which is the intended thickness of the metal, is finished, they fill small waxen tubes perpendicular to it from top to bottom, to serve both as canals for the conveyance of the metal to all parts of the work; and as vent-holes, to give passage to the air, which would otherwise occasion great disorder when the hot metal came to encompass it. The work being brought thus far, must be covered with its shell, which is a kind of crust laid over the wax, and which being of a soft matter, easily receives the impression of every part, which is afterwards communicated to the metal upon its taking the place of the wax, between the shell and the mould. The matter of this outer mould is varied according as different layers are applied. The first is generally a composition of clay, and old white crucibles well ground and sifted, and mixed up with water to the consistence of a colour fit for painting: accordingly they apply it with a pencil, laying it seven or eight times over, and letting it dry between whites. For the second impression they add horse-dung and earth to the former composition. The third impression is only horse-dung and earth. Lastly, the shell is finished by laying on several more impressions of this last matter, made very thick with the hand. The shell, thus finished, is secured by several iron girths, bound round it, at about half a foot distance from each other, and fastened at the bottom to the grate under the statue, and at top to a circle of iron where they all terminate. If the statue be so big that it would not be easy to move the moulds with safety, they must

be wrought on the spot where it is to be cast. This is performed two ways: in the first, a square hole is dug under ground, much bigger than the mould to be made therein, and its inside lined with walls of free-stone or brick. At the bottom is made a hole of the same materials, with a kind of furnace, having its aperture outwards: in this is a fire made to dry the mould, and afterwards melt the wax. Over this furnace is placed the grate, and upon this the mould, &c. formed as above. Lastly, at one of the edges of the square pit, is made a large furnace to melt the metal. In the other way, it is sufficient to work the mould above ground, but with the like precaution of a furnace and grate underneath. When finished, four walls are to be run around it, and by the side thereof a massive made for a melting furnace. For the rest the method is the same in both. The mould being finished, and inclosed as described, whether under ground or above it, a moderate fire is lighted in the furnace under it, and the whole covered with planks, that the wax may melt gently down, and run out at pipes contrived for that purpose, at the foot of the mould, which are afterwards exactly closed with earth, so soon as the wax is carried off. This done, the hole is filled up with bricks thrown in at random, and the fire in the furnace augmented till such time as both the bricks and mould become red hot. After this, the fire being extinguished, and every thing cold again, they take out the bricks, and fill up their place with earth moistened, and a little beaten to the top of the mould, in order to make it the more firm and steady. These preparatory measures being duly taken, there remains nothing but to melt the metal, and run it into the mould. This is the office of the furnace above described, which is commonly made in the form of an oven with three apertures, one to put in the wood, another for a vent, and a third to run the metal out at. From this last aperture, which is kept very close, while the metal is in fusion, a small tube is laid, whereby the melted metal is conveyed into a large earthen bason, over the mould, into the bottom of which all the big branches of the jets, or casts, which are to convey the metal into all the parts of the mould, are inserted. These casts or jets are all terminated with a kind of plugs, which are kept close, that, upon opening the furnace, the brass, which gushes out with violence, may not enter any of them, till the bason be full enough of matter to run into them all at once. Upon which occasion they pull out the plugs, which are long iron rods with a head at one end, capable of filling the whole diameter of each tube. The whole of the furnace is opened with a long piece of iron fitted at the end of each pole, and the mould filled in an instant. This completes the work in relation to the casting part; the rest being the sculptor's or carver's business, who, taking the figure out of the mould and earth wherewith it is encompassed, saws off the jets with which it appears covered over, and repairs it with chisels, gravers, puncheons, &c.

FOURMONT, STEPHEN, professor of the Arabic and Chinese languages, and one of the most learned men of his time, was born at Herbelai, a village 12 miles from Paris, in 1683. He studied in Mazarine college, and afterwards in the Seminary of Thirtysix. He was at length professor of Arabic in the Royal College, and was made a member of the Academy of Inscriptions. In 1738, he was chosen F. R. S. in London, and of that of Berlin in 1741. He was often consulted by the duke of Orleans, who greatly esteemed him, and made him one of his secretaries. He wrote a great number of books. The chief of those which have been printed are, 1. *The Roots of the Latin Tongue*, in verse. 2. *Critical Reflections on the Histories of Ancient Nations*, 2 vols. 4to. 3. *Meditationes Senecæ*, folio. 4. *A Chinese Grammar*, in Latin, folio. 5. *Several Dissertations* printed in the Memoirs of the Academy of Inscriptions, &c. He died at Paris in 1745.

FOURNEAUX ISLAND, a small circular island in the S. Pacific Ocean. Lon. 143. 2. W. Lat. 17. 11. S.

FOU-TCHOU, a city of China of the first rank in the province of Fo-kien, 870 miles S. of Peking.

FOU-TCHOU, a city of China of the first rank, in the province of Kiang-si; 735 miles E. of Peking.

FOWEY, FAWAY, or FOY, a populous and flourishing town of Cornwall, with a commodious haven on the British Channel. It lies 32 miles S. of Launceston. Lon. 4. 23. W. Lat. 50. 19. N.

FOWEY, FAWAY, FOUTH, or FOY, a river of Cornwall.

FOWL, among zoologists, denotes the larger sorts of birds, whether domestic or wild: such as geese, pheasants, partridges, turkies, ducks, &c. Tame fowl make a necessary part of the

stock of a country farm. See **POULTRY**. Fowls are again distinguished into two kinds, viz. land and water fowls, these last being so called from their living much in and about water: also into those which are accounted game, and those which are not. See **GAME**.

FOWLING, the art of catching birds by means of bird-lime, decoys, and other devices; or the killing of them by the gun. See **BIRD-CATCHING**, **BIRD-LIME**, **DECOY**, **SHOOTING**, and the names of the different birds in their order.

FOWLING, is also used for the pursuing and taking of birds with hawks, more properly called falconry, or hawking. See these articles.

FOWLING-PIECES, guns for birds; they are reckoned best, when they have a long barrel, from five feet and a half to six feet, with a moderate bore. But every fowler should have them of different sizes, suitable to the game he designs to kill. The barrel should be well polished and smooth within, and the bore of an equal bigness from one end to the other; which may be proved, by putting in a piece of pasteboard, cut of the exact roundness of the top: for if this goes down without stops or slipping, you may conclude the bore good. The bridge-pan must be somewhat above the touch-hole, and ought to have a notch to let down a little powder: this will prevent the piece from recoiling, which it would otherwise be apt to do.

FOX, GEORGE, the founder of the sect of Quakers, was a shoemaker in Nottingham. As he wrought at his trade, he used to meditate much on the scriptures: and conceiving that he was inspired, he began to preach. He proposed but few articles of faith; insisting chiefly on moral virtue, mutual charity, the love of God, and a deep attention to the inward motions and secret operations of the Spirit: he recommended a plain simple worship, and a religion without ceremonies, making it a principal point to wait in profound silence the directions of the Holy Spirit. Fox met with much rough treatment for his zeal, was often imprisoned, and several times in danger of being killed. But in spite of all discouragements his sect prevailed much, and many great men embraced his tenets; among whom were Barclay and Penn. He died in 1681. See **FRIENDS**.

FOX, JOHN, the martyrologist, was born at Boston in Lincolnshire, in 1517. At 16 he was entered a student of Brazen-nose college, Oxford; and in 1543, he proceeded M. A. and was chosen fellow of Magdalen college. He discovered an early genius for poetry, and wrote several Latin comedies, on Scriptural subjects, which his son assures us were written in an elegant style. He now applied himself with uncommon assiduity to divinity, particularly church-history; and, discovering a premature propensity to the doctrine of reformation, he was expelled the college as a heretic. His distress on this occasion was very great; but he soon found an asylum in the house of Sir Thomas Lucy of Warwickshire, who employed him as a tutor to his children. Here he married the daughter of a citizen of Coventry. Sir Thomas's children being grown up, after residing a short time with his wife's father, he came to London; where finding no immediate means of subsistence, he was reduced to the utmost degree of want; but as he was one day sitting in St. Paul's church, emaciated with hunger, a stranger accosted him familiarly, and, bidding him be of good cheer, put a sum of money into his hand; telling him at the same time, that in a few days new hopes were at hand. He was soon after taken into the family of the duchess of Richmond, as tutor to the earl of Surrey's children. In this family he lived, at Ryegate in Surrey, during the latter part of the reign of Henry VIII. the entire reign of Edward VI. and part of that of queen Mary I: but at length, persecuted by his implacable enemy Bishop Gardiner, he was obliged to seek refuge abroad. Basil in Switzerland was the place of his retreat, where he subsisted by correcting the press. On the death of Mary he returned to England; where he was graciously received by his former pupil the duke of Norfolk, who retained him in his family as long as he lived, and bequeathed him a pension at his death. Mr. secretary Cecil also obtained for him the rectory of Shipton near Salisbury; and he might have had considerable preferment, had he been willing to subscribe to the canons. He died in 1587, aged 70; and was buried in the chancel of St. Giles's, Cripplegate. He was a man of great industry, and considerable learning; a zealous, but not a violent reformer; a non-conformist, but not an enemy to the church of England. He left two sons; one of whom was bred a divine.

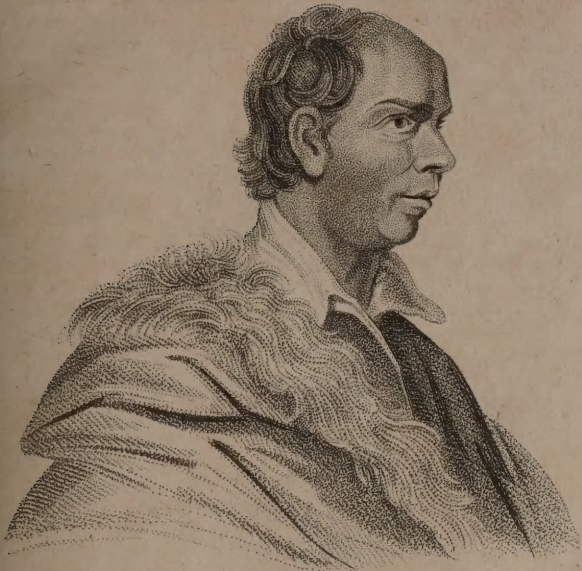
he other a physician. He wrote many pieces: but his principal work is, the Acts and Monuments of the Church, &c. commonly called Fox's Book of Martyrs.

FOX, CHARLES JAMES, one of the greatest statesmen in Europe, was the third son of Henry, the first Lord Holland, and Lady Georgiana Carolina Lenox, daughter of the late Duke of Richmond. He was born Jan. 24, 1749; and the union of his parents, conferred on him a descent from rival kings. To pourtray any thing like the character of this most distinguished senator, the limits of a volume would scarcely suffice. At the early period of nine years of age, the dawn appeared of that vast genius, which has since proved the admiration of the world; his father, who was a man of superior capacity, was then prime-minister; and having left in his study a political treaty which was for the approbation of a foreign power, Charles having eagerly perused it, threw the document into the fire, declaring it was unfit for the purpose intended. When about fifteen, he was permitted during the vacation month from college to visit the gay and luxurious city of Paris, but to return upon the expiration of that time; he immediately entered into all the gaiety of the scene which that capital affords with the ardour of a fashionable amateur; but quitted those fascinating attractions without reluctance, and once more returned to the seat of learning, where his industry was equally prominent: there it was observed, he had "no cotemporary so erudite in knowledge, none so elegant in mirth, and that to have seen him in either one or the other, it must have been supposed, that each was his peculiar study;" and from his fellow-student, the Earl of Carlisle, he received the following pleasing anticipation of his future abilities:—

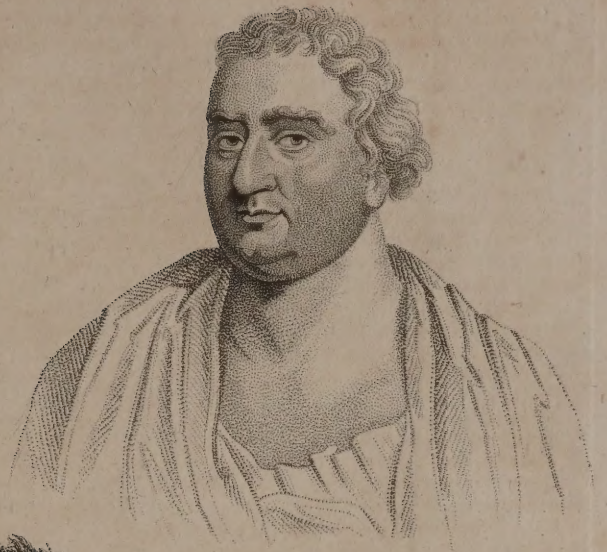
How will my Fox alone, by strength of parts
Shake the loud senate, animate the hearts
Of fearful statesmen! while around you stand,
Both peers and commons, listening your command;
While Tully's sense its weight to you affords,
His nervous sweetness shall adorn your words:
What praise to Pitt, to Townshend, e'er was due,
In future times, my Fox, shall wait on you.

His father never suffered him to be contradicted, that his towering genius should follow its own bent. In 1768, about twelve months before he had attained his 21st year, he took his seat in parliament under the banners of the Minister, as representative of Midhurst, in Sussex; but soon quitted the Tory side, to join the animated standard of a Burke and Dunning, imbibing those Whig principles which produced that strong and lasting attachment to the British Constitution, that has immortalized his memory. Mr. Fox's coalition with Lord North for a long time obscured his political integrity, and occasioned him much obloquy. Power, it should seem, was never long in his possession; and the transcendent abilities of his great rival Mr. Pitt, placed him as the honorable leader of the Opposition for many years; and he was looked up to as the "Man of the People." His memorable bill upon the administration of affairs in India, which he introduced into the House of Commons on the 18th of November, 1783, drew from the celebrated Mr. Burke, the following high eulogium: "I must say, then, that it will be a distinction honorable to the age, that the rescue of the greatest number of the human race that ever were so grievously oppressed from the greatest tyranny that was ever exercised, has fallen to the lot of abilities and dispositions equal to the task; that it has fallen to one who had the enlargement to comprehend, the spirit to undertake, and the eloquence to support, so great a measure of hazardous benevolence. But he has put to hazard his ease, his security, his interest, his power, even his darling popularity, for the benefits of a people whom he has never seen. He has faults; but they are faults which though they may in a small degree tarnish the lustre, and sometimes impede the march, of his abilities, have nothing in them to extinguish the fire of great virtues. In those faults there is no mixture of deceit, of hypocrisy, of pride, of ferocity, of complexional despotism, nor a want of feeling for the distresses of mankind:" and again, in 1790, upon the Army Estimates, that illustrious man, after those wide and important differences of opinion had been observable, which dissolved the long and close connexion of those two celebrated persons; he thus expressed himself—"he wished, as among the greatest benefits he could wish the country, an eminent share of power to the Right Hon. Gentleman (Mr. Fox) because he knew that, to his great and masterly understanding he had joined the greatest possible share

of that natural moderation, which is the best corrective of power; that he was of the most open, artless, candid, and benevolent disposition; disinterested in the extreme; of a temper mild and pliable even to a fault; without one drop of gall in his whole composition." On Mr. Fox's avowing his intention of retiring from office, Mr. Pitt observed, "he could not think his retreat warrantable; and that his abilities marked him to be public property." No man ever received the stamp of public approbation more than he did; his fame travelled far before him; and if he was the particular object of attention in his own country, he was no less so in other nations. In Russia, Catherine the Great, animated by his lively interference to prevent a war, and improve the relation between the two countries, requested Mr. Fox to sit for a bust of white marble to be placed between those of Demosthenes and Cicero at Petersburg. During his tour through Switzerland, the peaceful natives of that once happy soil, those brave defenders of their liberties, came out for miles in myriads to behold this prodigy of a man, and hail this great champion in freedom's cause, which the elegant author of the "Decline and Fall of the Roman Empire," thus pleasingly describes:—"Mr. Fox (Sept. 1788) gave me two days of free and private society. He seemed to feel, and even to envy, the happiness of my situation; while I admired the powers of a superior man, as they are blended in his attractive character, with all the softness and simplicity of a child. Perhaps no human being was ever more perfectly exempt from the taint of malevolence, vanity, or falsehood." In France, (Sept. 1802,) when Mr. Fox was presented to the First Consul (Bonaparte), he publicly declared, "that he was extremely happy in having the honor of seeing a man, whose fame as a statesman filled all Europe; and in being the enlightened friend of peace and conciliation between the two countries." He had been through life the most intimate and confidential friend of the heir apparent to the crown; and on one particular occasion received the most heart-felt thanks from the king for that sound and constitutional advice he had given his son; his conversation, it should seem, had made a deep and lasting impression upon the mind of his royal highness, for on his late birth-day (1810) upon the health of his daughter being drank, he most eloquently expressed himself to the following effect: "that he had made it his first care to instil into the mind and heart of his daughter the knowledge and love of the true principles of the British Constitution; and he had pointed out to her young understanding, as a model for study, the political conduct of his most revered and lamented friend, Mr. Fox, who had asserted and maintained, with such transcendent force, the just principles upon which the government, under this excellent Constitution, ought to be administered for the true and solid dignity of the crown, and the real security, freedom, and happiness of the people." The French Revolution by its alarming progress struck a panic amongst the great men of this country, and Mr. Fox was deserted by many of his friends, but the secession of Mr. Burke affected him even to tears, and he candidly acknowledged in the House of Commons, "that during the conversation of only a twelvemonth with that distinguished senator, he had gained more useful knowledge, than by all his experience, learning, and books;" yet notwithstanding he remained inflexible in his opinions; and during the extraordinary convulsions of a neighbouring nation, and the political feuds and animosities that agitated this country; sedition at home, and mutiny in the fleet; a rebellion in Ireland, by whom he lost one of his dearest connections; the voting away the Irish parliament, and the measure of a Union—an era, the most difficult and dangerous for a leader to steer clear; but he preserved the true dignity of his great character, triumphed at length over his enemies, was sought as the land-mark for the nation to rally round, and once more (Jan. 31, 1806,) became the servant of his king. Unfortunately for the nation, he enjoyed this station but for a few months; when he was deprived of serving that country, the first and nearest object of his heart. Yet it must not be forgot that during that short period, the abolition of the Slave Trade, (the bill respecting which was introduced into parliament so long back as 1791,) was accomplished; a traffic so disgraceful to an enlightened and free people! His last scene was marked with fortitude and composure: in speaking to a friend who anxiously hung over his pillow, about the state of the soul after death, he observed, "It is immortal, I am convinced; the existence of the Deity is a proof that spirits exists, why not therefore the soul of man? and if such



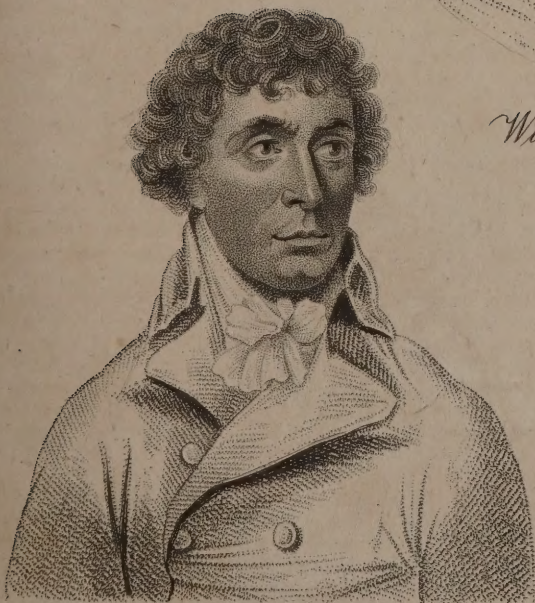
Oliver Goldsmith.



C. J. Fox.



William Hogarth.



Sir William Jones.



David Garrick.



FRANCE.

British Miles
50 100

an essence as the soul exists, by its nature it may exist for ever. I should have believed in the immortality of the soul, though Christianity had never existed; but how it acts as separated from the body is beyond my capacity of judgement. This however I shall know by next Christmas. I am happy, full of confidence, I may say of certainty; God's will be done! I have lived long enough, and shall die happy." He expired without a groan, on the 13th of September 1806, in the 58th year of his age, and was buried in Westminster Abbey on the 10th of October following, exactly opposite the monument of the illustrious Chatham; and within 18 inches of his political opponent Mr. Pitt. His funeral was splendid in the extreme, and attended by most of the distinguished characters in the kingdom; but the afflictions pouredtrayed by the people upon this public calamity, made a more lasting impression than all the magnificent paraphernalia of escutcheons, or the refined execution of the sculptor's art. With the sentiments of such men, who have been the leading features of society, little is left more than to observe, that as a statesman, it might be urged he was without a competitor, as his warnings proved almost prophetic; as a scholar, supremely distinguished; as a poet, harmony breathed through every line that found its way to the public; as a critic, profound, with a taste as refined as decisive; as a friend, disinterested; as an orator, though he might want the elegance of a Cicero, yet the powerful reasoning of a Demosthenes was conspicuous, simplicity was its characteristic, and his auditors never departed without being convinced of the truth of his arguments; in reply, he stood unequalled; as a literary character, his time was too much occupied to produce any thing more than a few political pamphlets, a small collection of poems, and a posthumous work, entitled, "A History of the early part of the Reign of James II." with an animated likeness of the author, engraved from a bust by Nollekens, under which the following lines appear, written by his most intimate friend, General Fitzpatrick:—

A Patriot's even course he steered,
Mid' Faction's wildest storms, unmoved;
By all, who mark'd his mind, revered,
By all, who knew his heart, beloved.

It was published, with an introductory chapter, under the direction of his nephew, Lord Holland; who has already given proofs of that classic excellence, which cannot fail of adding fresh laurels to this distinguished family. In short, his demise, has left in the political hemisphere an awful chasm; and the application of the poet was never more appositely quoted, than to "take him for all in all, we shall not look upon his like again!"

FOX, in zoology, an animal of the dog kind, which much resembles the common dog in form, and is of the size of a spaniel: it is chiefly distinguished by its long and straight tail, with the tip white. See CANIS.

FOXGLOVE, in botany. See DIGITALIS.

FOX ISLAND, an island in the Atlantic, on the west coast of Ireland; 7 miles E. of Slyme-head.

FOX ISLANDS, or LYSSIE OSTROVA, a group of 16 islands situated between the E. coast of Kamtschatka, and the W. coast of America. Lat. between 52° and 55° N.

FOY, St. a town of France, in the department of Lot and Garonne, 35 miles E. of Bourdeaux.

FOYLE, a river of Ireland in Derry, which runs by Londonderry, into Lough Foyle.

FOYLE, LOUGH, a large bay of Ireland; at the mouth of the Foyle, four miles below Londonderry.

FRACHES, in the glass trade, are the flat iron pans into which the glass vessels already formed are put when in the tower over the working furnace, and by means of which they are drawn out through the leers, that they may be taken gradually from the fire, and cooled by degrees.

FRACTION, in arithmetic and algebra, a part or division of an unit or integer; or a number which stands to an unit in the relation of a part to its whole. The word literally imports a broken number. Fractions are usually divided into decimal, sexagesimal, and vulgar. See ALGEBRA, and ARITHMETIC.

FRACTURE, in surgery, a rupture of a bone, or a solution of continuity in a bone, when it is crushed or broken by some external cause. See SURGERY.

FRENUM, or FRENUM, BRIDLE, in anatomy, a name given to divers ligaments, from their office in retaining and curbing the motions of the parts they are fitted to; as,

FRENUM LINGUE, or BRIDLE OF THE TONGUE, a membranous ligament, which ties the tongue to the os hyoides, larynx, fauces, and lower parts of the mouth.

FRAGA, a strong town of Spain in the kingdom of Arragon, 53 miles E. S. E. of Saragossa.

FRAGARIA, the STRAWBERRY, a genus of the polygynia order, and icosandria class of plants; natural order, Senticosæ. Calyx decemfid; petals five; receptacle of the seeds ovate, in the form of a berry. It has three species and several varieties.

FRAGNINO, and FRAGNITELLO, two towns of Naples, in the province of Principato Ultra; the former eight miles, and the latter six, from Benevento.

FRAGOA DE S. PEDRO, a town of Portugal, in the province of Beira; 13 miles S. S. W. of Lamego.

FRAIL, signifies 75 pounds of raisins.

FRAISE, in fortification, a kind of defence, consisting of pointed stakes, six or seven feet long, driven parallel to the horizon into the retrenchments of a camp, a half-moon, or the like, to prevent any approach or scalade. Fraises differ from palisades chiefly in this, that the latter stand perpendicular to the horizon, and the former jut out parallel to it, or nearly so, being usually made a little sloping, or with the points hanging down. Fraises are chiefly used in entrenchments and other works thrown up of earth; sometimes they are found under the parapet of a rampart, serving instead of the cordon of stone used in stone-works.

FRAISE A BATTALION, is to line the musqueteers round with pikes, that in case they should be charged with a body of horse, the pikes being presented may cover the soldiers from the shock, and serve as a barricade.

FRAME, a sort of loom, whereon artificers stretch their linens, silks, stuffs, &c. to be embroidered, quilted, or the like.

FRAME, among foundlers, a kind of ledge, which, being filled with wetted sand, serves as a mould to cast their works in. See FOUNDRY.

FRAME, in joinery, a kind of case, wherein a thing is set on closed, or even supported; as a window-frame, a picture-frame, &c.

FRAME, among painters, a kind of square, consisting of four long slips of wood joined together, whose intermediate space is divided by threads into several little squares like a net; and hence sometimes called reticula. It serves to reduce figures from great to small; or, on the contrary, to augment their size from small to great.

FRAME, among printers, is the stand which supports the cases.

FRAMLINGHAM, a large and ancient town of Suffolk, 18 miles N. E. of Ipswich, and 27 N. N. E. of London.

FRAMPTON, or FROMETON, a town of England, in Dorsetshire, 6 miles W. N. W. of Dorchester, and 12 N. W. of Weymouth.

FRANCAVILLA, the name of five towns of Naples.

FRANCE, an extensive country of Europe, for many ages a kingdom, but now one of the most powerful empires in the world. Before the present war, it was bounded by the English channel and the Austrian Netherlands on the N.; by Germany, the Alps, Switzerland, Savoy, and Piedmont, on the E.; by the Mediterranean sea and the Pyrenean mountains, which separate it from Spain, on the S.; and by the Atlantic ocean on the W. The air of France is pure, temperate, and healthy. It is so happily situated in the middle of the temperate zone, that some reckon it equal to Italy, both with regard to its fine landscapes and the fertility of the soil. The climate is undoubtedly much more salubrious. The soil produces corn, wine, oil, flax, fruits, &c. in great abundance. The monarchy was absolute before the revolution in 1789; and the subjects were extremely devoted to their prince, even under the greatest acts of oppression. The parliaments, for a long series of years past, had little or no share in the government; and their business was confined to the passing and registering the arrets or laws which the king sent them. However, they did not always pay a blind obedience to the king, and there have been frequent instances of their making a very spirited opposition. In civil causes they were the last resort, provided the court did not interpose. The parliament of Paris was the most considerable, where the king used often to come in person to see his royal acts recorded. It consisted of the dukes and peers of France, besides the ordinary members, who purchased their places; and they only took cognizance of causes belonging to the crown. The revenues

of the crown arose from the *taille* or land-tax, and the aids which proceeded from the customs and duties on all merchandize, except salt, the tax upon which commodity was called the *gabelles*. See *GABEL*. Besides these, there were other taxes, as, the capitation or poll-tax; the tenths of all estates, offices, and employments; besides the 15th penny, from which neither the nobility nor clergy were exempted; the tenths and free-gifts of the clergy, who were allowed to tax themselves; and, lastly, crown-rents, fines, and forfeitures, which brought in a considerable sum. All these are said to have amounted to 15,000,000*l.* sterling a-year. But the king had other resources and ways of raising money, whenever necessity obliged him. France was originally possessed by the Celtes or Gauls; a very warlike people, who often checked the progress of the Roman arms: nor did they yield till Julius Cæsar totally subdued their country, and reduced it to the form of a Roman province. In the reign of Valerian, the ancient Roman valour and discipline had begun to decline, and the neighbouring nations, began to make frequent incursions; and among the rest the Franks, a German nation, inhabiting the banks of the Rhine, proved particularly troublesome. After this period the country underwent various revolutions, but was more settled in the absolute monarchical form of government from the coronation of Charlemagne, till the late revolution in 1789, after which it became a republic. But the unparalleled successes of general Bonaparte induced him to take the reigns of government into his own hands; he was created first consul, Dec. 15, 1799, and afterwards assumed the title of emperor, May 20, 1804. France, before the revolution, was divided into the following military governments, or provinces: Alsace, Angoumois, Anjou, Armagnac, Artois, Aunis, Auvergne, Barrois, Basques, Bearn, Berry, Bigorre, Blaisois, Boulonnois, Bourbonnois, Bresse, Brittany, Burgundy, Cambresis, Champagne, Couserans, Dauphiny, Forez, Foix, Franche Comté, French Flanders, Gascony, Gevaudan, Guienne, French Hainault, Isle of France, Languedoc, Limosin, Lorrain, Lyonnois, Marche, Maine, Marsan, Navarre, Nivernois, Normandy, Orléanois, Perche, Perigord, Picardy, Poitou, Provence, Querci, Ruergue, Roussillon, Saintonge, Soissonnois, Touraine, Velay, and Vermandois. These varied much from each other in point of extent and importance, and there were others of still inferior consideration. France, in consequence of the revolution, was divided by the first legislative assembly into 83 departments, and these were subdivided into districts, cantons, and municipalities. The names of the departments are, Ain, Aisne, Allier, Alps Lower, Alps Upper, Ardeche, Ardennes, Arriege, Aube, Aude, Aveyron, Calvados, Cantal, Charente, Charente Lower, Cher, Correze, Corsica, Côte d'Or, Creuse, Dordogne, Doubs, Drome, Eure, Eure and Loire, Finisterre, Gard, Garonne Upper, Gers, Gironde, Herault, Indre, Indre and Loire, Isere, Ille and Vilaine, Jura, Landes, Loire and Cher, Loire Lower, Loire Upper, Lot, Lot, Lot and Garonne, Lozere, Maine, Maine and Loire, Manche, Marne, Marne Upper, Meurthe, Meuse, Morbihan, Moselle, Mouths of the Rhine, Nievre, Nord or North, North Coasts, Oise, Orne, Paris, Puy de Dome, Pyrenees Eastern, Pyrenees Lower, Pyrenees Upper, Rhine Lower, Rhine Upper, Rhone and Loire, Saone Upper, Saone and Loire, Sarne, Seine and Oise, Seine Lower, Seine and Marne, the Two Sevres, Somme, Straits of Calais, Tarn, Var, Vendee, Vienne, Vienne Upper, Vosges, and Yonne. About 18 new departments have been since erected out of the conquered territories. The chief mountains of France, are those of the Alps, Pyrenees, Cevennes, and Auvergne: Mount Blanc, &c. The population of France, before the revolution, was stated by the French at 25 millions; but from the great extent of territory acquired since the commencement of the present war, the total population is supposed to be now increased to more than 33 millions. Besides all the necessities of life, France produces many of its luxuries; as silk, perfumes, lemons, oranges, olives, prunes, peaches, &c. The forests abound with wood, and the mountains with mines of copper, lead, tin, iron; and some gold and silver. Gold in grains is also found among the sands of some rivers. The established religion of France, from the reign of Clovis I. to the revolution, has been the Roman Catholic; and though it was never accompanied by that dreadful engine of ecclesiastical tyranny, the inquisition, yet no country in Europe has exhibited more barbarous and bloody proofs of the intolerant spirit of that system of superstition than

France. Yet, though universal liberty of conscience was established upon the revolution in 1789, the Roman Catholic system was not attempted to be abolished. So far from this, the kingdom was divided into 10 archbishoprics (formerly 18), and 73 bishoprics (formerly 113), an episcopal hierarchy; an episcopal town being allotted to each department. But Danton and his atheistical associates, in the convention of 1793, endeavoured to overthrow all religion whatsoever. Upon the fall of Danton, Robespierre, affecting an abhorrence of the impiety of Atheism, did his utmost to recommend Deism, in its stead. But since his death, Christianity has been again openly professed; the churches have been restored to the use of all who incline to attend them; and people of all religious persuasions are allowed to worship God in the way most agreeable to themselves. France is watered and fertilized by a great number of rivers, many of which afford names to the new departments. The principal of these are the Seine, Loire, Garonne, and Rhone. The French in time of peace carry on a great trade with Spain, Italy, and the East Indies. Before the war, a trade very advantageous to Britain was established by the Commercial Treaty. They have very extensive manufactures of linens, woollens, silks, laces, paper, china, soap, &c. and particularly what is called Castile soap. France before the war, was said to contain 400 cities or walled towns, and 43,000 small towns and villages. Paris is the capital.

FRANCE, ISLE OF, a late province of France, so called, because it was formerly bounded by the rivers Seine, Marne, Oise, Aisne, and Ourque. It comprehended the Beauvoisis, the Valois, the county of Senlis, the Vexin, the Hurepois, the Gatinois, the Multien, the Goele, and the Mantois. Paris was the capital. It is now divided into four departments; viz. Oise, Seine and Oise, Seine and Marne, and Paris.

FRANCE, ISLE OF, or MAURITIUS, an island in the Indian Ocean. See *MAURITIUS*.

FRANCFORT ON THE MAINE, an Imperial and Hanseatic town of Germany, in Franconia, where the emperors were formerly elected. It is a handsome, strong, and rich place, and has a great deal of commerce. It is 20 miles E. of Mentz, and 350 W. by N. of Vienna. Lon. 8° 35' 40" E. Lat. 50° 7' 40" N.

FRANCFORT ON THE ODER, a town of Germany, in the middle Marche of Brandenburg, 43 miles S. E. of Berlin. Lon. 14. 45. E. Lat. 52. 22. N.

FRANCHE COMPTE, a late province of France, bounded on the S. by Bresse; on the W. by Burgundy; on the N. by Lorraine; and on the E. by Alsace and Switzerland. It is now divided into three departments; viz. Doubs, Jura, and Upper Saone.

FRANCHEMONT, or FRANCHIMONT, a town and district of Germany, in the late bishopric of Liege; now included in France, in the department of Ourte.

FRANCHISE and LIBERTY, in law, are used as synonymous terms; for "a royal privilege, or branch of the king's prerogative, subsisting in the hands of a subject." Being therefore derived from the crown, they must arise from the king's grant; or, in some cases, may be held by prescription, which presupposes a grant. The kinds are numerous and various. We shall briefly mention some of the principal; premising only, that they may be vested either in natural persons or bodies politic; in one man, or in many: but the same identical franchise, that has before been granted to one, cannot be bestowed on another, for that would prejudice the former grant. A County Palatine is a franchise vested in several persons. It is likewise a franchise for a number of persons to be incorporated and subsist as a body politic; with a power to maintain perpetual succession, and do other corporate acts: and each individual member of such corporation is also said to have a franchise. Other franchises are to hold a court-leet; to have a manor or lordship; or, at least, to have a lordship paramount: to have waifs, wrecks, estrays, treasure-trove, royal fish, forfeitures, and deodands: to have a court of one's own, or liberty of holding pleas and trying causes: to have cognizance of pleas; which is a still greater liberty, being an exclusive right, so that no other court shall try causes arising within that jurisdiction: to have a bailiwick, or liberty exempt from the sheriff of the county; wherein the grantee only, and his officers, are to execute all processes: to have a fair or market: with the right of taking toll, either there or at any other public places, as at bridges, wharfs,

wharfs, or the like; which tolls must have a reasonable cause of commencement, (as in consideration of repairs, or the like,) else the franchise is illegal and void: or lastly, to have a forest, chase, park, warren, or fishery, endowed with privileges of royalty. See CHASE, FOREST, &c.

FRANCHISE is also used for an asylum or sanctuary, where people are secure of their persons, &c. Churches and monasteries in Spain are franchises for criminals; so were they anciently in England, till they were abused to such a degree that there was a necessity for abolishing the custom.

FRANCHISE OF QUARTERS is a certain space or district at Rome, wherein are the houses of the ambassadors of the princes of Europe; and where such as retire cannot be arrested or seized, nor prosecuted at law.

FRANCIS, St. the founder of the society of the Franciscans, was the son of a merchant of Assisi, in the province of Umbria. Having led a dissolute life, he was reclaimed by a fit of sickness, and afterwards fell into an extravagant kind of devotion, that looked less like religion than alieation of mind. In 1208, hearing the passage quoted, (Matt. x. 9, 10,) "Provide neither gold nor silver," &c. he was led to consider a voluntary and absolute poverty as the essence of the gospel, and to prescribe it as a sacred rule to himself and those who followed him. See FRANCISCANS. He died in 1226.

FRANCISCANS, in ecclesiastical history, religious of the order of St. Francis, founded by him in 1209. This society, which appeared to Innocent III. extremely adapted to the state of the church, was solemnly approved and confirmed by Honorius III. in 1223. Francis, through an excessive humility, would not suffer the monks of his order to be called *fratres*, i. e. brethren or friars, but *Fraterculi*, i. e. little brethren, or friars minor, by which denomination they still continue to be distinguished. They are also called grey friars, on account of the colour of their clothing, and Cordeliers, &c. The Franciscans and Dominicans were zealous and active friends to the papal hierarchy. In 1287, Matthew of Aqua Sparta, being elected general of the order, discouraged the ancient discipline of the Franciscans, and indulged his monks in abandoning even the appearance of poverty. This conduct raised the indignation of the spiritual or austere Franciscans; so that from 1290, schisms arose in an order that had been famous for its pretended disinterestedness and humility. Such was the enthusiastic frenzy of the Franciscans, that they impiously maintained, that St. Francis was a second Christ, in all respects similar to the first; and that their institution and discipline were the true gospel of Jesus. Accordingly, Albizi, a Franciscan of Pisa, published a book in 1383, with the applause of his order, intitled, "The Book of the Conformities of St. Francis with Jesus Christ!" In the beginning of the 18th century, the whole Franciscan order was divided into two parties; the one called Spirituals, who embraced the severe discipline and absolute poverty of St. Francis; and the other, Brethren of the Community, who insisted on mitigating the austere injunctions of their founder.

FRANCOIS, CAPE, a town in the N. part of Hispaniola. Lon. 72. 18. W. Lat. 19. 46. N.

FRANCOISE, a town of France, in the department of Lot, $7\frac{1}{2}$ miles N. W. of Montauban, and 20 $\frac{1}{2}$ S. S. W. of Cahors.

FRANCONIA, a circle of Germany, bounded on the N. by Meissen and Thuringia, on the S. by Bavaria and Suabia; on the E. by Bohemia and the Upper Palatinate, and on the W. by the Lower, and the electorate of Mentz; being 88 miles from N. to S. and 95 from E. to W. The middle is very fertile in corn, wine, and fruits; but the borders are full of woods and barren mountains. The majority of the people are Lutherans; but there are also many Calvinists, Roman Catholics, and Jews. The Franks, who conquered and gave name to France, came from this province. Nuremberg is the capital.

FRANEKER, FRANEQUER, or FRANKER, a town of France, in the department of Eems, and late province of North Friesland, 9 miles W. of Lewarden.

FRANK, or FRANC, in the ancient English customs, signifies literally free from charges and impositions, or exempt from public taxes: it is used in various senses; sometimes compounded, and sometimes not; though the latter is doubtless most proper. Thus,

FRANK ALMOIGNE is a tenure, whereby a religious corporation, aggregate or sole, holdeth lands of the donor to them and

their successors for ever. The service which they were bound to render for these lands was not defined: but only in general to pray for the souls of the donor and his heirs, dead or alive; and therefore they did no fealty (which was incident to all other services,) because this divine service was of a more exalted nature. This is the tenure by which almost all the ancient monasteries and religious houses held their lands; and by which the parochial clergy, and very many ecclesiastical and eleemosynary foundations, still hold them; the nature of the service being upon the reformation altered, and made conformable to the purer doctrines of the church of England. It was an old Saxon tenure; and continued under the Norman revolution, through the great respect that was shewn to religion and religious men in ancient times. This is also the reason that tenants in frankalmoigne were discharged of all other services except the *trinoda necessitas*, of repairing the highways, building castles, and repelling invasions; just as the druids, among the ancient Britons, had "*omnium rerum immunitatem*." And even at present this is a tenure of a very different nature from all others; being not in the least feudal, but merely spiritual. For, if the service be neglected, the law gives no remedy by distress, or otherwise, to the lord of whom the lands are holden; but merely a complaint to the ordinary or visitor to correct it.

2. FRANK CHACE is a liberty of free chase, whereby persons that have lands within the compass of the same, are prohibited to cut down any woods, &c. out of the view of the forester.

3. FRANK FEE signifies the same thing as holding lands and tenements in fee simple; that is, to any person and his heirs, and not by such service as is required by ancient demesne, but is pleaded at common law. See FEE.

FRANK LAW, the free and common law of the land, or the benefit a person has by it. He that for any offence loseth this frank law incurs the inconveniences which the law affords.

FRANK MARRIAGE, in law, is where tenements are given by one man to another, together with a wife, who is the daughter or cousin to the donor, to hold in frank marriage. By such gift, though nothing but frank marriage is expressed, the donees shall have the tenements to them, and the heirs of their two bodies begotten; that is, they are tenants in special tail.

FRANKPLEDGE, a pledge or surety for freemen. For the ancient custom of England, for the preservation of the public peace, was that every freeborn man at 14 years of age, religious persons, clerks, knights and their eldest sons excepted, should find security for his fidelity to the king, or else be kept in prison: whence it became customary for a certain number of neighbours to be bound for one another, to see each man of their pledge forthcoming at all times, or to answer the transgression of any one absenting himself. This was called frankpledge, and the circuit thereof was called decenna, because it commonly consisted of ten households; and every particular person, thus mutually bound, was called decennier.

FRANK, or FRANC, an ancient coin, either of gold or silver, struck and current in France. The value of the gold frank was somewhat more than that of the gold crown; the silver frank was a third of the gold one: this coin is long out of use, though the term is still retained as the name of a money of account; in which sense it is equivalent to the *livre*, or twenty sols.

FRANK LANGUAGE, or *LINGUA FRANCA*, a kind of jargon spoken on the Mediterranean, and particularly throughout the coasts and ports of the Levant, composed of Italian, Spanish, French, vulgar Greek, and other languages.

FRANKED LETTERS. The privilege of letters coming free of postage to and from members of parliament was claimed by the House of Commons in 1660, when the first legal settlement of the present post-office was made; but afterwards dropped, upon a private assurance from the crown, that this privilege should be allowed the members. Accordingly a warrant was constantly issued to the postmaster-general, directing the allowance thereof to the extent of two ounces in weight: till at length it was expressly confirmed by 4 Geo. III. c. 24, which added many new regulations, rendered necessary by the great abuses in franking: whereby the annual amount of franked letters had increased from 23,600l. in the year 1715, to 170,700l. in the year 1763. Other regulations afterwards took place; in particular, franks were required to be dated (the month written at length,) and put into the office the same day; notwithstanding which, the revenue still lost

by this privilege above 80,000*l.* per annum. The following are the regulations of franking required by 25 Geo. III. and now in force. No letter directed by or to any M. P. shall be exempted from postage if it exceeds one ounce in weight. No letter directed by any member shall be exempted, unless he shall actually be in the post-town, or within the limits of its delivery of letters, or within 20 miles of it on the day, or the day before it, on which the letter shall be put into the office. No member shall be entitled to send free from postage more than ten letters in one day, nor to receive more than 15. Whenever the number of letters sent or received by such member in one day shall exceed the number exempted, and the postage upon any of them shall differ, the letters chargeable with a higher postage shall be included in the number exempted, in preference to any chargeable with a lower postage, and the remainder shall be chargeable with the postage to which common letters are now chargeable. Persons who may now in right of their offices send and receive letters free may continue so to do.

FRANKENDAL, a strong town of Germany, now included in France, in the department of Mont Tonnerre, 8 miles N. W. of Mannheim, and 8 S. of Worms. Lon. 8. 29. E. Lat. 49. 25. N.

FRANKENIA, in botany, a genus of the monogynia order, and hexandria class of plants; natural order, Calycanthemæ. Calyx quinquefid, funnel-shaped; petals five; stigma sexpartite; capsule unilocular and trivalvular. It has three species.

FRANKENSTEIN, a town of France, in the department of Sarre and Moselle, 20 miles S. E. of Deux Ponts.

FRANKFORD, a town of Virginia, the capital of Pendleton county, 180 miles N. W. of Richmond.

FRANKFORT, a town of the United States, on the river and in the state of Kentucky.

FRANKINCENSE, is a gummy resin, the product of the *juniperus lycia*, consisting of equal parts of gum and resin; the first is soluble in water, the other in alcohol. It is brought from Turkey and the East Indies, but is principally collected in Arabia. It usually comes to us in drops, but in a very impure state, a hundred pounds not yielding more than from forty to fifty pounds of pure frankincense.

FRANKLAND'S ISLANDS, a cluster of islands in the South Sea; 6 miles from the N. E. coast of New Holland. Lon. 146. 0. E. Lat. 17. 13. S.

FRANKLIN, BENJAMIN, LL. D. and F. R. S. one of the most celebrated philosophers and politicians of the 18th century, was born at Boston, 6th Jan. 1706. He was the son of Josias Franklin, a tallow-chandler, descended from an ancient English family, who had resided upwards of three centuries at Eaton in Northamptonshire, possessing a small freehold estate of 30 acres. Benjamin was placed under him; but a difference happening between them, he removed to New York, from whence he went to Philadelphia, where after serving as a journeyman some time, he attracted the notice of Sir William Keith, the governor, who persuaded him to set up for himself. Accordingly he came to England to procure printing materials, but on his arrival he found that the governor had deceived him by false promises, on which he worked as a journeyman printer in London, and in 1726 returned to Philadelphia, where he became clerk to a merchant. He next entered into partnership with a person named Meredith, in the printing-business, which he afterwards conducted alone. In 1730 he was united to a widow lady, whom he had courted before her first marriage. About this period he contributed to the forming of the public library at Philadelphia, and in 1732 he published his "Poor Richard's Almanack," in which he inserted some useful aphorisms or maxims of prudence. In 1736 he was appointed clerk to the general assembly at Pennsylvania, and the year following post-master of Philadelphia. In the French war in 1744 he proposed and carried into effect a plan of association for the defence of that province. About this time he commenced his electrical experiments of which he published an account. He had the honour of making several discoveries in this branch of philosophy, the principal of which was the identity of the electric fire and lightning. In 1747 he was chosen a representative of the general assembly, in which situation he distinguished himself by several acts of public utility. By his means a militia bill was passed, and he was appointed colonel of the Philadelphia regiment. In 1757 he was sent to England as agent for Pennsylvania. At

this time he was chosen fellow of the Royal Society, and honoured with the degree of doctor of laws by the universities of St. Andrews, Edinburgh, and Oxford. In 1762 he returned to America, but two years afterwards he again visited England, in his former capacity as agent, and it was at this period that he was examined at the bar of the house of commons concerning the stamp act. In 1773 he returned home, and was elected a delegate to the congress. He was very active in the contest between England and the colonies, and was sent to France, where in 1778 he signed a treaty of alliance offensive and defensive, which produced a war between that country and England. In 1783 he signed the definitive treaty of peace, and in 1785 returned to America, where he was chosen president of the supreme council. He died in 1790. Besides his political, miscellaneous, and philosophical pieces published in 4to. and 8vo. he wrote several papers in the American Transactions, and two volumes of Essays, with his life prefixed, written by himself, 2 vols. 12mo. The following epitaph on himself was written by Dr. Franklin many years before his death:

The Body of
BENJAMIN FRANKLIN, PRINTER,
Like the cover of an old book,
Its contents torn out,
And stript of its lettering and gilding,
Lies here food for worms.
Yet the work itself shall not be lost;
For it will (as he believed) appear once more,
In a new and more beautiful edition,
Corrected and amended
By the AUTHOR.

FRANKLIN, a county of Georgia, in the Upper District, seated on the Tugulo.

FRANKLIN, a populous and well-cultivated county of Kentucky. Frankfort is the capital.

FRANKLIN, a county of North Carolina, in-Halifax district.

FRANKLIN, a fertile county of Pennsylvania. Chambersburg is the capital.

FRANKLIN, a county of Vermont, containing twenty townships.

FRANKLIN, a county of Virginia.

FRANKS, FRANCES, FRANKIS, or FRANQUIS, a name which the Turks, Arabs, Greeks, &c. give to all the people of the western parts of Europe. The appellation is commonly supposed to have had its rise in Asia, at the time of the croisades; when the French made the most considerable figure among the croisces: from which time the Turks, Saracens, Greeks, Abyssinians, &c. used it as a common term for all the Christians of Europe, and called Europe itself Frankistan. Du Cange says, that about the time of Charlemagne, they distinguished Eastern France, Western France, Latin or Roman France, and German France, which was the ancient France afterwards called Franconia.

FRANZBURG, a town of Upper Saxony, in Swedish Pomerania, 14 miles S. of Stralsund.

FRAPPING, in naval affairs, the act of crossing and drawing together the several parts of the tackle, or other complication of ropes, which had been already strained to their utmost extent; in this sense it resembles the operation of bracing a drum. The frapping increases tension, and consequently adds to the security acquired by the purchase.

FRASERBURGH, or FRASERSBURGH, a small sea-port town in Aberdeenshire, seated on the S. extremity of the Murray Frith, called Kinnaird's Head, 16 miles E. of Banff, and 40 N. of Aberdeen.

FRATERNAL AFFECTION is the love and attachment subsisting among, or due to one another by, children of the same family. A hearty benevolence, an ardent concern for each other's welfare, and a readiness to serve and promote it, are the peculiar offices of this relation.

FRATERNITY, in the Roman Catholic system, signifies a society for the improvement of devotion. Of these there are several sorts; as, 1. The fraternity of the rosary, founded by St. Dominic. It is divided into two branches, called the common rosary, and the perpetual rosary; the former of whom are obliged to confess and communicate every first Sunday in the month, and the latter to repeat the rosary continually. 2. The fraternity of the scapulary, whom the blessed Virgin, according to the sabbatine bull of pope John XXII. has promised to deliver out of hell

the first Sunday after their death. 3. The fraternity of St. Francis's girdle are clothed with a sack of a grey colour, which they tie with a cord; and in processions walk bare-footed, carrying in their hands a wooden cross. 4. That of St. Austin's leathern girdle comprehends many devotees. Italy, Spain, and Portugal, are the countries where the greatest number of these fraternities, some of which assume the name of arch-fraternities, are to be found. Pope Clement VII. instituted the arch-fraternity of charity, which distributes bread every Sunday among the poor, and gives portions to forty poor girls on the feast of St. Jerome their patron. 5. The fraternity of death buries such dead as are abandoned by their relations, and causes masses to be celebrated for them.

FRATRIAGE, the partition among brothers or coheirs, coming to the same inheritance or succession. It more particularly signifies a younger brother's inheritance; or whatever the younger sons possess of the father's estate, which, in our ancient law, they are said to enjoy *ratione fratrii*; and were to do homage for the same to the elder brother, he being bound to do homage to the superior lord for the whole.

FRATRICELLI, or **FRATELLI**, [Ital. *q. d. fraterculi*, little brothers,] in ecclesiastical history, an enthusiastic sect of Franciscans, which rose in Italy, particularly in Ancona, about A. D. 1294. The word was used as a term of derision, as they were most of them apostate monks. For this reason the term, as a nick-name, was given to many other sects, as the Catharists, Waldenses, &c. however different in their opinions and in their conduct. But this denomination, applied to the austere part of the Franciscans, was considered as honourable.

FRAUD, in law, signifies deceit in grants, or conveyances of lands, &c. or in bargains and sales of goods, &c. to the damage of another person. A fraudulent conveyance of lands or goods, to deceive creditors, as to creditors is void in law. And a fraudulent conveyance, to defraud purchasers, is also to such purchasers void; and the persons justifying, or putting off such grants as good, shall forfeit a year's value of lands, and the full value of the goods and chattels, and likewise shall be imprisoned.

FRAUENBOURG, a town of Prussia Royal, in Poland, on the river Frisch-haff, six or seven leagues from Elbing, to the N. E.

FRAUENFELD, a town of the Helvetic republic, the capital of the late bailiwick of Thurgau. It lies 20 miles N. E. of Zurich.

FRAUSTADT, a town of Silesia, on the frontiers of Poland, 70 miles N. W. of Breslau.

FRAUSTADT, or **WSCHOWA**, a town of Poland, on the frontiers of Silesia, 48 miles W. of Posen.

FRAXINELLA, in botany. See **DICTAMNUS**.

FRAXINUS, the **ASH**: a genus of the diœcia order, and polygamia class of plants; natural order, Sepiaria. Hermaphrodite; calyx none, or four-parted; corolla none, or four-petaled; stamens two; pistil one; seed or capsule one, lanceolate. There are four species. If a wood of these trees be rightly managed, it will turn out greatly to the advantage of the owner: for, by the underwood, which will be fit to cut every eight or ten years, there will be a continual income, more than sufficient to pay the rent of the ground and all other charges; and still there will be a stock preserved for timber, which in a few years will be worth 40s. or 50s. per tree. This tree flourishes best in groves, but grows very well in rich soil in open fields. It bears transplanting and lopping. In Lancashire they lop the tops of these trees to feed the cattle in autumn when the grass is on the decline; the cattle peeling off the bark as food. The wood has the singular property of being nearly as good when young as when old. It is hard and tough, and is much used to make the tools employed in husbandry. The ashes of the wood afford very good potash. The bark is used in tanning calf-skin. The season for felling this tree, is from November to February; for if cut down too early, or too late, it is liable to the worm. The ash is hurtful to corn-lands, and therefore should be planted either in hedges or clumps, at about nine or ten feet distance.

FREA, or **FRIGGA**, the wife of Odin, or Woden, was, next to him, the most revered divinity among the Heathen Saxons, Danes, and other northern nations. As Odin was believed to be father, Frea was esteemed the mother of all the other gods.

In the earliest times, Frea was the same with the goddess Herthus, or Earth, who was so devoutly worshipped by the Angli and other German nations. But when Odin, the conqueror of the north, usurped the honours due only to the true Odin, his wife Frea usurped those which had been formerly paid to mother Earth. She was worshipped as the goddess of love and pleasure, who bestowed on her votaries a variety of delights, particularly happy marriages and easy births. To Frea the sixth day of the week was consecrated, which still bears her name, Friday, or Frea's day.

FREAM, in husbandry, ploughed land worn out of heart, and laid fallow till it recover.

FRECKLES, **LENTIGINES**, are spots of a yellowish colour, of the bigness of a lentile seed, scattered over the face, neck, and hands. Freckles are either natural, or proceed from the jaundice, or the action of the sun upon the part. Heat, or a sudden change of weather, will often make the skin appear of a darker colour than is natural, and thereby produce what is called tan, sunburn, and morpew; which seem to differ only in degree, and usually disappear in winter. Persons of a fine complexion, and those whose hair is red, are most subject to freckles, especially in parts exposed to the sun and air. To remove freckles, put juice of lemons in a glass vial, and, mixing it with sugar and borax finely powdered, let it digest eight days, and then use it. According to Homburg, one of the best applications for dispersing freckles, is a mixture of bullock's gall with a solution of alum, which, after the latter has subsided, must be digested in the sun for three or four months in a close phial. Another preparation is made by taking four ounces of lemon-juice, and mixing with it two drachms of sugar, and one of borax, finely powdered; and, after these ingredients have stood a week or fortnight in a glass bottle, the liquor will be fit for use. As, however, freckles generally vanish during the winter, and have been observed to re-appear in early spring, the sharp morning-air of which, though salubrious, is said to be uncommonly favourable to their re-production, perhaps the most easy method of preventing them would be a careful attention to this circumstance.

FREDBERG, or **FREDEBERG**, a rich and strong town of Germany, in Misnia, on the river Multa.

FREDEBURG, or **FREDENBURG**, a town of Germany, in Westphalia, 52 miles E. of Cologne, and 50 W. of Cassel.

FREDERICA, a town of Georgia, on the island of St. Simons. Lon. 81. 25. W. Lat. 31. 0. N.

FREDERICIA, a strong sea-port town of Denmark, in North Jutland, seated on the Little Belt. Lon. 9. 4. E. Lat. 55. 37. N.

FREDERICK, the name of several European monarchs.

FREDERICK I., king of Prussia, the son of Frederick-William the Great, elector of Brandenburg, was born in 1657; and succeeded his father in the electorate, A. D. 1688. In 1700, he entered into a negotiation with the emperor, Leopold I., to get Prussia erected into a kingdom: which he at last obtained by a singular accident. While appearances were rather unpromising, he received a letter from his minister written in ciphers, advising him to use the interest of a certain prince; but, he mistaking the ciphers, applied to the emperor's confessor; who, being a Jesuit, was so much struck with the honour done him by a Protestant elector, that he exerted his whole interest, and that of his order, to procure him the desired object. Frederick was accordingly crowned king of Prussia, Jan. 18, 1701. He was endued with many virtues. He was magnificent, generous, constant to his marriage-vows, and studied the true interest of his subjects, by preserving his dominions in peace. He was three times married: his second queen was sister to king George I. He founded the university of Halle, and the royal academy at Berlin. He died in 1713.

FREDERICK II. surnamed the **GREAT**, king of Prussia, one of the greatest warriors the present age has produced, was the son of Frederick-William, then hereditary prince of Brandenburg, and princess Sophia Dorothea, daughter of king George I. He was born in 1712, the year before his father mounted the throne, who was so far from being a patron of literature, that he regarded nothing but what related to the military art; and most of his generals scarce knew how to sign their names. He obtained but a scanty education, owing to his father's contempt of letters and predilection for military discipline. On growing up, the young prince

prince shewed so strong an inclination to literature and music as to incur his father's displeasure. The severe treatment he received, led him, in 1730, to attempt an escape from Prussia, but the scheme being discovered, the prince was confined in the castle of Custrin, and his young companion Katte executed before his face. After a confinement of some months he obtained his pardon, and in 1733 married the princess of Brunswick Wolfenbüttele, in obedience to his father's command, but he never cohabited with her. In 1740 he succeeded to the throne, and taking advantage of the defenceless state of Maria-Theresa, queen of Hungary, he marched into Silesia, which was added to his dominions by the treaty of Breslaw. In 1744 the war was renewed against the queen of Hungary, and the same year Frederick took Prague, which however he was forced to quit by the approach of a Saxon army under the prince of Lorraine. In 1745 he defeated that prince, at Friedburgh, and then marched into Bohemia, where he defeated an Austrian army which was superior to his own. Shortly after he took Dresden and laid it under heavy exactions. A treaty of peace was concluded at the end of this year by the mediation of the English minister; and the interval of tranquillity was employed by Frederick in regulating his dominions, forming a body of laws, and in composing some literary works. In 1750 Voltaire visited Prussia, and was received with the most flattering marks of attention by the king; but the friendship at last ended in a violent quarrel, and the French philosopher quitted Prussia abruptly, and in disgrace. In 1756 a treaty was concluded between England and Prussia, which produced another between France, Austria, and Russia. The seven years war, as it is called, began by the march of Frederick into Saxony and taking the camp of Pirna. The following year he gained the battle of Prague over the Austrians, on which he laid siege to that city; but after reducing it to great straits, he was compelled to retreat by marshal Daun, and retire into Saxony. Frederick was now surrounded by enemies, the French entered Hanover, the Russians and Swedes advanced towards Prussia, and the Imperialists pursued him into Saxony. Still undaunted, he attacked and defeated the French and Austrians at Rosebach; then marching into Silesia, he beat another army at Lissa. The Russians and Swedes retreated precipitately from Prussia; and the Hanoverians took the field under the prince of Brunswick. In 1758 he received a large subsidy from England; and the same year he entered Moravia, where he laid siege to Olmutz, which was relieved by marshal Daun. He then marched against the Russians, who had laid siege to Custrin, and defeated them after a bloody battle at Zorndoff. But not long after he was surprized and beat by Daun, at Hockkirchen. The next year the king was defeated after a very obstinate and doubtful engagement, at Cunnnersdoff, by the Russians; and in 1761, the confederates entered Brandenburg, and took Berlin. Frederick, however, by defeating Daun at Torgau, gave a turn to his affairs, and the Russians and Swedes quitted his territories. In 1762 peace was restored between him and Russia and Sweden, and in 1763 a treaty much in his favour was concluded with the empress queen, by which Silesia was confirmed to Prussia. Still intent upon aggrandisement, he planned the partition of Poland in 1772, and obtained for his share Western Prussia. In 1778 he opposed the design of the emperor Joseph to dismember Bavaria, and marched in person against that monarch, who was assisted by the famous general Laudohn. But no action took place, and by the treaty of Teschen, in 1779, the Austrian court renounced the design. After a long and active life, Frederick died in 1786. He was courteous in his manners, lively in conversation, an acute politician, and in general fond of justice and humanity. But he was an avowed infidel, and actuated by no better principle than pleasure and self-interest. He never had any issue. His works published in his lifetime are in four vols. 8vo.; and since his death fifteen more have been printed. The principal are, the *Memoirs of the House of Brandenburg*: a poem on the *Art of War*: the *History of his own Time*: and the *History of the Seven Years War*.

FREDERICK V. king of Denmark, reigned 20 years, and on his death-bed, expressed his satisfaction to his son Christian VII. in a circumstance, which few monarchs can boast who have reigned so long. "It is a great consolation to me my son, (said he) in my last moments, that I have not injured any person, and that my hands are not stained with one drop of blood."

FREDERICK, a county of Maryland, bounded on the N. by

Pennsylvania, E. by Baltimore, S. W. by the Potomac, and W. by Washington.

FREDERICK, a county of Virginia, bounded on the N. by Berkley, E. and S. by the Shanandoah, and W. by Hampshire. Winchester is the chief town.

FREDERICK, a town of New Brunswick, on the N. side of St. John's river. Lon. 66. 45. W. Lat. 46. 3. N.

FREDERICKSBURG, a Danish fort on the Gold coast of Guinea, in Africa, near Cape Threepoints, 62 miles from Cape Coast Castle. Lon. 1. 5. W. Lat. 4. 30. N.

FREDERICKSBURG, a town of Virginia, in Spotsylvania county, 50 miles S. S. W. of Alexandria. Lon. 77. 26. W. Lat. 38. 22. N.

FREDERICKSHALL, a town of Norway in the province of Aggerhuys, on the frontiers of Sweden, and on the extremity of the Swinesund, 31 miles S. E. of Christiania, and 50 N. of Uddevalla. Lon. 10. 59. E. Lat. 59. 2. N.

FREDERICKSODE, a town of Denmark, in Jutland, 50 miles N. of Sleswick.

FREDERICKS-SUND, a sea-port of Denmark, in the isle of Zealand, 10 miles N. W. of Copenhagen. Lon. 12. 13. E. Lat. 55. 50. N.

FREDERICKSTADT, a town of Denmark, 17 miles W. S. W. of Sleswick.

FREDERICKSTADT, a town of Norway, in the province of Aggerhuys, 26 miles W. of Frederickshall.

FREDERICKSTOWN, a flourishing town of Maryland, 47 miles W. by N. of Baltimore.

FREE, or **IMPERIAL CITIES** in the late German constitution, are those not subject to any particular prince; but governed, like republics, by their own magistrates.

FREE-BENCH, signifies that estate in copyhold which the wife, being espoused a virgin, has after the decease of her husband for her dower, according to the custom of the manor. In regard to this free-bench, different manors have different customs. In the manor of E. and W. Enbourne in Berkshire, and other parts of England, there is a custom, that when a copyhold tenant dies, the widow shall have her free-bench in all the deceased husband's lands, dum sola & casta fuerit, "whilst she lives single and chaste;" but if she shall be guilty of incontinency, he shall forfeit her estate. Nevertheless, upon her coming into the court of the manor riding backwards on a black ram, with his tail in her hand, rehearsing a ridiculous and indelicate form of words in doggerel rhymes, characteristic of the times in which they were composed, the steward is bound by the custom to restore her to her free-bench.

FREEBOOTER, or **FLIBUSTER**, was originally a name given to the pirates who scoured the American Seas, and made war against the Spaniards.

FREED-MAN. See **LIBERTUS**.

FREEDOM. See **LIBERTY**.

FREEDOM OF CONSCIENCE. See **TOLERATION**.

FREEDOM OF THE WILL, that power or faculty of the mind, whereby it is capable of acting or not acting, choosing or rejecting whatever it judges proper or improper. Of this every man must be sensible, who finds in himself a power to begin or forbear, continue or end, several actions, barely by a thought or preference of the mind. See **METAPHYSICS**.

FREE-HOLD, signifies lands or tenements which a person holds in fee-simple, fee-tail, or for term of life. Freehold is distinguished into freehold in deed, and freehold in law: the first of which signifies the real possession of lands, &c. in fee, or for life; the other is the right that a person has to such lands or tenements before his entry.

FREE-HOLD is also extended to such offices as a man holds in fee, or during life. A freehold, by the common law, cannot commence in futuro, but it must take effect presently, either in possession or reversion, or remainder; and where a person pleads liberum tenementum, or freehold, generally the law intends he has an estate in fee, and not barely for life. Whatever is part of the freehold, goes to the heir; and things fixed thereto, may not be taken as a distress for rent, or in execution, &c. No man shall be disseised of his freehold by stat. Magna Charta, cap. 29, but by judgement of his peers, or according to laws of the land: nor shall any distrain freeholders to answer for their freehold, in any thing concerning the same, without the king's writ. Freehold estates,

estates, of certain value, are required by statutes to qualify jurors, electors of the knights of the shire in parliament, &c.

FREEMAN, SUSANNAN, afterwards Mrs. CARROL and Mrs. CENTLIVRE, a celebrated comic writer, daughter of Mr. Freeman of Holbeach, in Lincolnshire. She had such an early turn for poetry, that it is said she wrote a song before she was seven years old. Before she was twelve, she could not only read Moliere in French, but enter into the spirit of all the characters. Her father dying, left her to the care of a step-mother, whose treatment being harsh, she determined, though almost destitute of every necessary, to go up to London to seek a better fortune. As she was proceeding on foot, she was met by the noted libertine, Anthony Hammond, Esq. who was so struck with her beauty, that he instantly fell in love with her; and inquiring into her story, soon prevailed upon her inexperienced innocence to go with him to Cambridge. After some months' cohabitation, he persuaded her to come to London; where, in a short time, she was married to a nephew of Sir Stephen Fox. But he dying about a year after, her wit and beauty soon procured her a second husband, one Carrol, an officer in the army; but he being killed in a duel about eighteen months after, she became a votary of the Muses, and under this name of Carrol, some of her earlier pieces were published. Her first attempt was a tragedy, the *Perjured Husband*; but her natural vivacity leading her to comedy, we find but one more attempt in the buskin, among eighteen dramatic pieces which she afterwards wrote. In 1706, Mr. Joseph Centlivre, principal cook to queen Anne, married her; and, after passing several years happily together, she died at his house in Spring Garden, in Dec. 1723. She for many years enjoyed the intimacy and esteem of the most eminent wits of the times, viz. Sir Richard Steele, Rowe, Budgell, Farquhar, Dr. Sewell, &c. and few authors received more tokens of esteem and patronage from the great. Her plays do not abound with wit, and the language is sometimes poor; but her plots are well conducted, and her characters natural.

FREE-STONE, a whitish stone, dug up in many parts of Britain, that works like alabaster, but is more hard and durable; being of excellent use in building, &c. It is a species of the grit-stone, but finer sanded and smoother. The qualities of the several kinds of free-stones used in the different parts of Europe vary much. They all agree in this general property indeed, that they are softer while in the quarry, than when they have been some time exposed to the air: but even this general property differs greatly in degree.

FREETHINKERS. See **DEISM**, and **DEIST**.

FREEZE, FRIEZE, or FRIZE. See **FRIEZE**.

FREEZING, in philosophy, the same with congelation. See **COLD**, **CONGELATION**, **FROST**, and **ICE**. Freezing may be defined the fixing of a fluid body into a solid mass, by the action of cold. Water and some other fluids suddenly dilate and expand in the act of freezing, so as to occupy a greater space in the solid than in the liquid state: in consequence of which ice is specifically lighter than water and floats upon it. Water also loses of its weight by freezing, being found lighter after it is thawed, than before it was frozen. And it even evaporates nearly as fast while frozen, as while it is fluid. Water which has been boiled freezes more readily than that which has not been boiled; and a slight disturbance of the fluid disposes it to freeze more speedily; having sometimes been cooled several degrees below the freezing point, without congealing when kept quite still, but suddenly freezing into ice on the least motion or disturbance. Water, covered over with a surface of oil of olives, does not freeze so readily as without it; and nut-oil absolutely preserves it under a strong frost, when olive-oil would not. Rectified spirit of wine, nut-oil, and oil of turpentine, seldom freeze. The surface of water, in freezing, appears all wrinkled; the wrinkles being sometimes in parallel lines, and sometimes like rays, proceeding from a centre to the circumference. Fluids standing in a current of air grow much colder than before. Fahrenheit had long ago observed, that a pond, which stands quite calm, often acquires a degree of cold much beyond what is sufficient for freezing, and yet no congelation ensued; but if a slight breath of air happens in such a case to brush over the surface of the water, it freezes the whole in an instant. It has also been discovered, that all substances grow colder by the evaporation of the fluids which they contain, or with which they are mixed. If both these methods, therefore, be practised upon the same body at the

same time, they will increase the cold to almost any degree of intenseness we please. Although cold, in general, contracts most bodies, and heat expands them, yet there are some instances to the contrary, especially in the extreme cases or states of these qualities of bodies. Thus, though iron, in common with other bodies, expands with heat, yet, when melted, it is always found to expand in cooling again. Thus also, though water expands gradually as it is heated, and contracts as it cools, yet in the act of freezing it suddenly expands again, and that with an enormous force, capable of rending rocks, or bursting the very thick shells of metal, &c. A computation of the force of freezing water has been made by the Florentine Academicians, from the bursting of a very strong brass globe or shell, by freezing water in it; when, from the known thickness and tenacity of the metal, it was found that the expansive power of a spherule of water only one inch in diameter was sufficient to overcome a resistance of more than 27,000 pounds, or 13 tons and a half. See the experiments on bursting thick bomb-shells, by freezing water in them, by Major Edward Williams of the Royal Artillery, in the *Edin. Philos. Trans.* vol. 2. Such a prodigious power of expansion, almost double that of the most powerful steam-engines, and exerted in so small a mass, seemingly by the force of cold, was thought a very material argument in favour of those who supposed that cold, like heat, is a positive substance. Dr. Black's discovery of latent heat, however, has afforded a very easy and natural explication of this phenomenon. He has shewn, that, in the act of congelation, water is not cooled more than it was before, but rather grows warmer: that as much heat is discharged, and passes from a latent to a sensible state, as, had it been applied to water in its fluid state, would have heated it to 135°. In this process, the expansion is occasioned by a great number of minute bubbles suddenly produced. Formerly these were supposed to be cold in the abstract; and to be so subtle, that, insinuating themselves into the substances of the fluid, they augmented its bulk, at the same time that, by impeding the motion of its particles upon each other, they changed it from a fluid to a solid. But Dr. Black shews, that these are only air extricated during the congelation; and to the extrication of this air he ascribes the prodigious expansive force exerted by freezing water. The only question, therefore, is, By what means this air comes to be extricated, and to take up more room than it naturally does in the fluid? To this it may be answered, that perhaps part of the heat, which is discharged from the freezing water, combines with the air in its unelastic state, and, by restoring its elasticity, gives it that extraordinary force; as is seen also in the case of air suddenly extricated in the explosion of gun-powder. The degree of expansion of water, in the state of ice, is by some authors computed at about $\frac{1}{10}$ of its volume. Oil and quicksilver shrink and contract after freezing.

FREEZING MIXTURES, preparations for the artificial congelation of water, and other fluids. See **COLD**, and **ICE**.

FREEZING POINT denotes the point or degree of cold, by a mercurial thermometer, at which certain fluids begin to freeze, or, when frozen, at which they begin to thaw again. On Fahrenheit's thermometer, this point is at + 32° for water, and at - 40° for quicksilver, these fluids freezing at those two points respectively.

FREEZING RAIN, or RAINING ICE, a very uncommon kind of shower, which fell in the west of England, in Dec. 1672; whereof we have various accounts in the *Philos. Trans.* This rain, as soon as it touched any thing above ground, as a bough or the like, immediately settled into ice; and, by multiplying and enlarging the icicles, broke all down with its weight. The rain that fell on the snow immediately froze into ice, without sinking into the snow at all. It made an incredible destruction of trees, beyond any thing in all history. "Had it concluded with some gust of wind (says a gentleman who was on the spot,) it might have been of terrible consequence. I weighed the sprig of an ash-tree, of just three quarters of a pound, the ice on which weighed 16 pounds. Some were frightened with the noise in the air; till they discerned it was the clatter of icy boughs, dashed against each other." Dr. Beale observes, that there was no considerable frost observed on the ground during the whole time; whence he concludes, that a frost may be very intense and dangerous on the tops of some hills and plains; while in other places it keeps 2, 3, or 4 feet distant above the ground, rivers, lakes, &c. and may wander about very furiously

in some places, and remiss in others not far off. The frost was followed by glowing heats, and a wonderful forwardness of flowers and fruits.

FREIGHT, or FRAIGHT, in navigation and commerce, is the consideration of money agreed to be paid for the use or hire of a ship, or in a larger sense, the burthen of such ship. The freight is most frequently determined for the whole voyage, without respect to time: sometimes it depends on time; in the former case it is either fixed at a certain sum for the whole cargo, or so much per ton, barrel, bulk, or other weight or measure, or so much per cent. on the value of the cargo. If a certain sum is agreed on for the freight of the ship, it must all be paid, although the ship when measured should prove less, unless the burthen is warranted. If the ship is freighted for transporting cattle or slaves at so much per head, and some of them die on the passage, freight is only due for such as are delivered alive; if for lading them, it is due for all put on board. When a whole ship is freighted, if the master suffers any goods besides those of the freight to be put on board, he is liable for damages. If the voyage is completed according to the agreement, without any accident, the master has a right to demand the freight before the delivery of the goods; but if such delivery is prevented by negligence or accidents, the parties will be reciprocally responsible in the following manner. If the merchant should not load the ship within the time agreed on, the master may engage with another, and recover damages. If the merchant recalls the ship after she is laden and sailed, he must pay the whole freight; but if he unloads before the ship has actually sailed, he will in such case only be responsible for damages. If the merchant loads goods which are not lawful to export, and the ship is prevented from proceeding on that account, he must nevertheless pay the freight. If the master is not ready to proceed on the voyage at the time stipulated, the merchant may load the whole or part of the cargo on board another ship, and recover damages; but any real casualties will release the master from all damages. If an embargo is laid on the ship before she sails, the charterparty is dissolved, and the merchant pays the expence of loading and unloading; but if the embargo is only for a short limited time, the voyage shall be performed when it expires; and neither party is liable for damages. If the master sails to any other port than that agreed on, without necessity, he must sail to the port agreed on at his own expence, and is also liable for any damages in consequence of it. If a ship is taken by the enemy, and retaken or ransomed, the charterparty continues in force. If the master transfers goods from his own ship to another, without necessity, and they perish, he is responsible for the full value, and all charges; but if his own ship is in imminent danger, the goods may be put on board another ship at the risk of the owner. If a ship is freighted out and home, and a sum agreed on for the whole voyage, nothing becomes due until the return of such ship. If a certain sum is specified for the homeward voyage, it is due, although the correspondent abroad should have no goods to send home. A ship was freighted to a particular port and home, a particular freight agreed upon for the homeward voyage, with an option reserved for the correspondent to decline it, unless the ship arrived before a certain day. The master did not go to the port agreed on, and therefore became liable to damages; the obligation being absolute on his part, and conditional only on the part of the freighter. If the goods are damaged without fault of the ship or master, the owner is not obliged to receive them and pay the freight, but he must either receive or abandon the whole; he cannot receive those that are not damaged, and reject the others. If the goods are damaged through the insufficiency of the ship, the master is liable for the same; but if it is owing to stress of weather he is not accountable. If part of the goods is thrown overboard or taken by the enemy, the part delivered pays freight. The master is accountable for all the goods received on board by himself and mariners, unless they perish by the act of God, or the king's enemies. The master is not liable for leakage of liquors, nor accountable for contents of packages, unless packed in his presence.

FREIND, JOHN, a learned English physician and author, born at Croton, in Northamptonshire, in 1675. In 1696, he published, in conjunction with Mr. P. Foulkes, an edition of two Greek orations, viz. of *Æschines* against *Ctesiphon*, and *Demosthenes* de *Corona*, with a new Latin version. In 1699, he wrote a letter to Dr. Sloane concerning an *Hydrocephalus*, published in the *Philosophical Transactions*, and another letter in Latin to

the same gentleman, *De Spasmi rarioris*, *Historia*, printed in the same *Transactions*. In 1703, his *Emmenologia* appeared; which gained him great reputation. In 1704, he was chosen professor of chemistry in the university of Oxford. In 1705, he attended the earl of Peterborough to Spain, as physician to the army there; and upon his return in 1707, published an account of the earl's expedition. In 1709, he published his *Chemical Lectures*. In 1712, he attended the duke of Ormond in Flanders, as his physician. In 1716, he was admitted a fellow of the college of physicians in London. This year he published the first and third books of *Hippocrates De Morbis popularibus*, with a Commentary on Fevers, written by himself. He sat M. P. for Launceston in Cornwall in 1722, where he distinguished himself by his opposition to the ministry. In March 1722, he was committed to the tower on a charge of high treason: and while he was under confinement, he wrote a Latin epistle to Dr. Mead, *De quibusdam Variolarum Generibus*; and began his *History of Physic*, the first part of which was published in 1725, and the second in 1726. Upon the accession of George II, he was appointed physician to the queen, who shewed the utmost esteem for him. He died at London in 1728. His works were published together in Latin at London by Dr. Wigan, in folio, in 1733, and dedicated to the queen.

FREJULS, or FREJUS, a town of France, in the department of Var, anciently called *Forum Julium*, or *Julii*. It is seated near the *Argens*, 40 miles N. E. of *Toulon*.

FRENAYE, two towns of France, in the department of Sarthe; 1. six miles E. of *Alençon*: 2. nine miles S. S. W. of *Alençon*.

FRENCH BEAN, in botany. See *PHASEOLUS*.

FRENCH BROAD, a navigable river of Tennessee, which joins the *Holstein* 11 miles above *Knoxville*.

FRENCH LANGUAGE, the language now spoken in France, which, like the English, is not an original language, but a medley of several. Those that prevail most, and are the basis of it, are, 1. The Celtic; whether that were a particular language itself, or whether it were only a dialect of the Gothic, as spoke in the West and North: 2. The Latin, which the Romans carried with them into Gaul, when they conquered it: And, 3. The Teutonic, or that dialect of the Teutonic spoken by the Franks, when they passed the Rhine, and established themselves in Gaul. Of these three languages, in the space of about 1300 years, was the modern French gradually formed. Its progress was very slow. Both the Italian and Spanish were regular languages long before the French. One character of the French language is, that it is natural and easy. The words are ranged in it much in the same order as the ideas in our minds, in which it differs exceedingly from the Greek and Latin, where the inversion of the natural order of words is reputed a beauty. The Hebrew surpasses even the French in this point, but comes short of it in copiousness and variety. But, as to the analogy of grammar, and the simplicity where-with the moods of verbs are formed, the English has the advantage not only over the French, but over all the known languages in the world; though the peculiar expressions and idioms of the English are sometimes so quaint and extraordinary, that it loses a good deal of the advantage which its grammatical simplicity gives it over the rest. The French has few compound words, wherein it differs widely from the Greek, High Dutch, and English. This the French authors acknowledge to be a great disadvantage; the Greek and Dutch deriving a great part of their force and energy from the composition of words, and frequently expressing that in one sounding word, which the French cannot express but by a periphrasis. The diminutives in the French are as few as the compounds, the greatest part of those in use having lost their diminutive signification. The French is chiefly admired for its justness, purity, accuracy, and flexibility. It is the most universal and extensive language in Europe. The policy of states and courts has rendered it necessary for the ministers of princes, &c. and the discoveries and improvements made by the French in arts and sciences have had the same effect among the learned. In Germany, and elsewhere, the princesses and persons of distinction value themselves on understanding French; and in several courts of Europe, French is almost as much used as the language of the country.

FRESCATI, or FRASCATI, a small town of Italy, on the brow of a hill, 10 miles S. E. of *Rome*.

FRESCO, a method of painting in relieve on walls, so as to endure

endure the weather. It is performed with water-colours on fresh plaster, or on a wall laid with mortar not yet dry. This sort of painting has a great advantage by its incorporating with the mortar, and, drying along with it, becomes very durable. The Italians, from whom we borrow the term, call it fresco; because it is frequently used for walls, alcoves, and other buildings in the open air. Vitruvius, (lib. vii. cap. 4.) calls it *udo tectorio*. Painting in fresco is very ancient, having been practised in the earliest ages of Greece and Rome. See PAINTING.

FRESH DISSEISIN, in law, such a disseisin, as a man may defeat of himself, as where it is within 15 days.

FRESH FORCE, a force newly done; as where a man is deforced of lands after the death of his ancestor, the person having right may within 40 days bring his bill of fresh force and recover the lands.

FRESH SHOT, in sea-language, the falling down of any large river into the sea, whereby the sea has fresh water a great way from its mouth.

FRESHES, in sea-language, denote the impetuosity of an ebb tide, increased by heavy rains, and flowing out into the sea, often discolouring it to a considerable distance, and forming a line that separates the two colours, and which may be distinctly perceived for a great length along the coast.

FRESHES, a local term signifying annual inundations, from the rivers being swollen by the melted snows and other fresh waters from the uplands, as is the Nile, &c. from periodical or tropical rains. As a sailor's term, it is opposed to marine or salt water floodings, tides, &c. The word is of common use in America, where the inundations so called are of great service.

FRESNE, CHARLES DE, SIEUR DU CANGE, one of the most learned writers of his time, was born at Amiens in 1610, and studied at the Jesuits' college in that city. Afterwards he studied the law at Orleans, and gained great reputation by his works; among which are, 1. The history of Constantinople under the French emperors. 2. John Cinnamus's History of the affairs of John and Manuel Comnenus, in Greek and Latin, with historical and philological notes. 3. Glossarium ad Scriptores mediæ & infimæ Latinitatis: 6 vols. folio. 4. A Greek Glossary, consisting of curious passages from rare M. S. S. 2 vols. folio. He died in 1688, aged 78. Lewis XIV settled pensions on his four children.

FRET, or FRETTE, in architecture, a kind of knot or ornament, consisting of two lists or small fillets variously interlaced or interwoven, and running at parallel distances equal to their breadth.

FRET-WORK, work adorned with frets. It is sometimes used to fill up and enrich flat empty spaces; but it is mostly practised in roofs, which are fretted over with plaster-work.

FRET, in heraldry, a bearing composed of six bars, crossed and variously interlaced. Some call it the true lover's knot. See HERALDRY.

FRET, in music, a kind of stop on some instruments, particularly bass-voils and lutes. Frets consist of strings tied round the neck of the instrument, at certain distances, within which such and such notes are to be found.

FRETOY, a town of France, in the department of the Oise, 5 miles N. W. of Noyon.

FRETTS, in mineralogy, a term used by miners to express the worn side of the banks of the rivers in mine-countries, where they search for the shoad stones or grewts washed down from the hills, in order from thence to trace out the running of the shoad up to the mine.

FREUDENBERG, the name of three towns of Germany: viz. 1. in the circle of Bavaria, four miles E. of Amberg; 2. in that of Franconia, 8 miles N. of Wertheim; 3. in Westphalia, 5 miles W. N. W. of Siegen.

FREUDENSTADT, a fortified town of Suabia, with a citadel, in the kingdom of Wirtemberg: 24 miles S. E. of Strasburg.

FREVENT, a town of France, in the department of the Straits or Calais; 7½ miles S. of St. Pol, and 6 W. of Arras.

FREYA, FRIA, or FRIGGA, the Venus of the Saxons. See FREA. The following German towns appear to have been named from her:

FREYBERG or FRIDBERG, a town of Upper Saxony in the matgraviate of Meissen, 19 miles W. S. W. of Dresden.

FREYBORG or FRIBOR, a town of Moravia, 28 miles E. N. E. of Prerau, and 36 E. of Olmutz.

FREYBURG, a town of Silesia, in Schweidnitz, near the Pohnitz, 7 miles W. of Schweidnitz.

FREYBURG, or FRIBURG, a town of Upper Saxony, 16 miles S. of Halle, and 4 N. N. W. of Naumburg.

FREYE-ÆMTER, a territory of the Helvetic republic, surrounded by the cantons of Zurich, Bern, Lucerne, and Zug; anciently called Rori and Waggenthal.

FREYENSTADT, a town of Bavaria, 20 miles S. E. of Nuremberg, and 31 N. W. of Ratisbon.

FREYENTHURN, a town of Carniola, on the Kulp, 7 miles S. of Rudolfswoth.

FREYENWALD, a town of Brandenburg, on the Oder, 24 miles N. W. of Custrin, and 32 N. E. of Berlin.

FREYSINGEN, or FRIESINGEN, an ecclesiastical principality in Bavaria, between Munich and Landshut. It comprehends the counties of Ismaning and Werdenfels, and the lordship of Burgkrain.

FREYSINGEN, the capital of the above bishopric.

FREYSTADT; two towns of Silesia: 1. in the principality of Glogau, 14 miles N. E. of Sagan; 2. in that of Teschen, 7 miles, N. N. W. of Teschen.

FRIAR, or FRIER, [*Lat. frater, Ital. fra, and French frere, i. e. brother*:] a term common to monks of all orders; founded on this, that there is a kind of brotherhood presumed between the religious persons of the same monastery. Friars are generally distinguished into these four principal branches, viz. 1. Franciscans, Minors, or grey friars: 2. Augustines: 3. Dominicans, or black friars: 4. Carmelites, or white friars. From these four the rest of the orders descend. See these articles.

FRIAR, in a more peculiar sense, is restrained to such monks as are not priests; for those in orders are usually dignified with the appellation of father.

FRIARS OBSERVANT, [*fratres observantes*,] were a branch of the Franciscans; thus called, because not combined together in any cloister, convent, or corporation, as the conventuals are, but only agreed among themselves to observe the rules of their order.

FRIBURG, or FREYBURG, a large town of Germany, in Suabia capital of Austrian Brigaw, 10 miles E. of Brisach, and 34 S. S. E. of Strasburg. Lon. 7. 57. E. Lat. 48. 4. N.

FRIBURG, a town of Germany, in Upper Bavaria, 15 miles S. S. E. of Brannau, and 18 of Burkhausen.

FRIBURG, or FREYBURG, a town of the Helvetic republic, capital of the canton seated on the Sane, 15 miles S. W. of Bern, and 75 of Zurich. Lon. 6. 53. E. Lat. 46. 48. N.

FRIBURG, one of the cantons of Switzerland. It is surrounded on all sides by the canton of Bern. The land is fertile in corn, fruits, and pastures: and the canton can send 18,000 men into the field.

FRICENTI, or FRICENTY, an episcopal town of Naples, in Principato Ultra, near the Tripalto: 12 miles N. W. of Conza.

FRICTION, [*friction, Fr. frictio, from frico, Latin*,] the rubbing of bodies together called also attrition. The phenomena arising upon the friction of divers bodies, under different circumstances, are very numerous and considerable. Mr. Hawksbee gives a number of experiments of this kind; particularly of the attrition or friction of glass, under various circumstances, the result of which was, that it yielded light and became electrical. All bodies by friction are brought to conceive heat; many of them to emit light; particularly a cat's back, sugar, beaten sulphur, mercury, sea-water, gold, copper, &c. but, above all, diamonds, which when briskly rubbed against glass, gold, or the like, yield a light equal to that of a live coal when blown by the bellows. See ELECTRICITY.

FRICTION, in mechanics, the rubbing of the parts of engines and machines against each other, by which means a great part of their effect is destroyed. It arises from the roughness or asperity of the surface of the body moved on, and that of the body moving: for such surfaces consisting alternately of eminences and cavities; either the eminences of the one must be raised over those of the other, or they must be both broke and worn off; but neither can happen without motion; nor can motion be produced without a force impressed. Hence, the force applied to move the body is either wholly or partly spent on this effect; and consequently there arises a resistance or friction which will be greater, ceteris ar-

bus;

bus, as the eminences are the greater and the substance the harder: and as the body, by continual friction, becomes more and more polished, the friction diminishes. Messrs. Amontons, De La Hire, Cams, Desaguliers, Muschenbroek, Ferguson, Euler, and other mechanicians, have made a number of ingenious experiments to settle a principle for the exact calculation of the quantity of friction. But the most successful set of experiments, made on this subject, are those of the Rev. Samuel Vince A. M. of Cambridge, published in the 75th Vol. of the Philosophical Transactions, p. 165. Mr. Emerson, in his Principles of Mechanics has also made several important remarks on the friction of wood and metals. See MECHANICS.

FRICTION, in medicine, is the act of rubbing a diseased part with oils, unguents, and other matters, in order to ease, relieve, and cure it. Friction is also performed with a flesh-brush, a linen-cloth, or with flannel; which last is the most eligible. It is a kind of exercise that remarkably contributes to the health of sedentary persons; for it excites and kindles the natural warmth; diverts fluxions; promotes perspiration; opens the pores: and tends to dissipate stagnant humours. This operation is particularly beneficial to the nervous, debilitated, and studious; being an useful substitute for other exercise. Hence we recommend to such individuals to spend half an hour every morning and evening in rubbing their whole body, especially their limbs, with a clean piece of flannel. It ought, however, to be observed, that this practice will be of the greatest service when the stomach and bowels are empty. Lastly, we venture to affirm, that the most important purposes to which friction may be rendered subservient in the animal economy, have hitherto been almost entirely neglected: we are, however, convinced from experience, that medicated frictions, or the introduction of the most active medicines into the human system, by rubbing them in properly on the surface, might be attended with the most happy effects, especially in all chronic diseases. Common sense appears to have long since pointed out this excellent method of administering medicines, even to the Indian savages, though it is little practised in enlightened Europe, where the stomach is doomed to be the field of battle, for deciding commotions and irregularities in our complicated frame. But who is hardy enough to maintain, that the digestive organ was by Nature destined to be the exclusive vehicle of drugs, and to serve as their common laboratory.

FRIDBERG, a town of Germany, in Bavaria, 4 miles S. E. of Augsburg, and 28 W. N. W. of Munich.

FRIDBERG, an imperial town of Germany, in Weteravia, 12 miles N. E. of Frankfurt, and 28 E. N. E. of Mentz.

FRIDBERG, a town of Germany in Stiria, 32 miles E. of Pruck, and 42 S. of Vienna.

FRIDBURG, a town of Germany, in Upper Saxony, 30 miles W. of Leipsick.

FRIDECK, a town of Silesia, 10 miles W. S. W. of Teschen, and 10 S. of Odelberg.

FRIDECK, a town of Prussia, 12 miles E. of Culm.

FRIDING, a town of Germany, in Suabia, 30 miles N. E. of Constance.

FRIDLAND, a town of Bohemia, 55 miles E. of Dresden.

FRIDSTOL, one of the ancient immunities granted to churches. The word signifies a seat, chair, or place of peace and security, where criminals might find safety and protection. Of these there were many in England; but the most famous were those at Beverly; and in St. Peter's church at York, granted by charter of king Henry I.

FRIEDBERG, or **FRIEDENBURG**, a town of Silesia, in the duchy of Jauer, on the Queiss; 11 miles W. of Lowenberg.

FRIEDBERG HOHEN, a town of Silesia, in the duchy of Schweidnitz; 5 miles S. W. of Striegau.

FRIEDEBURG, a town of Westphalia, in E. Friesland, 22 miles E. N. E. of Embden.

FRIEDERICKSTED, a town on the W. coast of Santa Cruz. Lon. 93. 25. W. Lat. 17. 48. N.

FRIEDLINGEN, or **FRIDLINGEN**, a town and fort of Suabia, 3 miles E. of the Rhine, and 4 N. of Basle.

FRIENDLY ISLANDS, a cluster of 60 islands, in the Pacific Ocean, so named by Capt. Cook in 1773, on account of the friendship which appeared to subsist among the inhabitants, and from their courteous behaviour to strangers. The chief of these

islands are Annamooka, Tangataboo, Lefooga, and Taöoa, or Middleburg. The natives of these islands seldom exceed the common stature, but are very strong and well made. These islands lie between 170° and 180° Lon. W. and between 20° and 23° Lat. S.

FRIENDS, or **QUAKERS**, a numerous and respectable religious society, which took its rise about the middle of the 17th century; and spread very quickly into the British colonies in North America, as well as into various countries in Europe. The members called themselves at first Seekers, from their seeking the truth; but after their society was formed, assumed the name of Friends. The name of Quakers was given them in derision. George Fox, a shoemaker, (see Fox,) is generally allowed to have been the founder of this Society. They were soon after joined by a number of learned, ingenious, and pious men. The chief of these were George Keith, the justly celebrated William Penn, (see PENN,) and Barclay of Ury. They believe in one eternal God, the Creator and Preserver of the universe; and in Jesus Christ his Son, the Messiah, and Mediator of the new Covenant, (Heb. xii. 24.) To Christ alone they give the title of the Word of God, (John i. 1.) They hold, that the scriptures are able to make wise unto salvation, through faith in Christ Jesus, (2 Tim. iii. 15.) They reverence the precepts of our Lord, and believe that in the life to come every man will be rewarded according to his works, (Matt. xvi. 27.) And that, to enable mankind to practise these sacred precepts, many of which are contradictory to the unregenerate will of man, (John. i. 9,) every man coming into the world is endued with a measure of the light, grace, or good Spirit, of Christ; by which, as it is attended to, he is enabled to distinguish good from evil, and to correct the disorderly passions and corrupt propensities, of his nature, which mere reason is altogether insufficient to overcome. They consider as obstructions to pure worship, all forms which divert the attention of the mind from the secret influence of this unction from the Holy One, (1 John ii. 20, 27.) They meet often together, (Heb. x. 25,) in testimony of their dependence on the heavenly Father, and for a renewal of their spiritual strength: nevertheless, in worship they do not depend for acceptance with him, on a formal repetition of the words and experiences of others; but they believe it to be their duty to cease from the activity of the imagination, and to wait in silence for a true sight of their condition: believing even a single sigh, (Rom. viii. 26,) arising from such a sense of their infirmities, to be more acceptable to God, than any performances, which originate in the will of man. They believe the renewed assistance of the light and power of Christ to be indispensably necessary for all true ministry; and that this holy influence is not at our command, or to be procured by study, but is the free gift of God to his chosen and devoted servants. Hence they object to preaching for hire, (Matt. x. 8,) and consequently to the payment of tithes. As male and female are one in Christ, they allow such of the female sex as have a right qualification to exercise their gifts in the ministry: and this liberty they esteem to be a peculiar mark of the gospel dispensation, as foretold by the prophet Joel, (Joel ii. 28, 26,) and noticed by the apostle Peter, Acts ii. 16, 17.) They hold that baptism is one in nature and operation; that nothing short of it can make living members of Christ's mystical body; and that the baptism with water, administered by John, belonged, as the latter confesses, to an inferior and decreasing dispensation, (John iii. 30.) They therefore practise it not. They believe that communion between Christ and his church is not maintained by the Lord's Supper nor any other external performance, but only by a real participation of his divine nature, (2 Pet. i. 4,) through faith; that this is the supper alluded to in the Revelation, (See Rev. iii. 20,) and that where the substance is attained, it is unnecessary to attend to the shadow. With respect to oaths, they abide literally by Christ's positive injunction, "Swear not at all." Wars and fightings they consider in their origin and effects, utterly repugnant to the Gospel. They inculcate submission to the laws in all cases wherein conscience is not violated. But as Christ's kingdom is not of this world, they think the magistrate ought not to interfere in matters of religion; but to maintain the external peace and good order of the community. They are careful in requiring their members not to be concerned in illicit trade, nor in any manner to defraud the revenue. The society, from its first appearance, disused those names of the months and days which,

which, having been given in honour of the heroes or false gods of the heathens, originated in their flattery or superstition; and the custom of speaking to a single person in the plural number, as having arisen also from motives of adulation. Compliments, superfluity of apparel and furniture, outward shows of rejoicing and mourning, and observation of days and times, they esteem incompatible with the simplicity and sincerity of the Christian life; and public diversions, gaming, and other vain amusements of the world, they condemn. They think that a true and living faith is not produced in the mind of man by his own effort; but is the free gift of God, (Eph. ii. 8,) in Christ Jesus, nourished and increased by the progressive operation of his Spirit in our hearts, and our proportionate obedience, (John vii. 17.) They require no formal subscription to any articles, either as the condition of membership, or to qualify for the service of the church, but prefer judging of men by their fruits. In the practice of discipline, they think it indispensable that the order recommended by Christ himself be invariably observed: (See Matth. xviii. 15, to 17.) For the purposes of discipline, meetings were appointed, at an early period of the society, which, from the times of their being held, were called quarterly meetings. It was afterwards found expedient to divide the districts of those meetings, and to meet oftener; whence arose monthly meetings, subordinate to those held quarterly. At length, in 1669, a yearly meeting was established, to superintend, assist, and provide, rules for the whole; previous to which general meetings had been occasionally held. A monthly meeting is usually composed of several particular congregations, situated within a convenient distance of each other. Its business is to provide for the subsistence of their poor, and for the education of their offspring; to judge of the sincerity and fitness of persons desiring to be admitted into membership; to excite due attention to the discharge of religious and moral duty; and to deal with disorderly members. Monthly meetings also grant to such of their members as remove into other monthly meetings, certificates of their membership and conduct. Each monthly meeting is required to appoint overseers, to take care that the rules of discipline be put in practice. In disputes between individuals, members should not sue each other at law. They are enjoined to apply to arbitration, agreeable to rules laid down. If any refuse he is disowned. To monthly meetings also belongs the allowing of marriages. Those who intend to marry, appear together and propose their intention to the monthly meeting; and if not attended by their parents or guardians produce a written certificate of their consent, signed by witnesses. The meeting then appoints a committee to inquire whether they are clear of other engagements respecting marriage; and if at a subsequent meeting, to which the parties also come and declare the continuance of their intention, no objections are reported, they have the meeting's consent to solemnize their intended marriage. This is done in a public meeting for worship; towards the close whereof the parties stand up, and solemnly take each other for husband and wife. A certificate of the proceedings is then publicly read, and signed by the parties, and afterwards by the relations and others as witnesses. Of such certificates the monthly meeting keeps a record; as also of the births and burials of its members. A certificate of the date, of the name of the infant, and of its parents, signed by those present at the birth, is the subject of one of these last-mentioned records; and an order for the interment, countersigned by the grave-maker, of the other. The naming of children is without ceremony. Burials are also conducted in a simple manner. The body, followed by the relations and friends, is sometimes, previously to interment, carried to a meeting; and at the grave a pause is generally made; on both which occasions it frequently falls out that one or more friends present have somewhat to express for the edification of those who attend: but no religious rite is considered as an essential part of burial. Several monthly meetings compose a quarterly meeting. The yearly meeting has the general superintendence of the society in the country in which it is established. Appeals from the judgement of quarterly meetings are here finally determined; and correspondence is maintained with other yearly meetings. The women have quarterly and yearly meetings, of their own sex, held at the same time and in the same place with those of the men; but separately, and without the power of making rules. Elders are selected of either sex, who, by their experience in the work of religion, are qualified for that service. These, and ministers approved by their monthly meetings, have

meetings peculiar to themselves, called meetings of ministers and elders; in which they have an opportunity of exciting each other to a discharge of their several duties. The yearly meeting held in London, in 1675, appointed a meeting to be held in that city for the purpose of advising and assisting in cases of suffering for conscience sake, which hath continued to this day. It is composed of friends under the name of correspondents, chosen by the several quarterly meetings, and who reside in or near the city. The same meetings also appoint members of their own in the country as correspondents, who are to join their brethren in London on an emergency. There is not in any of the meetings a president, as they believe that Divine Wisdom alone ought to preside. The office of clerk, with a few exceptions, is undertaken voluntarily by some member; as is also the keeping of the records. Where these are very voluminous, and require a house for their deposit, a clerk is hired to have the care of them; but except a few clerks of this kind, and persons who have the care of meeting-houses, none receive any stipend or gratuity for their services in the society.

FRIESACH, a town of Carinthia, in the archbishopric of Salzburg, 56 miles S. E. of Salzburg.

FRIESINGEN, FREISINGEN, FREYSINGEN, or FRI-SINGEN, a town of Bavaria, 17 miles N. N. E. of Munich.

FRIESLAND, or NORTH FRIESLAND, one of the late United Provinces, now included in the French empire. It was so named from the Frisians, and was bounded on the E. by the Lauvers, which separates it from Groningen, on the S. by Overysse, on the W. by the Zuyder Zee, and on the N. by the German ocean. It is 30 miles from N. to S. and 28 from E. to W. The land is very fertile in corn and pasture; the horses are large and the cows and sheep prolific.

FRIESLAND, EAST, a late province of Germany, in the ci-devant circle of Westphalia, near the German ocean. The principal towns are Emden, Norden, Leer, Essens, Whitemunde, and Aurick.

FRIESLAND, WEST, a name given to that part of Batavia, lately called North Holland; now included in the department of the Texel, and united to the French empire.

FRIEZE, (drap de frise, Fr.) a coarse warm cloth, made perhaps first in Friesland.

FRIEZE, in commerce, a coarse kind of woollen stuff, or cloth, for winter-wear; so called, as being friezed or naped on one side.

FRIEZE, or FRIZE, in architecture, a large flat member which separates the architrave from the cornice; of which there are as many kinds as there are orders of columns. See **ARCHITECTURE**.

FRIGATE, among seamen, a ship of war, light built, and that is a good sailer.

FRIGATES, are usually of two decks; light-built, designed for swift sailing. When smaller, with but one deck, they are called light frigates. Those mounting from 20 to 44 guns are esteemed excellent cruisers. The name was formerly known only in the Mediterranean, and applied to a long kind of vessel navigated in that sea with sails and oars. The English were the first who appeared on the ocean with these ships, equipped for war as well as for commerce.

FRIGATOON, a Venetian vessel, commonly used in the Adriatic, built with a square stern, and without any fore-mast, having only a main-mast, mizen-mast, and bow-sprit.

FRIGHT, or TERROR, sudden fear; it is frequently productive of very remarkable effects upon the human system. Of this many instances occur in medical writings. In general, the effects of terror are a contraction of the small vessels and a repulsion of the blood in the large and internal ones: hence proceed general oppression, trembling, and irregularity in the motions of the heart; while the lungs are also overcharged with blood. Frights often occasion incurable diseases, as epilepsy, stupor, madness, &c. In this way they have killed many, by the agitation into which they have thrown the spirits. We have also accounts of persons absolutely killed by terror, when in perfect health at the time of receiving the shock. Persons ordered to be led to execution, but with private orders to be reprieved on the scaffold, have expired at the block without a wound. Out of many instances of the fatal effects of fear, the following is selected as one of the most singular: "George Grochantzy, a Polander, who had enlisted as a soldier in the service of the king of Prussia, deserted during the last war. A small party was sent in pursuit of him, and, when he least expected it, surprised him singing and dancing among a com-

pany of peasants, in an inn. This event so sudden and so dreadful in its consequences, struck him in such a manner, that, giving a great cry, he became altogether stupid and insensible, and was seized without the least resistance. They carried him away to Gloau, where he was brought before the council of war, and received sentence as a deserter. He suffered himself to be led and disposed of, at the will of those about him, without uttering a word, or giving the least sign that he knew what had happened, or would happen to him. He remained immoveable as a statue wherever he was placed, and was wholly passive with respect to all that was done to him or about him. During all the time that he was in custody, he neither eat, nor drank, nor slept, nor had any evacuation. Some of his comrades were sent to see him; after that he was visited by some officers of his corps, and by some priests; but he still continued in the same state, without discovering the least signs of sensibility. Promises, intreaties, and threatenings, were equally ineffectual. The physicians were of opinion, that he was in a state of hopeless idiocy. It was at first suspected that those appearances were feigned; but these suspicions gave way, when it was known that he took no sustenance; and that the involuntary functions of nature were in a great measure suspended. After some time they knocked off his fetters, and left him at liberty to go whither he would. He received his liberty with the same insensibility that he had shewn upon other occasions; he remained fixed and immoveable; his eyes turned wildly here and there without taking cognizance of any object, and the muscles of his face were fallen and fixed like those of a dead body. Being left to himself, he passed twenty days in this condition, without eating, drinking, or any evacuation, and died on the twentieth day. He had been sometimes heard to fetch deep sighs; and once he rushed with great violence on a soldier, who had a mug of liquor in his hand, forced the mug from him, and having drank the liquor with great eagerness, let the mug drop to the ground." When a person is affected with terror, the principal endeavour should be to restore the circulation to its due order; to promote perspiration, and to allay the agitation of the patient. For these purposes he may drink a little warm liquor, as camomile tea, &c. the feet and legs may be put into warm water, the legs rubbed, and the camomile tea repeated every six or eight minutes; and when the skin is warm, and there is a tendency to perspiration, sleep may be promoted by a gentle opiate. Yet frights have been known to cure, as well as to cause, diseases. Mr. Boyle mentions agues, gout, and sciatica, thus cured. Among the ludicrous effects of fear, the following instance, quoted from a French author by Mr. Andrews in his volume of Anecdotes, shews upon what slight occasions this passion may be sometimes excited in a very high degree, and even in persons the most unlikely to entertain fear. "Charles Gustavus (the successor of Christina, queen of Sweden) was besieging Prague, when a boor of most extraordinary visage desired admittance to his tent; and being allowed entrance, offered, by way of amusing the king, to devour a whole hog of 100 weight in his presence. The old general, Konigsmarc, who stood by the king's side, and who, soldier as he was, had not got rid of the prejudices of his childhood, hinted to his royal master that the peasant ought to be burnt as a sorcerer. 'Sir, said the fellow, irritated at the remark, if your majesty will but make that old gentleman take off his sword and his spurs, I will eat him immediately before I begin the hog.' Konigsmarc (who had, at the head of a body of Swedes, performed wonders against the Austrians, and who was looked upon as one of the bravest men of the age,) could not stand this proposal, especially as it was accompanied by a most hideous and preternatural expansion of the frightful peasant's jaws. Without uttering a word, the veteran suddenly turned round, ran out of the court, and thought not himself safe until he had arrived at his quarters; where he remained above twenty-four hours locked up securely, before he had got rid of the panic which had so severely affected him." The ingenious Dr. Beattie observes, in his Elements of Moral Science, that "fear should not rise higher than to make us attentive and cautious; when it gains an ascendancy in the mind, it becomes an insupportable tyranny, and renders life a burden. The object of fear is evil; and to be exempt from fear, or at least not enslaved to it, gives dignity to our nature, and invigorates all our faculties. Yet there are evils which we ought to fear. Those that arise from ourselves, or which it is in our power to prevent, it would be madness

to despise, and audacity not to guard against. External evils, which we cannot prevent, or could not avoid without a breach of duty, it is manly and honourable to bear with fortitude. Insensibility to danger is not fortitude, no more than the incapacity of feeling pain can be called patience; and to expose ourselves unnecessarily to evil is worse than folly, and very blameable presumption. It is commonly called fool-hardiness; that is, such a degree of hardness or boldness as none but fools are capable of.

FRIGID ZONE. See ZONE.

FRILAZIN, a class or rank of people among the Anglo-Saxons, consisting of those who had been slaves, but had obtained their liberty, either by purchase or otherwise.

FRINGILLA, the FINCH, in ornithology, a genus of the class aves, order passerres. Bill conical, straight, sharp-pointed. There are a hundred and eight species comprehended under this genus, distinguished principally by varieties in their colour.

F. CÆLEBS, the CHAFFINCH, has black limbs, and the wings white on both sides; the three first feathers of the tail are without spots, but the two chief ones are obliquely spotted. It has its name from its delighting in chaff. This species entertains us agreeably with its song very early in the year, but towards the end of summer assumes a chirping note: both sexes continue with us the whole year. In Sweden the females quit that country in September, migrate in flocks into Holland, leaving their mates behind, and return in spring.

F. CANARIA, the CANARY-BIRD, hath a whitish body and bill, with the prime feathers of the wings and tail greenish. It was originally peculiar to those isles to which it owes its name. See CANARY. It is supposed to have been first brought to Europe in the fourteenth century. At a still later period Canary-birds were more generally introduced into Germany, where the greatest attention is paid to the breeding and rearing of these beautiful creatures, which are much celebrated for their song, and docility in imitating musical notes. Hence they are become a source of considerable emolument to the Tyrolese, who export vast numbers to various parts of Europe, and also to England. If treated with proper care they will breed, and become as vigorous and healthy in this country as in their native islands. These delicate birds are subject to a variety of diseases; to prevent which, the greatest care should be taken to provide them with pure water and simple food. During the time of moulting, which often proves fatal to many of them, a little white wine dropped on a piece of biscuit, or sugar, will be of considerable service. The Canary-bird will prove fertile with the siskin and goldfinch; but in this case the produce for the most part proves sterile: the pairs succeed best when the hen is the Canary, and the cock of the opposite species. She will also prove prolific with the linnet, yellow-hammer, chaffinch, and even the house-sparrow; but the male Canary-bird will not assimilate with the female of any of these species; the hen must be always of the Canary species, and the young generally prove males. Canaries are said by some to live fifteen years, by others eighteen.

F. UARDUELIS, the GOLDFINCH, with the quill-feathers red forwards, and the outermost without any spots; the two outermost are white in the middle, as the rest are at the point. The young bird before it moults is grey on the head; and hence it is termed by the bird-catchers a grey-pate. Their note is very sweet, and they are much esteemed on that account, as well as for their great docility. Towards winter they assemble in flocks, and feed on various seeds, particularly those of the thistle. They are fond of orchards, and often build in apple or pear-trees. Their nests are very elegantly formed of fine moss, liverwort, and bents, on the outside; lined first with wool and hair, and then with the goslin or cotton of the swallow. Goldfinches often attain the age of twenty years. They abound throughout Europe; and are also met with in Asia and Africa, but less commonly.

F. DOMESTICA, the SPARROW, has the prime feathers of the wings and tail brown, the body variegated with grey and black, and a single white streak on the wings. These birds are proverbially salacious, and have three broods in the year. They are every where common about our houses, where they build in every place they can find admittance; under the roof, corner of the brick-work, or in holes of the wall. They make a slovenly nest; generally a little hay ill put together, but lined well with feathers; where they lay five or six eggs of a reddish-white colour spotted

with

with brown. They sometimes build in trees, in which case they take more pains with the nest; and often expel the martins from theirs, to save the trouble from constructing one of their own. Sparrows, from frequenting only habitations and parts adjacent, may be said to be chiefly fed from human industry; for in spite of every precaution they will partake with the pigeons, poultry, &c. in the food thrown out to them, grain of all kinds being most agreeable to their taste, though they will eat refuse from the kitchen of most kinds. They are familiar but crafty, and do not so easily come into a snare as many others. In autumn they often collect into flocks, and roost in numbers on the neighbouring trees, when they may be shot by dozens, or caught in great numbers at night by a bat fowling net. The sparrow has no song, only a chirp or two frequently repeated. This species is found every where throughout Europe; and is also met with in Egypt, Senegal, Syria, and other parts of Africa and Asia.

F. LINOTA, the **LINNET**, has the bottom of the breast of a fine blood-red, which heightens as the spring advances. These birds are much esteemed for their song. They feed on seeds of different kinds, which they peel before they eat; the seed of the linum, or flax, is their favourite food; from whence the name. They breed among furze and white thorn: the outside of their nests is made with moss and bents, and lined with wool and hair. They lay five whitish eggs, spotted like those of the goldfinch.

F. SPINUS, the **SISKIN**, has the prime feathers of the wings yellow in the middle, and the four first chief tail feathers without spots; but they are yellow at the base, and black at the points. It visits these islands at very uncertain times, like the gross-beak, &c. It is to be met with in the bird-shops in London; and being rather scarce, sells at a higher price than the merit of its song deserves; it is known there by the name of the aberdavine. It is very tame and docile, and is often kept and paired with the Canary-bird, with which it breeds freely. Dr. Kramer informs us, that this bird conceals its nest with great art; and though there are infinite numbers of young birds in the woods on the banks of the Danube, which seem just to have taken flight, yet no one could discover it. See Plate LVIII.

FRISEI, **FRISII**, **FRISIONES**, or **FRISONES**, an ancient people of Germany, so called either from their ardent love of freedom, or from the fresh and unbroken lands they occupied.

FRISORT, a town of Germany, in the bishopric of Munster, 14 miles S. W. of Oldenburg.

FRIT, in the glass-manufacture, is the matter or ingredients whereof glass is to be made, when they have been calcined or baked in a furnace. A salt drawn from the ashes of the plant kali, or from fern or other plants mixed with sand or flint, and baked together, makes an opaque mass, called by glassmen frit; probably from the Italian *frittare*, to fry; or because the frit, when melted, runs into lumps, like fritters, called by the Italians *fritelli*. Frit, by the ancients, was called ammonitrum, of *αμμος*, sand, and *νιτρον*, nitre; under which name it is thus described by Pliny: fine sand from the Volturian sea, mixed with three times the quantity of nitre, and melted, makes a mass called ammonitrum, which being rebaked makes pure glass. There are three kinds of frits: 1. The crystal frit, or that for crystal metal, made with salt of pulverine and sand. 2. The ordinary frit, made with bare ashes of pulverine or barilla, without extracting the salt from them. This makes the ordinary white or crystal metal. 3. The frit for green glasses, made of common ashes, without any preparation. This last requires ten or twelve hours baking. The materials in each are to be finely powdered, washed, and seared; then equally mixed, and frequently stirred together in the melting-pot.

FRITH, usually signifies the opening of a river into the sea; such are the Frith of Forth, or of Edinburgh, the Frith of Clyde, &c.

FRITILLARIA, **FRITILLARY**, a genus of the monogynia order, and hexandria class of plants; natural order Coronaria. Corolla hexapetalous, campanulated, with a nectariferous cavity above the heel in each petal; stamina as long as the corolla. There are five species, all bulbous-rooted flowery perennials, having many varieties.

FRITZLAR, a town of Italy, in the kingdom of Westphalia, on the Eder, 13 miles S.S.W. of Cassel.

FRIUOLI, a province of in the late republic of Venice, bounded on the north by the Tirol and Carinthia; east by

Carniola and Gradisca; south by the Adriatic, and west by the Trevisan, Feltrin, and Bellunese. It is divided into the diocese of Udina and Concordia. Udina is the capital.

FRIZE, in architecture. See **FRIEZE**.

FRIZE, in commerce. See **FRIEZE**. Of frizes, some are crossed, others not: the former are chiefly of English manufacture; the latter of Irish.

FRIZING OF CLOTH, a term in the woollen manufactory, applied to the forming of the nap of stuff into a number of little hard burrs or prominences, covering almost the whole ground thereof.

FROBENIUS, **JOHN**, a famous and learned printer of the sixteenth century, born at Hamelburg in Franconia. He studied in the university of Basil, where he acquired great reputation for learning, and setting up a printing-house in that city, was the first of the German printers who brought that admirable art to any degree of perfection. Being a man of great probity and piety, he would never, for the sake of profit, suffer libels or any thing that would hurt the reputation of another, to go through his press. The great character of this printer, was the principal motive which induced Erasmus to reside at Basil, in order to have his own works printed by him. A great number of valuable books were printed by him with care and accuracy. He died in 1527. Erasmus wrote his epitaph in Greek and Latin. John Frobenius left a son named Jerome Frobenius, and a daughter married to Nicholas Episcopus; who, joining in partnership, continued Frobenius's printing-house with reputation, and printed correct editions of the Greek fathers.

FROBISHER, or **FORBISHER**, **SIR MARTIN**, an excellent navigator and sea-officer in the sixteenth century, born at Doncaster in Yorkshire, and from his youth brought up to navigation. He was the first Englishman who attempted to find a N. W. passage to China, and in 1576, he sailed with two barks and a pinnace for that purpose. In this voyage he discovered a cape, to which he gave the name of Queen Elizabeth's Foreland, and the next day discovered a strait to which he gave his own name. This voyage proving unsuccessful, he attempted the same passage in 1577; but discovering some ore in an island, and his commission directing him only to search for ore, he returned to England with it. He sailed again with fifteen ships and a great number of adventurers, to form a settlement; but being obstructed by the ice, and driven out to sea by a violent storm, they, after encountering many difficulties, returned home, without making any settlement; but with a large quantity of ore. He afterwards commanded the *Aid* in Sir Francis Drake's expedition to the West Indies, in which St. Domingo, Cartagena, and Santa Justina, in Florida, were taken and sacked. In 1588, he bravely exerted himself against the Spanish armada, when he commanded the *Triumph*, one of the largest ships in that service: and as a reward for his distinguished bravery, received the honour of knighthood, from the lord high-admiral at sea. He afterwards commanded a squadron which cruised on the Spanish coast; and in 1592, took two valuable ships and a rich carrac. In 1594 he was sent to the assistance of Henry IV. king of France, against a body of the Leaguers and Spaniards, who had strongly entrenched themselves at Croyzon near Brest; but in an assault upon that fort, on the seventh of November, he was unfortunately wounded with a ball, of which he died soon after he had brought back the fleet to Plymouth, and was buried in that town.

FROBISHER'S STRAITS, a narrow sea, S. of Cape Washington; W. of Davis's Strait, and N. of Cape Farewell in West Greenland.

FRODINGHAM, or **FRODLINGHAM**, a town of Yorkshire, 36 miles E. of York.

FRODSHAM, a town of Cheshire, noted for its ancient castle. It is 10 miles N. E. of Chester.

FROG, in zoology. See **RANA**.

FROME, a river of England, that rises from several springs in the S. W. of Dorsetshire, and falls into Poolhaven, near Wareham.

FROME, or **FROME SELWOOD**, a town of Somersetshire, and the chief town of this part of the country, which was anciently one great forest, called Selwoodshire. It is thirteen miles S. of Bath.

FROMISTA, a town of Spain, in the province of Leon, 18 miles N. of Valencia.

FRONDESCENTIA, [from *frons*, a leaf,] in botany, the unfolding

folding of the leaves of plants. It is also used, by ellipsis, for the time of unfolding.

FRONSAC, a town of France, in the department of the Gironde, and late province of Guienne, 22 miles N. E. of Bourdeaux.

FRONT, in anatomy, the forehead, or that part of the face above the eyebrows. The Latin *frons*, is derived by Martinus from the Greek *φρονειν*, to think, or perceive: of *φρων*, the mind or thought.

FRONT, in architecture, denotes the principal face or side of a building, or that presented to their chief aspect or view.

FRONTAL, in architecture, a little front on, or pediment sometimes placed over, a small door, or window.

FRONTAL, **FRONTLET**, or **BROW-BAND**, in the Jewish ceremonies, consists of four several pieces of vellum, on each of which is written some text of scripture.

FRONTIERS, the extremes of a kingdom or country, which the enemies find in front when they would enter it. They were anciently called *Marches*.

FRONTIGNAC, **FRONTIGNAN**, or **FRONTIGNIAC**, a town of France, in the department of Herault, and late province of Languedoc, famous for its excellent wines. It is 12 miles S. S. W. of Montpellier.

FRONTINAC, **Fort**, a fortress of Canada, on the N. W. side of Lake Ontario, three miles from its mouth, and 300 from Quebec.

FRONTINUS, **SEXTUS JULIUS**, an ancient Roman author, of consular dignity, who flourished under Vespasian, Titus, Domitian, Nerva, and Trajan. He commanded the Roman armies in Britain; was made city-prætor when Vespasian and Titus were consuls; and curator of the aqueducts by Nerva, which occasioned his writing *De Aquæductibus Urbis Romæ*. He wrote four books upon the Greek and Roman art of war; a tract *De Re Agraria*, and another *De Limitibus*. These have been often separately printed; but were all collected together in a neat edition at Amsterdam, in 1661, with notes by Robert Keuchen. He died under Trajan.

FRONTIS OS, in anatomy, called also *os coronale*, the bone of the forehead. See *ANATOMY*.

FRONTISPIECE OF A BOOK, an ornament with an engraved title on the first page, or more properly an emblematical engraved device fronting the title-page.

FRONZELLA, one of the 17 almost inaccessible passes through the mountains of Vicenza, in Maritime Austria, commencing in the valley of Brenta.

FROSE, a town of Upper Saxony, in the duchy of Magdeburg, 10 miles S. of Magdeburgh.

FROSSAY, a town of France, in the department of Lower Loire, 4½ miles S. E. of Painbœuf.

FROST, or **FREEZING**, in physiology, is such a state of the atmosphere, as occasions the congelation or freezing of water and other fluids. See *FREEZING*. Under the articles *COLD*, *CONGELATION*, *EVAPORATION*, *FLUIDITY*, and *FREEZING*, it is shewn, that water and other fluids are capable of containing the element of fire or heat in two very different states. In the one, they seem to imbibe fire in such a manner, that it eludes all the methods by which we are accustomed to observe it, either by our sensation of feeling, or the thermometer; in the other, it manifests itself obviously to our senses, either by the touch, the thermometer, or the emission of light. In the first of these states, we call the body cold; and are apt to say that this coldness is occasioned by the absence of heat. But this mode of expression is not strictly just, for even those fluids which are coldest to the touch contain a vast deal of heat. Thus vapour, which is colder to the touch than the water from which it was raised, contains an immense quantity of fire. The same may be said of common salt, and snow, or ice. If a quantity of each of these substances is separately reduced to 28° or 30° of Fahrenheit's thermometer, upon mixing them together, the heat which could have raised the thermometer to the degree above-mentioned, now enters into the substance of them in such a manner that the mercury falls down to 0. Here an excessive degree of cold is produced, and yet we are sure that the substances contain the very same quantity of heat that they formerly did; nay, they will even seem exceedingly cold, when they most certainly contain a great deal more heat than they ori-

ginally did; for they absorb it from all bodies around them; and if a small vessel full of water is put in the middle of such a mixture, it will in a short time be full of ice. It appears, therefore, that our senses, even when assisted by thermometers, can only judge of the state in which the element of fire is with relation to the bodies around us, without regard to the quantity contained in them. Thus, if heat flows from any part of our body into any substance actually in contact with it, the sensation of cold is excited, and we call that substance cold; but if it flows from any substance into our body, the sensation of heat is excited, and we call that substance hot, without regard to the absolute quantity contained in either case. See *CALORIC*. Of all known substances, the atmosphere either absorbs or throws out heat with the most remarkable facility: and in one or other of these states it always is with respect to the surface of the earth, and such bodies as are placed on or near it; for these, properly speaking, have no temperature of their own, but are entirely regulated by that of the atmosphere. When the air has been for some time absorbing the heat from terrestrial bodies, a frost must be the undoubted consequence, for the same reason that water freezes in a vessel put into a freezing mixture: and were this absorption to continue for a length of time, the whole earth would be converted into a frozen mass. There are, however, certain powers in nature, by which this effect is always prevented; and the most violent frost we can imagine must always, as it were, defeat its own purposes, and end in a thaw. To understand this subject, we must observe, 1. In that state of the atmosphere which we denominate frost, there is a most intimate union between the air and the water it contains; and therefore frosty weather, except in very high latitudes, is generally clear. 2. When such an union takes place, either in winter or summer, we observe the atmosphere also inclined to absorb heat, and consequently to grow frosty. Thus in clear settled weather, even in summer, though the day be excessively hot by the continued sunshine, yet the mornings and evenings are remarkably cold, and sometimes even disagreeably so. 3. The air being therefore always ready in the time of frost or in clear weather, to absorb heat from every substance which comes into contact with it, it follows that it must also absorb part of that which belongs to the vapours contained in it. 4. Though vapour is capable of becoming much colder than water without being frozen, yet by a continued absorption it must at last part with its latent heat, *i. e.* that which essentially constitutes it vapour; and without which it is no longer vapour, but water or ice. No sooner, therefore, does the frost arrive at a certain pitch, than the vapours, everywhere dispersed through the air, give out their latent heat: the atmosphere then becomes clouded: the frost either goes off, or becomes milder, by the great quantity of heat discharged into the air; and the vapours descend in rain, hail, or snow, according to the particular disposition of the atmosphere at the time. 5. Even in the polar regions, where it may be thought that the frost must increase beyond measure, there are natural means for preventing its running to extremes. The principal cause here is, the mixture of a great quantity of vapours from the temperate regions of the globe with the air in those dreary climates. It is well known, that aqueous vapour always flies from a warm to a colder place. For this reason, the vapours raised by the sun in the more temperate regions of the earth, must continually fly northward and southward in great quantities. Thus they furnish materials for those immense quantities of snow and ice which are to be found in the neighbourhood of the poles, and which we cannot imagine the weak influence of the sun in these parts capable of raising. It is impossible that a quantity of vapour can be mixed with frosty air, without communicating a great deal of heat to it; and thus there are often thaws of considerable duration even in those climates where, from the little influence of the sun, we should suppose the frost would be perpetual. 6. We may now account with some probability for the uncertain duration of frosts. In Britain they are seldom of a long continuance; because the vapours raised from the sea with which our island is surrounded, perpetually mix with the air over it, and prevent a long duration of the frost. For the same reason, frosts are never of such long duration in maritime places on the continent as in the inland ones. There is nothing, however, more uncertain than the motion of the vapours with which the air is constantly filled; and therefore it is impossible to prognosticate the duration of a frost with any degree of certainty.

certainty. In general, we may always be certain, that if a quantity of vapour is accumulated in any place, no intense frost can subsist in that place for any length of time; and by whatever causes the vapours are driven from place to place, by the same causes the frosts are regulated throughout the whole world. See VAPOUR. Frost, being derived from the atmosphere, naturally proceeds from the upper parts of bodies downwards, as the water and the earth: so, the longer a frost is continued, the thicker the ice becomes upon the water in ponds, and the deeper into the earth the ground is frozen. In about 16 or 17 days frost, Mr. Boyle found it had penetrated 14 inches into the ground. At Moscow, in a hard season, the frost will penetrate two feet deep in the ground; and Capt. James found it penetrated 10 feet in Charlton island, and the water in the same island was frozen to the depth of six feet. Scheffer assures us, that in Sweden the frost pierces two cubits or Swedish ells into the earth, and turns what moisture it finds there into a whitish substance, like ice; and standing waters to three ells, or more. The same author also mentions sudden cracks in the ice of the lakes of Sweden, nine or ten feet deep, and many leagues long; the rupture being made with a noise not less loud than if many guns were discharged together. By such means, however, the fishes are furnished with air; so that they are rarely found dead. The natural history of frosts furnish very extraordinary effects. The trees are often scorched and burnt up, as with the most excessive heat, in consequence of the separation of water from the air, which is therefore very drying. In the great frost in 1683, the trunks of oak, ash, walnut, &c. were miserably split and cleft, so that they might be seen through, and the cracks often attended with dreadful noises like the explosion of fire-arms. Philos. Trans. Number 165. The close of the year 1708, and the beginning of 1709, were remarkable throughout the greatest part of Europe, for a severe frost. Dr. Derham says, it was the greatest in degree, if not the most universal in the memory of man; extending through most parts of Europe, though scarcely felt in Scotland or Ireland. In very cold countries, meat may be preserved by the frost six or seven months, and prove tolerably good eating. See Captain Middleton's observations made in Hudson's Bay, in the Philos. Trans. Number 465, sect. 2. In that climate the frost seems never out of the ground, it having been found hard frozen in the two summer-months. Brandy and spirits, set out in the open air, freeze to solid ice in three or four hours. Lakes and standing waters, not above 10 or 12 feet deep, are frozen to the ground in winter, and all their fish perish. But in rivers where the current of the tide is strong, the ice does not reach so deep, and the fish are preserved. Id. ib.

FROTH-SPIT, or CUCKOW-SPIT, a name given to a white froth, or spume, very common in spring and the first months of summer, on the leaves of certain plants, particularly on those of the common white field lychnis, or catchfly, thence called by some spatling-poppy. It is formed by a little leaping animal, called by some the flea-grasshopper, by applying its anus close to the leaf, and discharging thereon a small drop of a white viscous fluid, which, containing some air in it, is soon elevated into a small bubble: before this is well formed, it deposits such another drop; and so on, till it is every way overwhelmed with a quantity of these bubbles, which form the white froth which we see. Within this spume it is seen to acquire four tubercles on its back, wherein the wings are inclosed: these bursting, from a reptile it becomes a winged animal; and thus rendered perfect, it flies to meet its mate, and propagate its kind. It has an oblong obtuse body; a large head with small eyes; four external wings, of a dusky brown colour, marked with two white spots: the head is black. It is a species of Cicada.

FRUTESCENCIA, [from *fructus*, Lat. fruit,] in botany, literally signifies the growth of the fruit, but is used elliptically for the precise time in which, after the fall of the flowers, the fruits arrive at maturity, and disperse their seeds. In general, plants which flower in spring ripen their fruits in summer, as rye; those which flower in summer have their fruits ripe in autumn, as the vine; the fruit of autumnal flowers ripens in winter, or the following spring, if kept in a stove or otherwise defended from excessive frosts. These frosts, says M. Adanson, are frequently so pernicious and violent, as to destroy the greatest part of the perennial plants of Virginia and Mississippi, that are cultivated in France, even before they have exhibited their fruit. The plants which flower

during our winter, such as those of the Cape of Good Hope, ripen their fruit in spring, in our stoves.

FRUCTIDOR, [*i. e.* the fruit-month, from *fructus*, Lat.] the name of the 12th month, in the late French Revolutionary Calendar. It began Aug. 19, and ended Sept. 16.

FRUCTIFICATION OF PLANTS, is defined by Linnæus to be the temporary part of a vegetable appropriated to generation, terminating the old vegetable, and beginning the new. See BOTANY.

FRUIT, in its general sense, includes whatever the earth produces for the nourishment of animals, expressed by the Latins under the name *fruges*, as herbs, grain, hay, corn, &c.

FRUIT, in botany, called by the Greeks, *καρπός*, in the Linnæan system, is one of the parts of fructification, and is distinguished into three parts, viz. the pericarpium, seed, and receptacle, or receptaculum seminum. See BOTANY. Fruit, more properly, signifies the production of a tree, or plant, for the propagation of its kind, in which sense the word takes in all kinds of seeds, with their furniture.

FRUITS, in commerce, are distinguished into recent or fresh, and dry.

1. FRUITS, DRY, are those dried in the sun, or by the fire, with other ingredients sometimes added to make them keep; imported chiefly beyond sea, and sold by the grocers. Such are raisins, currants, figs, capers, olives, cloves, nutmegs, pepper, and other spices; which see in their order. Under the denomination of dry fruits are also frequently included apples, pears, almonds, filberds, &c.

2. FRUITS, FRESH, OR RECENT, are those sold just as they are gathered from the tree, without any farther preparation; as are most of the productions of our gardens and orchards, sold by the fruiterers.

FRUIT, PRESERVATION OF. In the Philosophical Transactions, No. 237, we have a receipt for preserving fruit and flowers for a whole year, which is as follows. Take saltpetre, one pound; bole armoniac, two pounds; common clean sand, three pounds: mix them together; and, in dry weather, take fruit or flowers of any sort, not fully ripe, each with its stalk, and put them singly into an open glass, till it be full; cover it close with oil-cloth; and in a dry cellar, put each of these glasses four fingers-deep under ground, so that quite round above, as well as below, there may remain two fingers-thick of the mixture. One of the most easy methods of preserving fruit, is that of depositing it in ice-houses, where it may remain in a frozen state for a considerable time. And, if the fruit be afterwards gradually thawed, by covering it with melted ice, or immersing it in cold spring-water, it will lose but little of its flavour, provided it be consumed on the same day. Fruit may also be preserved, by keeping it in pits dug in a dry soil, or in dry cellars, or even in barns, if the temperature be between 32° and 48° of Fahrenheit's thermometer; that is, such as will neither induce frost nor vegetation. These pits or magazines, however, ought to be covered with such materials as are calculated to repel heat, and to absorb any accidental putrid exhalations, and thus retard the progress of putrefaction. Hence Dr. Darwin recommends the fruit to be covered first with pulverized charcoal, one or two inches thick, over which is to be laid a stratum of saw-dust, and over the latter, a thick, impenetrable thatch of straw: thus, seeds and fruits may be stored up for ages, without vegetating or decaying. He likewise mentions another mode of preserving fruit, by heat. As fermentation will not commence in the heat of boiling water, or 212°; and, as that degree of temperature can be easily procured by steam, or by the vicinity of vessels containing boiling water, he is of opinion, that such fruits as are used for culinary purposes throughout the year, may be kept in a fresh state, by putting them into bottles, and exposing them to the wasted steam of engines; or, by immersing them in the hot water that flows from such steam when condensed; or, by placing the bottles near the boilers which are fixed beside kitchen-fires.

FRUITERY, a place for the keeping of fruit; a fruit-house or fruit-loft. A fruitery should be inaccessible to any thing of moisture, and should be as much as possible so, even to frost.

FRUIT-TREES, are such as bear fruit, namely, Apple, Cherry, Pear-trees, &c. With regard to fruit-trees it may be observed, 1. The cutting or pruning them when young hinders their bear-

ing, though it contributes to the richness and flavour of the fruit as well as to the beauty of the tree. 2. Kernel fruit-trees come later to bear than stone fruit-trees: the time required by the first, before they come to any fit age for bearing, being on an average five years; but when they do begin, they bear in greater plenty than stone-fruit. 3. Stone-fruit, figs, and grapes, commonly bear considerably in three or four years, and bear full crops the fifth and sixth years; and hold it for many years, if well ordered. 4. Fruit-trees in the same neighbourhood will ripen a fortnight sooner in some grounds than in others of a different temperature. 5. In the same country, hot or cold summers set considerably forwards, or put backwards, the same fruit. 6. The fruit on wall-trees generally ripen before those on standards, and those on standards before those on dwarfs. 7. The fruit of all wall-trees planted in the S. and E. quarters, commonly ripen about the same time, only those in the S. rather earlier than those in the E.; those in the W. are later by 8 or 10 days; and those in the N. by 15 or 20. While young, no trees should be suffered to bear a large quantity of fruit; and, if they abound with blossoms, the fruit should be gathered as soon as it is formed; leaving only half a dozen of the produce, to ascertain its size and quality. By this measure, the trees will not only produce larger and finer fruit, but, by being kept clear, the leading and collateral branches will every year become more vigorous. Nor ought any young plant, or newly-engrafted tree, to be permitted to run mopeheaded, as it will make no progress, till each branch has acquired a determined leader: for, if the growth of a tree be prevented, it will be extremely difficult to throw such energy into the system, as to enable it to grow freely. As long as fruit-trees continue in the nursery, it will be requisite to cut down the head, in order to give strength and symmetry to the stem: it will also be useful to shorten most of the grafts, lest they should be blown out by the wind: these operations likewise contribute to swell the buds. The ingenious Mr. Bucknall particularly recommends, not to place the rows of trees in a situation either directly north or south, but rather inclining to the east, as the sun will then shine upon them in the early part of the day during the spring, and thus dissipate the vapours collected in the night; which if suffered to condense, will stunt the fruit in the earlier stages of its growth. He farther observes, that if the shaws (or shades) be properly attended to, the trees being placed in this position, will be enabled to withstand the power of the winds; nor will they be affected by blight. The shaw will also protect the fruit from the autumnal winds, by which half the crop of fruit is not unfrequently blown down, before it is ripe; and, as the heads are at that season of the year laden with fruit and leaves, many trees are torn up from the ground, or so lacerated as to be completely spoiled; a misfortune that might be effectually prevented by a proper disposition of the shades. In the Transactions of the Economical Society of Leipzig, we meet with a communication from the Rev. Mr. Germershausen, on the means of promoting the growth of young fruit-trees, especially in grass-land. This method simply consists in spreading flax-shows, or the refuse of flax, after it has been combed, on the soil contiguous to the trunks of the trees, as far as the roots extend; by which means their size as well as their fertility is remarkably increased. He mentions an instance, where an old plum-tree which, being in a languishing state, in a grass-field, was treated in the manner above-directed, and thus not only acquired a new bark, but produced larger, and better-tasted fruit: the young shoots also, which formerly grew up around the stem, were prevented from sprouting forth, because the refuse of the flax excluded the access of air to the trunk, and imparted additional nutriment to the roots. The leaves falling from the trees in autumn, may be substituted for the flax-shows, if these cannot be easily procured; but it will be necessary to dig a small trench for the reception of the decayed leaves, and also to cover them with tiles, flat stones, or a log of wood, to prevent their dispersion by the wind. This precaution, however, is not required with the refuse of flax, which adheres so closely to the soil, as to withstand the most violent storm. Although gardeners bestow the strictest attention on orchards, it sometimes happens that the bark of trees is stripped off by sheep, or by other accidents. In this case, it has been recommended by Mr. W. Fairman, of Miller's House, Lynsted, Kent, to take off the arms of such trees as are damaged; to cut slips off the rind, about two or three inches in width, and to place four or five of them perpendicularly round the naked part.

The damaged rind is previously to be cleared away, the sound bark somewhat raised, and the slips inserted beneath it, to promote the circulation of the sap. These dressings are next to be bound very tight with rope-yarn; and a composition of loam and cow-dung, together with a small proportion of drift-sand, should be applied, over which some old sacking, or similar stuff, ought to be fastened. Mr. Fairman adds, that he made an experiment with this mode of treatment, in the spring of 1794, on some trees which had been much damaged by sheep, and that it completely succeeded, the slips adhering closely, and being full of sap. Fruit-trees, like the rest of the vegetable creation, are the prey of a variety of insects, of which few are more destructive than those infesting apple, pear, cherry, oak, white-thorn, and similar trees. They deposit their black eggs in clusters, resembling withered leaves, and which are twisted by a cobweb round the uppermost branches. These notorious insects are hatched in the spring, when they assume the form of very diminutive caterpillars, which destroy every thing before them, and rapidly propagate in the most unfavourable weather. They damage oaks very materially; devour the white-thorn, and kill the plant; apples and pears, likewise, receive great injury. The only remedy hitherto known of exterminating such noxious vermin, is to cut off all the twigs or shoots of every tree on which these nests of insects appear; to collect them in a heap, and burn them as soon as the weather will permit; for, where this necessary operation is deferred till the summer approaches, the insects increase prodigiously, and commit irreparable damage. The disorders to which fruit-trees are subject, are various; the most fatal are Blight, Canker, Mildew, Moss, &c. to which we refer. The effects of frost are likewise often fatal, especially to the more tender fruit-trees. With a view to obviate such damage, different methods have been suggested. In a communication from a Swedish agriculturist to a respectable periodical work, published on the Continent, the following expedient is stated to have been successfully employed, to protect fruit-trees from the vernal frosts. As soon as the weather begins to grow cold in autumn, large quantities of water are to be poured on the trunks of such trees, so that they may receive an early impression of the cold. In the spring, snow is to be accumulated round their stems; which retards vegetation, and prevents them from blossoming too early. In consequence of this irrigation, the buds shoot forth at a period, when no apprehension need be entertained from the attacks of the frost that frequently happens during the nights of spring.—Such practice of watering the borders of trees, is said to increase the heat in them, by accelerating the motion of their juices; if the soil of such border has been properly opened and prepared. It is farther recommended, to add one ounce of common salt to every gallon of water, where those borders are old, and have been impoverished by producing many successive crops; or if they have been manured with dung not sufficiently putrefied. The following method of making fruit grow, during winter, is abstracted from the ninth vol. of the Annual Register for 1763: Let the trees be taken up by the roots in the spring, at the time they are about to bud; carefully preserving some of their own soil among the roots. These are to be placed upright in a cellar till Michaelmas, when they are to be put into vessels with the addition of fresh earth, and deposited in a stove or hot-house, being regularly moistened every morning with rain-water, in which sal-ammoniac has been dissolved, in the proportion of one ounce to a quart. Thus, in the month of February, the fruit will appear. The same method is applicable to rose-trees, and flowers; which last, when sown in pots at or before Michaelmas, and watered in a similar manner, will blow towards the end of December. In order to ascertain when fruits, for instance, apples and pears, are sufficiently ripe to be gathered, it is requisite to attend to the colour of the skin inclosing the seeds. During their infant state, there is no cavity round the kernels, but they are in contact with the seed-vessel. In a subsequent period, when the fruit has exhausted the nutritious matter, the cells containing the seeds become hollow, and the latter assumes a dark colour. This, Dr. Darwin observes, is the proper criterion by which to judge when such fruits should be gathered; as it indicates that they will not continue to increase in size, but waste and become hollow, by absorbing the mucilaginous particles from the centre. Among the various distinct publications which have appeared on this subject, the following are allowed to possess considerable merit: "A Treatise on Fruit-trees," &c. by Thomas Hitt;

Hitt; 8vo. 2d. edition, 1768;—and “The British Fruit-Gardener, and Art of Pruning,” &c. by Thomas Abercrombie; 8vo. 1779.

FRUITS, COLOURS FROM. The red juices of currants, mulberries, elder-berries, black-cherries, and other fruit, impart their tinging particles to water, but more completely to rectified spirits; and the tincture acquires a brighter colour. The red watery solutions, as well as the juices, are sometimes rendered dull, and sometimes more lively, by means of acids; they generally acquire a purplish hue, by the addition of alkalies. The greater part of the colours of these juices is perishable, though they strongly resist fermentation, and continue almost unchanged, when the liquor is converted into wine. If the juice be thinly spread upon other bodies, exsiccated, and exposed to the air, the colour speedily decays; the bright red fades sooner than any other; but the dark dull red obtained from the juice of the black-cherry, is of considerable durability. The ripe berries of the buck-thorn tinge paper of a green colour: when green, those berries afford a yellow, and if ripe, a purplish pigment. The injudicious practice of promiscuously allowing fruit, whether ripe or unripe, to children and infants, is very reprehensible. On account of its acidity, they are not able to bear it in excess; and their digestive powers become so frequently impaired at the expence of other secretions; such as insensible perspiration, and the discharges by stool, both of which are thus unnaturally promoted. All fruit given to young people, ought to be perfectly ripe: mothers and nurses should likewise bestow especial attention on the cleanliness of the peels, or shells, which, as they generally pass through different hands, or may have been stored in improper places, require to be previously wiped or washed.

FRUMENTACEOUS is applied by botanists to all such plants as have a conformity with wheat, in their fruits, leaves, ears, or the like.

FRUMENTARIJ, a kind of soldiers or archers under the western Roman empire. The first mention we find made of these officers is in the reign of the emperor Adrian, who made use of them to inform himself of whatever passed.

FRUMENTATION, in Roman antiquity, a largess of corn bestowed on the people.

FRUSH, a sort of tender horn that grows in the middle of the sole, and at some distance from the toe: it divides into two branches, running towards the heel, in the form of a fork. See **FARRIERY**.

FRUSTUM, in mathematics, a part of some solid body separated from the rest. Thus,

1. The **FRUSTUM OF A CONE** is the part that remains when the top is cut off by a plane, parallel to the base; and is otherwise called a truncated cone.

2. The **FRUSTUM OF A GLOBE, OR SPHERE**, is any part thereof cut off by a plane, the solid contents of which may be found by this rule: To three times the square of the semidiameter of the base add the square of its height; then multiply that sum by the height, and this product, multiplied by $\frac{1}{162}$ gives the solidity of the frustum.

3. The **FRUSTUM OF A PYRAMID** is what remains after the top is cut off by a plane parallel to its base. As a general theorem: in the frustum of any solid, generated by the revolution of any conic section about its axis: if to the sum of the two ends be added four times the middle section, then the last sum divided by six will be the mean area, and being drawn into the altitude of the solid will produce the content: That is A and a being the areas of the ends, and M equal the middle section; then we have

$$\frac{A + a + 4M}{6} \times h = \text{solid content.}$$

This theorem holds good for complete solids as well as frustums, whether right or oblique, and not only of the solids generated from the conic sections, but also of all pyramids, cones, and in short of any solid, whose parallel sections are similar figures. See **MENSURATION**.

FRUTEX, a **SHRUB**. Shrubs, according to Linnæus, make a branch of the seventh family in the vegetable kingdom; and are distinguished from trees, in that they come up without buds. But this distinction is not universal, though it be generally just with regard to those of Europe. Nature has made no absolute distinc-

tion between trees and shrubs. **Frutex**, in its general acceptation, is a plant whose trunk is perennial, gemmiparous, woody, dividing and subdividing into a great number of branches. In short, it is the epitome of a tree, exemplified in the rose-bush.

FRUTINGEN, a town of the Helvetic republic, in the late canton of Bern, 30 miles S. E. of Friburg.

FRUTIS, [from *fruor*, to enjoy,] a name of Venus.

FUCHSIA, in botany, a genus of the octandria monogynia class and order. Calyx one-leaved, coloured, bearing the corolla, very large; petals four, small; berry inferior, four-celled, with many seeds. There are five species.

FUCINUS, in ancient mythology, the god of the lake so named. His temple stood on its banks.

FUCINUS LACUS, in ancient geography, a lake of Italy in the country of the Marsi, now called Celano, from a cognominal citadel, in the S. of Abruzzo-Ultra.

FUCUS, in antiquity, a name given to certain dyes and paints; particularly to a purple sea-plant used to dye woollens and linens of that colour. The dye, says Theophrastus, was very beautiful, but not lasting; for it soon began to change, and in time went wholly off. The women also used something called fucus, to stain their cheeks red; and many have supposed, from the same word expressing both, that the same substance was used on both occasions. But this, on a strict inquiry, proves not to be the case. The Greeks called every thing *poros*; that would stain or paint the flesh. But this peculiar substance used by the women to paint their cheeks, was distinguished from the others by the name of rizon among the more correct writers, from *ρίζα*, a root; and was indeed a root brought from Syria into Greece.

FUCUS, in botany, a genus of the cryptogamia algæ. Male vesicles smooth, hollow, with villose hairs within, interwoven; female vesicles smooth, filled with jelly, sprinkled with immersed grains, prominent at the tip. Seeds solitary. This genus comprehends most of those plants which are commonly called seaweeds; more than seventy species are enumerated; they may all be used to manure land, or burnt for alkali. Some of the species are eaten, either fresh out of the sea; or boiled tender, with butter, pepper, &c. If the *F. saccharinus* is washed in spring-water, and then hung up in a warm place, a substance like sugar exudes from it.

F. CILIATUS, the **CILIATED OR LIGULATED FUCUS**, is found on the shores of Iona and other places, but is not common. The colour is red, the substance membranous and pellucid, without rib or nerve; the ordinary height of the whole plant about four or five inches. It is variable in its appearance, according to the different stages of its growth. It is eaten by the Scots and Irish promiscuously, with dilse.

F. PALMATUS, the **PALMATED OR SWEET FUCUS**, commonly called *dulse* or *dilse*, grows plentifully on our sea-coasts and islands. Its substance is membranaceous, thin, and pellucid; the colour red, sometimes green with a little mixture of red; its length generally about five or six inches, but varies from three to twelve: it is fan-shaped, or gradually dilated from the base upwards. Its divisions are extremely various. The inhabitants both of Scotland and England take pleasure in eating this plant: and women of weak habits often recover an appetite by eating it raw.

FUEGO, or **FOGO**, one of the Cape de Verd Islands, in the Atlantic, so named from its volcano; and called also St. Philip, from its having been discovered on St. Philip's day. Lon. 24. 20. W. Lat. 15. 10. N.

FURGO, or **TERRA DEL FUEGO**, a large island, separated from the S. extremity of America, by the Straits of Magellan. It consists of a chain of stupendous mountains, some of which are volcanoes, covered with perpetual snow; notwithstanding which the inhabitants go naked, and paint their bodies, which are naturally fair.

FUEL. Dr. Black divides fuels into five classes; the first comprehends the fluid inflammable bodies; the second, peat or turf; the third, charcoal of wood; the fourth, pit-coal charred; and the fifth, wood, or pit-coal, in a crude state, and capable of yielding a copious and bright flame. The fluid inflammables are considered as distinct from the solid, on this account, that they are capable of burning upon a wick, and become in this way the most manageable sources of heat; though, on account of their price, they are never employed for producing it in great quantities;

ties; and are only used when a gentle degree, or a small quantity of heat is sufficient. The species which belong to this class are alcohol and different oils. Alcohol, when pure and free of water, is as convenient and manageable a fuel for producing moderate or gentle heats as can be desired. Its flame is perfectly clean, and free from any kind of soot; it can easily be made to burn slower or faster, and to produce less or more heat, by changing the size or number of the wicks upon which it burns; for as long as these are fed with spirit, in a proper manner, they continue to yield flame of precisely the same strength. The cotton, or other materials, of which the wick is composed, is not scorched or consumed in the least, because the spirit with which it is constantly soaked is incapable of becoming hotter than 174°, Fahrenheit, which is considerably below the heat of boiling water. It is only the vapour that arises from it which is hotter, and this too only in its outer parts, that are most remote from the wick, and where only the combustion is going on, in consequence of communication and contact with the air. At the same time, as the alcohol is totally volatile, it does not leave any fixed matter which, by being accumulated on the wick, might render it foul and fill up its pores. The wick, therefore, continues to imbibe the spirit as freely, after some time, as it did at the first. The second kind of fuel mentioned, peat, is so spongy that, compared with the more solid fuels, it is unfit to be employed for producing very strong heats. It is too bulky for this: we cannot put into a furnace, at a time, a quantity that corresponds with the quick consumption that must necessarily go on when the heat is violent. However, when we desire to produce and keep up, by means of cheap fuel, an extremely mild gentle heat, we can hardly use any thing better than peat. But it is best to have it previously charred, that is, scorched, or burnt to black coal. The next fuel, in order, or the charcoal of wood, is the chief fuel used by the chemists abroad, and has many good properties. It kindles quickly, emits few watery or other vapours while burning, and when consumed leaves few ashes, and those very light. They are, therefore, easily blown away, so that the fire continues open, or pervious to the current of air which must pass through it to keep it burning. This sort of fuel, too, is capable of producing as intense a heat as can be obtained by any; but in those violent heats it is quickly consumed, and needs to be frequently supplied. Fossil-coals charred, called cinders, or coaks, have, in many respects, the same properties as charcoal of wood; as kindling more readily in furnaces than when they are not charred, and not emitting watery, or other gross smoke, while they burn. This sort of charcoal is even greatly superior to the other in some properties. The fifth and last kind of fuel is wood, or fossil-coals, in their crude state, which it is proper to distinguish from the charcoals of the same substances. The difference consists in their giving a copious and bright flame, when plenty of air is admitted to them, in consequence of which they must be considered as fuels very different from charcoal, and adapted to different purposes. See FLAME. The fuel generally used for common purposes in Britain is pit-coal: it is attended with considerable expence, which is not a little increased by the enormous waste, arising from the injudicious manner in which the fires are usually managed. Hence different compositions have been proposed, among which that contrived by Count Rumford more particularly claims our attention. It is known by the name of kindling-balls, which are composed of equal parts of coal, charcoal, and clay; the two former are reduced to a fine powder, well mixed and kneaded together with the clay moistened with water; and then formed into balls of the size of hens eggs, which are thoroughly dried. These balls may be made so inflammable as instantly to take fire from the smallest spark, after they have been dipped in a strong solution of nitre, and then dried. With those three ingredients, Count Rumford is of opinion, that a certain proportion of straw, cut very small, or of chaff, or even of sawdust, may be advantageously incorporated. The excellence of the fuel thus prepared consists in its economy and cleanliness; circumstances of the utmost importance, and which are calculated greatly to improve the apartments of the opulent.

FUENHOA, a city of China, in the province of Pe-tcheli, celebrated for its extent and the number of its inhabitants, as well as for the beauty of its streets and triumphal arches.

FUEN-TCHEOU, or **FUEN-TCHEOU-FOU**, a city of China, of the first rank, in the province of Chansi, on the Fuen, 280 miles S. W. of Pekin.

FUENTE GINALDO, a town of Spain, in Estremadura, 16 miles N. W. of Coria.

FUERTEVENTURA, or **FORTAVENTURA**, one of the Canary Islands, consisting of two peninsulas, joined by an isthmus 12 miles broad.

FUESSEN, or **FUSSEN**, a town of Suabia, in the bishopric of Augsburg, on the Lech, 47 miles E. of Augsburg.

FUGALIA, in Roman antiquity, a feast supposed by some to be the same with the Regifugium, held on the 24th of February, in memory of the expulsion of the kings, and the abolition of monarchy.

FUGAM FECIT, is where it is found by inquisition that a person fled for treason or felony; as to which it is agreed, that whosoever a person found guilty by such inquest, either as a principal or as an accessory before the fact, is found also to have fled for the same, he forfeits his goods absolutely, and the issues of his lands, till he is pardoned or acquitted. But wherever the indictment against a man is insufficient, the finding a fugam fecit will not hurt him; and that in all cases the particulars of the goods found to be forfeited may be traversed. 2 Haw. 450.

FUGITIVE, a person obliged to fly his country, or remove from a place where he had some abode, or establishment, on account of his crimes, debts, or other occasions.

FUGITIVE PRECES, in literature, essays, poems, or other short compositions, inserted in newspapers, magazines, or the like periodical publications; or printed on loose sheets or half-sheets; so called, because easily lost and soon forgot.

FUGITIVE'S GOODS, are the proper goods of him that flies, which after the flight lawfully found, belong to the king or lord of the manor. 5 Co. Rep. 109. See FELON'S GOODS.

FUGUE, [from *fuga*, a flight,] in music, a composition either vocal or instrumental, or both, in which one part leads off some determined succession of notes called the subject, which, after being answered in the fifth and eighth by the other parts, is interspersed through the movement, and distributed amid all the parts in a desultory manner, at the pleasure of the composer; sometimes accompanied by other adventitious matter, and sometimes by itself. These are the principal rules of the fugue; of which some are peculiar to itself; and others common to it with what the French call imitation. 1. The subject proceeds from the tonic to the dominant, or from the dominant to the tonic, in rising or descending. 2. Every fugue finds its response in the part immediately following that which commenced. 3. That response ought to resume the subject in the interval of a fourth or fifth above or below the key, and to pursue it as exactly as the laws of harmony will admit; proceeding from the dominant to the tonic when the subject is introduced from the tonic to the dominant, and moving in a contrary direction when the subject is introduced from the dominant to the tonic. One part may likewise resume the same subject in the octave or unison of the preceding; but in that case, it is a repetition rather than a real response. 4. As the octave is divided into two unequal parts, of which the one contains four gradations descending from the tonic to the dominant, and the other only three in continuing the ascent from the dominant to the tonic; this renders it necessary to have some regard to this change in the expression of the subject, and to make some alterations in the response, that we may not quit the cords that are essential to the mode. It is a different case when the composer intends to alter the modulation; for there the exactness of the response itself, when taken in a different tone, produces the alteration proper for this change. 5. The fugue should be planned in such a manner, that the response may commence before the close of the best air, so that both the one and the other may be in part heard at the same time: that, by this anticipation, the subject may be as it were connected with itself, and that the art of the composer may discover itself in this concourse. It is absolute mockery, instead of a fugue, to impose upon the hearers the same air, merely transposed from one key to another, without any other restraint than an accompaniment afterwards formed at pleasure. This deserves at best no better name than what the French call imitation. See IMITATION. Besides these rules, which are fundamental, there are others, which, though prescribed by taste alone, are not less essential. Fugues, in general, render music more noisy than agreeable; for this reason they are most agreeable in the chorus. There are distinct descriptions of fugues; the simple fugue, the double fugue, and the counter fugue. The

FUGUE,

FUGUE, SIMPLE, contains but one subject, is the least elaborate in its construction, and the easiest in its composition.

FUGUE, DOUBLE, consists of two subjects, occasionally intermingled and moving together; and the

FUGUE, COUNTER, is that fugue in which the subjects move in a direction contrary to each other. In all the different species of fugues, the parts fly, or run after each other, and hence the derivation of the general name fugue.

FUIRENA, in botany, a genus of the triandria monogynia class and order; natural order, Calamariæ. Ament imbricate, with awned scales; calyx none; corolla with three petal-shaped obovate glumes, ending in a tendril. One species, *F. paniculata*, a lofty grass of Surinam and Jamaica.

FULCRUM, in mechanics, the prop or support by which a lever is sustained. See **MECHANICS**.

FULCRUM, in botany. See **BOTANY**.

FULDA, or **FULDE**, a late episcopal principality of Germany, in the Upper Rhine.

FULDA, a river which joins the Werra at Minden; they form the Weser.

FULDA, or **FULDE**, the capital of the above late principality, seated on the river, 55 miles S. of Cassel.

FULGORA, in zoology, a genus of the class insecta, order hemiptera. Head hollow, inflated, extended forward; antennæ short, seated beneath the eyes, consisting of two joints, the outer one larger and globular; snout elongated, inflected, four-jointed; legs formed for walking. There are about 25 species, almost all inhabitants of hot climates. *F. Europæa*, has the body green; wings hyaline, reticulate; front conic. This is a small insect, and destitute of the shining quality, by which foreign species are distinguished. *F. lanternaria*, or Peruvian lantern-fly is a very curious and beautiful insect of Surinam, and other parts of South America, which diffuses a very brilliant phosphoric splendor in the dark from its head.

FULICA, in ornithology, the **GALLINULE** and **COOT**, a genus of birds of the order grallæ. Generic character: bill strong, thick, and sloping to the point; upper mandible arched over the lower at the edge, and reaching far up the forehead; nostrils nearly oval; front bald; toes four, long, and furnished with broad scalloped membranes. There are twenty-five species.

F. ATRA-COOT, is distinguished from the gallinule by pinnated feet. It inhabits Europe, Asia, and America, and is about the size of a small fowl. It feeds on small fish and water-insects, is common in some parts of this country at all seasons, but in the breeding season is seen almost always in pairs, about the borders of ponds and lakes well fringed with rushes, of which it mats itself a large nest, said to be often observed floating on the water. These birds are devoured when young by the buzzards, which infest their haunts, and prevent them from that great multiplication which might be otherwise expected. See Plate LVIII.

F. ATERRIMA, the **GREATER COOT**, is of a larger size than the common coot, and its plumage is blacker. This species is found in Lancashire and Scotland; but is more plentiful on the Continent, being found in Russia and the W. of Siberia very common; also at Sologne and the neighbouring parts, where they call it judelie. Its flesh is much esteemed.

FULIGO, in botany, a genus of the cryptogamia fungi class and order. Fungus with a cellular fibrous bark; the fibres penetrating in a reticulate manner through the seminal mass.

FULLER, THOMAS, D. D. a learned English historian and divine, born at Alwinkle, Northamptonshire, in 1608. He studied at Cambridge, and was chosen minister of St. Bennet's there. Upon the restoration, he was appointed chaplain extraordinary to Charles II. and created D. D. His memory was so amazingly tenacious, that he could repeat a sermon, verbatim, if once he heard it. He once undertook, in passing to and from Temple-bar to the Poultry, to tell at his return every sign as it stood in order, on both sides of the way, repeating them either backwards or forwards: and this task he actually performed. He wrote, 1. *A History of the Holy War*. 2. *The Church History of Britain*, in folio. 3. *Andronicus, or the Unfortunate Politician*, in 8vo. 4. *A Pisgah sight of Palestine*. 5. *A History of English Worthies*; and other works. He died in August 1661. He was fond of punning; but once attempting to play off a joke upon a gentleman named Sparrowhawk, he met with a retort in his own stile.

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"What is the difference, said the Dr. (who was very corpulent) between an owl and a sparrowhawk?" "It is, replied the other, fuller in the head, fuller in the body, and fuller all over." Thus he retorted the owl upon him completely.

FULLER, a workman employed in the woollen manufactories, to mill, or scour, cloths, serges, and other stuffs, in order to render them more thick, compact, and durable.

FULLER'S EARTH, or **TERRA FULLONICA**, in natural history, a soft, greyish, brown, dense, and heavy marle: when dry, it is of a greyish, ash-coloured brown, in all degrees from very pale to almost black, and it has generally something of a greenish cast: it is very hard and firm, of a compact texture, of a rough and somewhat dusty surface, that adheres slightly to the tongue: it is very soft to the touch, not staining the hands, nor breaking easily between the fingers: it has a little harshness between the teeth, and melts freely in the mouth: thrown into the water, it makes no ebullition, or hissing, but swells gradually in bulk, and falls into a fine soft powder. It makes no effervescence with aqua-fortis. The greatest quantity, and of the finest quality, is dug in the pits at Wavedon, near Woburn in Bedfordshire. The strata in these pits lie thus: From the surface to the depth of six feet, there are several layers of sand, all reddish, but some lighter-coloured than others. Under these there is a thin stratum of a sand-stone, which they break through, and then they find the fuller's earth. A specimen from Hampshire, analysed by Bergman, contained.

51.8 silica,
25.0 alumina,
3.3 lime,
3.7 oxyd of iron,
0.7 magnesia,
15.5 water.

100.0

This earth is used by fullers to take grease out of their cloth before they apply soap. It is essential to fuller's earth that the particles of silica should be very fine, otherwise they would cut the cloth. Any clay possessed of this property may be considered as fuller's earth; for it is the alumina alone which acts upon the cloth, on account of its strong affinity for greasy substances.

FULLER'S THISTLE, **FULLER'S WEED**, or **TEAZLE**, in botany. See **DIPSACUS**.

FULLERTON POINT, a cape on the W. coast of Antigua, Lon. 61. 35. W. Lat. 17. 13. N.

FULLING, is the art of cleansing, scouring, and pressing cloths, stuffs, and stockings; to render them stronger, closer, and firmer: it is also sometimes called milling. The fulling of cloths, &c. is performed by a kind of water-mill, thence called a fulling, or scouring-mill. Without describing the mechanism of this manufacturing process, we cannot omit to remark that urine is sometimes employed, as well as soap and fuller's earth, to prepare the stuffs for receiving the first impressions of the pester. They are first steeped in urine, then in a solution of fuller's earth and water, and lastly in soap, dissolved in hot water. Soap alone would fully answer this purpose, but it is too expensive, especially as, according to the present mode of dressing, fuller's earth is of equal efficacy. Urine is certainly prejudicial, and ought entirely to be abandoned here, both on account of its disagreeable smell, and its sharp, saline properties, which frequently render the cloths dry and harsh. The scouring of cloth, however, is not the only object in fulling it; the alternate pressure communicated by the pestles, or stampers, to the stuffs, occasions in its advanced stages an effect analogous to that produced upon hats in the operation of felting. Thus, the fibres of wool which compose one of the threads, whether of the warp or the woof, assume a progressive motion, first introducing themselves among those of the contiguous threads, then into those which follow, so that gradually all the threads, both of the warp and the woof, become completely felted. The cloth, after having by this process become contracted, and shortened in its dimensions, partakes in a great measure of the nature of felt: hence it may be cut without being liable to unravel; and consequently there is no necessity to hem its edges. Farther, as the threads of both the warp and woof are more intimately combined, the web, which acquires a greater degree of thickness, likewise forms a warmer clothing. The process of fulling stockings, caps, &c. is performed in a manner somewhat different.

ferent from that in mills; namely, either with the feet or hands; or a kind of rack or wooden machine, armed with teeth of the same materials; or, which is still better, horses' or bullocks' teeth may be substituted. In this operation, urine, green soap, white soap, and fuller's earth, are employed; but the first of these ingredients, for the reasons before stated, is here also detrimental to the texture. Stockings manufactured in a loom, should be filled with soap alone; but, for dressing such as have been knit, earth may likewise be added. Lastly, knit-worsted is by this process rendered less subject to run, if a stitch should happen to drop in the stockings.

FULMINATION, in the Romish canon law, a sentence of a bishop, official, or other ecclesiastic, appointed by the pope, by which it is decreed that some bull sent from the pope shall be executed.

FULMINATION, in chemistry, differs from detonation only in degree, they are both the effects of rapid decomposition accompanied by a loud noise, either with or without flame. See **GOLD**, **MERCURY**, **POWDER**, and **SILVER**.

FUMARIA, in botany, **ENGLISH FUMITORY**, a genus of the diadelphia hexandria class and order. Natural order, Corydalis. Calyx two-leaved; corolla ringent; filaments two, membranaceous, with three anthers on each. There are fifteen species.

F. OFFICINALIS, or **COMMON FUMITORY**, grows naturally in shady cultivated grounds, and produces spikes of purplish flowers in May and June. It is very juicy, of a bitter taste, without any remarkable smell. Its medical effects are, to strengthen the tone of the bowels, gently loosen the belly, and promote the natural secretions.

FUMIGATION, in medicine, denotes the artificial impregnation of the atmosphere, with the fumes or smoke of any vegetable or aromatic substance. By the subtle fumes produced by burning certain substances, much benefit or prejudice may be produced, according to the nature of the case, and the constitution on which the effects are to be exerted; as is evident from the palsies produced among metal-gilders, workers in lead-mines, &c. and also from the benefits received in many cases when the air is impregnated with salutary materials. Catarrhs and colds, for instance, are relieved by fumes received with the breath; by the same means, expectoration is assisted in the asthma; and even ulcers in the lungs have been relieved by this method.

FUNAMBULUS, among the Romans, was what we call a rope-dancer, and the Greeks *schœnobates*.

FUNARIA, in botany, a genus of the cryptogamia musci class and order. Capsule obovate; fringe double; outer, of sixteen oblique wedge-form teeth, cohering at the tips; inner, a membrane divided into sixteen flat teeth; veil square. There are three species.

FUNCHAL, or **FUNCHIAL**, the capital of Madeira, a large, strong, handsome, and populous town, with two castles, and several fine churches. Lon. 16. 49. W. Lat. 32. 32. N.

FUNCTION, in algebra, denotes any compound quantity; and when one of the component quantities is variable, it is said to be a variable function. Functions are formed either by addition, subtraction, multiplication, division, involution, or evolution; as also by the resolution of equations. But besides these, which are called algebraical functions, there are others called transcendental, arising from the management of exponents, logarithms, &c. For a farther account of functions, the reader may consult Bernoulli, *Oper. T. 3*, also Euler's *Analys. Infinitor*.

FUNCTION, in the animal œconomy, is by physicians divided into vital, animal, and natural.

1. **FUNCTIONS, ANIMAL**, include the senses, memory, judgment, and voluntary motions; without any or all of which an animal may live, but not very comfortably. The animal functions perform the motion of the body by the action of the muscles; and this action consists chiefly in the shortening the fleshy fibres, which is called contraction, the principal agents of which are the arteries and nerves distributed in the fleshy fibres. All parts of the body have their own functions, or actions, peculiar to themselves. Life consists in the exercise of these functions, and health in the free and ready exercise of them.

2. **FUNCTIONS, NATURAL**, are such as it cannot subsist any considerable time without; as the digestion of the aliment, and its conversion into blood.

3. **FUNCTIONS, VITAL**, are those necessary to life, and without which the individual cannot subsist; as the motion of the heart, lungs, &c.

FUNDS, PUBLIC, the taxes or other public revenues appropriated to the payment of the interest or principal of the national debt. When the practice was first adopted of borrowing money of individuals for defraying the extraordinary expences of the state, the produce of some particular tax was generally appropriated as the fund out of which the principal and interest of the debt was to be discharged. The possession of the acknowledgement given by government for the money advanced, establishing a right to receive the payments from the fund originally agreed upon, the sale of these securities was considered as a sale of the claim upon the fund; and as the acknowledgements given were of different kinds, the general appellation of the provision on which they rested was found more convenient for purposes of business: thus the sale and purchase of the government securities was commonly called the sale or purchase of the public funds, till at length the expression has so far varied from its original signification, that instead of meaning the revenue out of which public debts or the interest of them is payable, it denominates the capital of such debts, in which sense it is generally used. Hence the term is now used to signify those large sums which have been lent to government, and constitute the national debt; and for which the lenders, or their assignees, receive interest from revenues allotted for that purpose. The term stock is used in the same sense, and is also applied to the sums which form the capital of the bank of England, the East India and South Sea companies; the proprietors of which are entitled to a share of the profits of the respective companies. The practice of funding was introduced by the Venetians and Genoese in the sixteenth century, and has been adopted since by most of the nations in Europe. Princes had often borrowed money, in former times, to supply their exigencies, and sometimes mortgaged their territories in security: but these loans were generally extorted, and their payment was always precarious; for it depended on the good faith and success of the borrower, and never became a regular burden on posterity. The origin of funds is derived from the peculiar manners and circumstances of modern Europe. Since the invention of gunpowder, and the progress of commerce, the military occupation has become a distinct employment in the hands of mercenaries; the apparatus of war is attended with more expence; and the decision of national quarrels has often been determined by command of money rather than by national bravery. Ambitious princes have therefore borrowed money, to carry on their projects with more vigour. Weaker states have been compelled, in self-defence, to apply to the same resource; the wealth introduced by commerce has afforded the means; the regularity of administration, established in consequence of the progress of civilization, has increased the confidence of individuals in the public security; the complicated system of modern policy has extended the scenes of war, and prolonged their duration; and the colonies established by the mercantile nations have rendered them vulnerable in more points, and increased the expence of defending them. When a greater sum has been required for the annual expence, than could easily be supplied by annual taxes, the government have proposed terms, to their own subjects, or foreigners, for obtaining an advance of money, by mortgaging the revenue of future years for their indemnification. This mortgage may either be for a limited period, or perpetual. If the sum allotted annually for the benefit of those who advance the money, be considerably greater than the interests of the sums advanced, they may agree to accept of such allowance, for a limited time, as a full equivalent. Thus, they may either agree for the casual produce of the revenue assigned; or a fixed annuity for a greater or less number of years; or a life-annuity to themselves or nominees; or an annuity for two or more lives; or an annuity, with the benefit of survivorship, called a tontine, in which scheme, the whole sum to which the original annuitants were entitled continues to be distributed among the survivors. The establishment of the funds was introduced in Britain at the Revolution; and has since been gradually enlarged, and carried to an amazing extent. The various methods above-mentioned have been used in their turns, but perpetual annuities have been granted for the greatest part: and, even when the money was originally advanced on other conditions, the lenders have been sometimes induced,

induced, by subsequent offers, to accept of perpetual annuities, instead of the former terms. The debt, for which perpetual annuities are granted, is called the redeemable debt, and the other is called the irredeemable debt. Although the debts thus contracted by government are seldom paid for a long term of years; yet any creditor of the public may obtain money for what is due to him when he pleases, by transferring his property in the funds to another; and regular methods are appointed for transacting these transfers in an easy manner. By these means, the stocks become a kind of circulating capital; and have the same effect, in some respects, as the circulating money in the nation. When a stockholder transfers his share, he may sometimes be able to obtain a greater price than the original value, and at other times be obliged to accept of a less one. The value of the funds depends on the proportion between the interest they bear, and the benefit which may be obtained by applying the money to other purposes. It is influenced by the plenty or scarcity of money, and by the greatness or smallness of the public debt; and it is impaired by any event which threatens the safety, or weakens the credit, of the government. The business of stock-jobbing is founded on the variation of the prices of stock. Persons possessed of real property may buy or sell stock, according to their notion that the value is likely to rise or fall, in expectation of making profit by the difference of price. And a practice has taken place among persons who often possess no property in the funds, to contract for the sale of stock against a future day, at a price now agreed on. For instance: A agrees to sell B 1000*l.* of bank-stock, to be transferred, in twenty days, for 1200*l.* A has, in fact, no such stock; but, if the price of bank-stock, on the day appointed for the transfer, should be only 118 per cent, A may purchase as much as will enable him to fulfil his bargain for 1180*l.* and thus he gains 20*l.* by the transaction; on the contrary, if the price of bank-stock be 125 per cent, he will lose 50*l.* The business is generally settled without any actual purchase or transfer of stock, by A paying to B, or receiving from him, the difference between the current price of the stock, on the day appointed, and the price bargained for. This practice, which is really nothing but a wager concerning the price of stock, is contrary to law; yet it is carried on to a great extent. In the language of Exchange-alley, where matters of this kind are transacted, the buyer is called a bull, and the seller a bear. As neither party can be compelled by law to implement these bargains, their sense of honour, and the disgrace and loss of future credit, which attend a breach of contract, are the principles by which the business is supported. When a person declines to pay his loss, he is called a lame duck, and dare never afterwards appear in the alley. This opprobrious appellation, however, is not bestowed on those whose failure is owing to want of ability, providing they make the same surrender of their property voluntarily, which the law would have exacted if the debt had been entitled to its sanction. The interest or dividend on the stock is paid half-yearly; and the purchaser has the benefit of the interest due on the stock he buys, from the last term to the time of purchase. The principal funds established at different periods are, the Aggregate Fund, the South Sea Fund, the General Fund, the Sinking Fund, and the Consolidated Fund. The Aggregate Fund was established in the year 1715, and had this name given to it, because it consisted of a great variety of taxes and surpluses of taxes, which were in that year consolidated, and given as the security for discharging the interest and principal of all the Exchequer bills then outstanding, and of some other public debts; and likewise for the payment of 120,000*l.* per annum to the civil list. The South Sea Fund was established in 1716, and was so called because appropriated to pay the interest and allowance for management on the capital of the South Sea Company. The General Fund was also established in 1716, by making perpetual various duties which had been granted for the term of thirty-two years, and consolidating them with some other duties into one fund. It was appropriated chiefly to the payment of the interest on various sums raised by lotteries during the reign of Queen Anne. The Sinking Fund consisted of the surpluses of the three funds just-mentioned, whenever the produce of the taxes composing them should be greater than the charges upon them. The establishment of these funds formed part of a plan for a general reduction of the interest payable on the public debts, and this being effected, the charge on each of the three funds was of course lessened con-

siderably, and the future overplus was directed to be carried into a fourth fund, to which was given the name of the Sinking Fund, because appropriated to the purpose of redeeming or sinking the public debts. The act of parliament by which this fund was established, expressly ordained that it should be applied to the discharge of the public debts, and "to or for none other use, intent, or purpose whatsoever;" yet in the course of a few years many encroachments were made upon it, and ultimately it became a mere nominal distinction, the whole produce of it being usually taken towards the supplies of the current year. The Consolidated Fund was established in consequence of a new arrangement of the public accounts in the year 1786, when the funds above-mentioned were abolished, and the whole of the public revenue, (except the annual grants) included under this general head. Out of this fund are paid the interest and expences of management of all the public debts, the interest on Exchequer bills, the civil list, pensions to the royal family and others, salaries and allowances to various public officers, and some miscellaneous annual expences. The surplus of the produce of the fund, after satisfying all these charges, is annually granted by parliament as part of the ways and means for raising the supplies voted. The debts bearing a certain rate of interest payable till the principal shall be redeemed, are denominated, in the language of finance, perpetual annuities, or redeemable annuities; but, in the common course of business, they are called funds or stocks: a small part of the public debts consist of annuities for a certain term of years, commonly called long or short annuities: there are also some life and tontine annuities still existing; but the whole of the terminable annuities bears a very small proportion to the permanent debts. The perpetual annuities are distinguished according to the rate of interest they pay, or the time or purpose of their creation; and when by a new loan government contracts an additional debt, bearing a certain fixed interest, the capital thus created is added to the amount of that part of the public debt which bears the same rate of interest, and the produce of the taxes imposed for payment of the interest of such new debt being carried to the fund established for paying the interest of the former capital, the old and new debts are consolidated, and the whole interest made payable out of the general produce of the fund; hence we have three or four per cent. consolidated annuities, according to the rate of interest payable on the capital. The interest on all the public debts was formerly paid at the Exchequer; but the bank being found a much more convenient place for this purpose, nearly the whole is now payable there, the company receiving a certain allowance from government for managing all business relative to the public funds. The different denominations of the funds transferable at the Bank of England, with the days on which the transfers are made, and the times when the interest or dividend becomes due, are at present as follows:

Funds.	Transfer days	Divid. due.
Consolid. 3 per C. An....	Tues. Wed. Th. and Fr.	Jan. 5, and July 5.
Three per C. An. 1726....	Tues. and Thurs.....	
Navy 5 per C. An.....	Mon. Wed. and Fr.....	
Bank Stock.....	Tues. Th. and Fr.....	April 5, and Oct. 10.
5 per C. An. 1797, 1802....	Tues. Th. and Fr.....	
4 per C. Consolid. An....	Tues. Th. and Sat.....	
Reduced 3 per C. An....	Tues. Wed. Th. and Fr.	May 1, and Nov. 1.
Long Annuities.....	Mon. Wed. and Sat.....	
Imperial 3 per C. An....	Mon. Wed. and Fr.....	
Imperial An. 25 years....	Tues. Th. and Sat.....	March 25, and Sept. 25.
Irish 5 per C. An.....	Tues. Th. and Sat.....	
Irish Terminable An....	Tues. Th. and Sat.....	

Transferable at the South Sea House.

South Sea Stock.....	Mon. Wed. and Fr....	Jan. 5, and July 5.
New South Sea An.....	Tues Th. and Sat.....	
Three per Cent. An.....	Tues. and Thurs.....	Jan. 5, and July 5.
Old South Sea An.....	Mon. Wed. and Fr....	

As the prices of the several funds are continually fluctuating, and there is frequently a considerable difference in the interest produced by investing money in different funds, the following table of the prices which each fund should be at to produce an equal

equal interest, will be found very useful to persons investing their money in these securities.

TABLE,

Shewing the comparative Value per Cent. of the several Public Funds, and the Annual Interest produced by 100l. invested at different Prices.

3 per Cent.	4 per Cent.	5 per Cent.	Bank-Stock, 7 per c.	Ind. St. 10½ per Cent.	Annual Interest.
45	60	75	105	157½	6 13 4
45¾	61	76¼	106¾	160¾	6 11 1
46½	62	77½	108½	162¾	6 9 0
47¼	63	78¾	110¾	165¾	6 6 11
48	64	80	112	168	6 5 0
48¾	65	81¼	113¾	170¾	6 3 0
49½	66	82½	115½	173½	6 1 2
50¼	67	83¾	117¾	175¾	5 19 4
51	68	85	119	178	5 17 7
51¾	69	86¼	120¾	181¾	5 15 11
52½	70	87½	122½	183½	5 14 3
53¼	71	88¾	124¾	186¾	5 12 8
54	72	90	126	189	5 11 1
54¾	73	91¼	127¾	191¾	5 9 0
55½	74	92½	129½	194½	5 8 1
56¼	75	93¾	131¾	196¾	5 6 7
57	76	95	133	199	5 5 3
57¾	77	96¼	134¾	202¾	5 3 10
58½	78	97½	136½	204½	5 2 6
59¼	79	98¾	138¾	207¾	5 1 3
60	80	100	140	210	5 0 0
60¾	81	101¼	141¾	212¾	4 18 9
61½	82	102½	143½	215½	4 17 6
62¼	83	103¾	145¾	217¾	4 16 4
63	84	105	147	220	4 15 2
63¾	85	106¼	148¾	223¾	4 14 0
64½	86	107½	150½	225½	4 13 0
65¼	87	108¾	152¾	228¾	4 11 11
66	88	110	154	231	4 10 10
66¾	89	111¼	155¾	233¾	4 9 10
67½	90	112½	157½	236½	4 8 10
68¼	91	113¾	159¾	238¾	4 7 10
69	92	115	161	241	4 6 11
69¾	93	116¼	162¾	244¾	4 6 0
70½	94	117½	164½	246½	4 5 1
71¼	95	118¾	166¾	249¾	4 4 2
72	96	120	168	252	4 3 3
72¾	97	121¼	169¾	254¾	4 2 5
73½	98	122½	171½	257½	4 1 7
74¼	99	123¾	173¾	259¾	4 0 9
75	100	125	175	262½	4 0 0

Tables of all the intermediate prices, and for comparing the value of the terminable annuities with the other funds are given in Fairman's Guide to Purchasers in the Public Funds. Some useful information respecting the funds, and the mode of transacting business at the bank and stock exchange, will also be found in Mortimer's "Every Man his Own Broker."

FUNDAMENT, in anatomy, the lowest part of the intestinum rectum, called by anatomists the anus. See **ANATOMY**.

FUNDAMENTAL NOTE, in music, the principal note in a song, or composition, to which all the rest are in some measure adapted, and by which they are swayed: it is otherwise called the key to the song.

FUNDI, in ancient geography, a town of Latium, on the Via Appia, near Cajeta; now called Fundi.

FUNDY, a bay of North America, between New England and Nova Scotia, remarkable for its tides, which rise to the height of fifty or sixty feet, and flow so rapidly as to overtake animals which feed upon the shore. It has a good fishery.

FUNEN, **FIONIA**, or **FYEN**, a considerable island of Denmark, in the Baltic sea, separated from Jutland by a strait called the Lesser Belt, and from the island of Zealand by the Great Belt. It is 340 miles in circuit; is fertile in wheat and barley, and

abounds in grain, cattle, horses, game, and fish. Odensee is the capital. Lon. from 9. 40. to 10. 50. E. Lat. 55. 7. to 55. 42. N.

FUNERAL RITES, ceremonies accompanying the interment or burial of any person. See **BURIAL**. These rites differed among the ancients, according to the different genius and religion of each country. The Egyptians, among the rest of their funeral rites, embalmed their dead. Among the ancient Greeks it was usual sometimes, before the interment, to put a piece of money into the mouth of the deceased, which was thought to be Charon's fare for wafting the departed soul over the infernal river. This ceremony was not used in those countries which were supposed to be situated in the neighbourhood of the infernal regions, and to lead thither by a ready and direct road. The corpse was likewise furnished with a cake composed of flour, honey, &c. which was designed to oppose the fury of Cerberus, the door-keeper of hell, and to procure the ghost a safe and quiet entrance. During the time the corpse continued in the house, there stood before the door a vessel of water, the design of which was, that those concerned about the body might purify themselves by washing; it being the opinion of the Greeks as well as of the Jews, that pollution was contracted by touching a dead body. The ceremonies by which they expressed their sorrow for the death of their friends were various; but it seems to have been a constant rule to recede as much as possible in habit and behaviour from their ordinary customs. For this reason they abstained from banquets and entertainments; they divested themselves of all ornaments; they tore, cut off, or shaved their hair, which they cast into the funeral-pile, to be consumed with the body of their deceased friend. Sometimes they threw themselves on the ground, and rolled in the dust, or covered their head with ashes; they beat their breasts, and even tore their flesh with their nails upon the loss of a person they much lamented. When persons of rank, such as public magistrates, or great generals, died, the whole city put on a face of mourning: all public meetings were intermitted; the schools, baths, shops, temples, and all places of concourse, were shut up. Interring or laying the dead in the ground, seems to have been the most ancient practice among the Greeks; though burning came afterwards to be generally used among them. It was customary to throw into the funeral-pile those garments the deceased usually wore. The pile was lighted by one of the dead person's nearest relations or friends, who made prayers and vows to the winds to assist the flames, that the body might quickly be reduced to ashes; and during the time the pile was burning, the dead person's friends stood by it, pouring libations of wine, and calling upon the deceased. When Numa reformed the religion of Rome, he ordered that the pontiffs should have the care of the funeral ceremonies; which, in most respects, were like those of the Greeks already described. The funeral-rites among the Hebrews, were solemn and magnificent: when any person was dead, his relations and friends rent their clothes; which custom is but faintly imitated by the modern Jews, who only cut off a bit of their garment, in token of affliction. It was usual to bend the dead person's thumb into the hand, and fasten it in that posture with a string; because the thumb then having the figure of the name of God, they thought the devil would not dare to approach it. When they came to the burying-place, they made a speech to the dead in the following terms: "Blessed be God, who has formed thee, fed thee, maintained thee, and taken away thy life. O dead! he knows your numbers, and shall one day restore your life, &c." Then they spoke the eulogium, or funeral-oration, of the deceased; after which they said a prayer, called the righteousness of judgment; then turning the face of the deceased towards heaven, they called out, "Go in peace." The ancient Christians testified their abhorrence of the Pagan custom of burning the dead; and always deposited the body entire in the ground: and it was usual to bestow the honour of embalming upon the martyrs, at least, if not upon others. They prepared the body for burial, by washing it with water, and dressing it in a funeral-attire. The exportation, or carrying forth of the body, was performed by near relations, or persons of such dignity as the circumstances of the deceased required. Psalmody, or singing of psalms, was the great ceremony used in all funeral-processions among the ancient Christians. In the Latin church, when a person is dead, they wash the body, and put a crucifix in its hand. At its feet stands a vessel full of holy water, and a sprinkler, that they who come in may sprinkle both themselves and the deceased. In the mean time some priest stands by the corpse, and prays for the

the deceased till it is laid in the earth. In the funeral-procession, the exorcist walks first, carrying the holy water; next the cross-bearer, afterwards the rest of the clergy, and last of all the officiating priest. They all sing the miserere, and some other psalms; and at the end of each psalm a requiem. We learn from Ale's ritual, that the faces of deceased laymen must be turned towards the altar, when they are placed in the church; and those of the clergy, towards the people. The corpse is placed in the church surrounded with lighted tapers: after the office for the dead, mass is said; then the officiating priest sprinkles the corpse thrice with holy water, and as often throws incense on it. The body being laid in the grave, the friends and relations of the deceased sprinkle the grave with holy water.

FUNERAL EXPENCES, in law, are allowed previous to all other debts and charges; but if the executor or administrator be extravagant, it is a species of devastation or waste of the substance of the deceased, and shall only be prejudicial to himself, and not to the creditors or legatees of the deceased. But, in strictness, no funeral-expences are allowable against a creditor, except for the shrouds, coffin, ringing the bell, parson, clerk, grave-digger, and bearer's fees, but not for pall or ornaments.

FUNGI, [from *αμύγος*, *fungus*.] in botany, the fourth order of the twenty-fourth class of vegetables, in the Linnaean system; comprehending all those which are of the mushroom kind, and which in Tournefort's constitute the second, third, fourth, fifth, sixth, seventh, and eighth, genera of the first section in the class seventeen. This order contains ten genera. See **AGARICUS**, **BOLLETUS**, **CLAVARIA**, **LYCOPERDON**, &c. and **BOTANY**.

FUNGI, an order of plants in the *Fragmenta Methodi Naturalis* of Linnaeus.

FUNGITÆ, in natural history, a kind of fossile coral, of a conic figure, though sometimes flattened and striated longitudinally.

FUR, or **FURR**, in commerce, signifies the skins of wild beasts, dressed in alum with the hair on; and used as a part of dress, by princes, magistrates, and others. The kinds most in use are those of the ermine, sable, castor, hair, coney, &c. See **CASTOR**, **CAVIA**, **LEPUS**, **MUSTELA**, &c. It was not till the later ages that the furs of beasts became an article of luxury. The refined nations of antiquity never made use of them; those alone who were stigmatized as barbarians were clothed in the skins of animals. Those at present used are imported chiefly from North America, and Russia.

FURCA, in antiquity, a piece of timber resembling a fork, used by the Romans as an instrument of punishment.

FURCHE, in heraldry, a cross forked at the ends.

FURIA, in natural history, a genus of the class and order *vermes intestina*, having a body linear, equal, filiform, and ciliate, each side with a single row of reflected prickles, pressed close to the body; one species only is mentioned by Gmelin, viz. the *F. infernalis*, which inhabits the vast marshy plains of Bothnia and Finland, where it crawls up shrubs and sedge-grass, and being carried forwards by the wind, penetrates suddenly into the exposed parts of men and cattle, where it quickly buries itself under the skin, leaving a black point where it had entered, which is frequently succeeded by excruciating pains, inflammation, and even death. This fatal termination takes no length of time, a few hours, or a day, being sufficient for the whole process, unless the animal be almost instantly extracted by means of the knife, or a milk-poultrice.

FURIE, or **FURIES**, in Pagan mythology, goddesses, whose offices it was to punish the guilty after death. They sprang from the blood of the wound which Cælus received from his son Saturn. According to others, they were daughters of Earth, and conceived from the blood of Saturn. Some make them daughters of Acheron and Night, or Pluto and Proserpine. According to the more received opinions, they were three in number, Tisiphone, Megera, and Alecto, to which some add Nemesis. Plutarch mentions only one called Adrasta, daughter of Jupiter and Necessity. They were supposed to be the ministers of the vengeance of the gods; stern and inexorable; always employed in punishing the guilty upon earth, as well as in the infernal regions. They were also called Eumenides and Erinnydes. The Athenians styled them *εὐμενίδες*, venerable goddesses. Their worship was almost universal; and people dared not to mention their names, or fix their eyes upon their temples.

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FURLING, in the sea-language, signifies the wrapping up and binding any sail close to the yard; which is done by hawling upon the clew-lines, bunt-lines, &c. which wraps the sail close together, and being bound fast to the yard the sail is furled.

FURLONG, [*farlang*, Sax.] a long measure, equal to one-eighth of a mile, or forty poles. It is also used, in some law-books, for the eighth part of an acre.

FURLOUGH, in the military language, a licence granted by an officer to a soldier, to be absent for some time from his duty.

FURNACE, an utensil to raise and maintain a vehement fire in, whether of coal or wood. In order to apply fire, to manage and to direct it where it is to act, furnaces are convenient, and they are the most necessary and indispensable instruments to chemists. The materials of which they are constructed ought to be sufficiently proof against that degree of heat, which they are intended to be exposed to. Commonly they are built of bricks, made of sand and clay, or of cast-iron, or of iron plates, which, the better to be defended against the fire, are coated (in the inside) to the thickness of an inch with Windsor loam. According to Lewis, various kinds of fire-proof furnaces, for small experiments, may be prepared from black-lead crucibles. The burning of the fuel is kept up in the furnace either by a natural current of air, which is caused by the fire itself, and such a furnace is called an air wind-furnace; or it is done by compressed air, conveyed to the furnace by a large bellows, as in blast-furnaces. In all furnaces the principal things to be attended to are, 1. To confine the heat as much as possible to the matter to be operated upon; 2. To prevent its being dissipated; 3. To produce as much heat with as little fuel as possible; and, 4. To have it in our power to regulate the degree of heat according to our pleasure. To answer the first intention, the fire is usually confined in a chamber or cavity built on purpose for it, and furnished with a door for putting in the fuel; a grate for supporting it, and allowing air to pass through, as well as the ashes to drop down into a cavity provided on purpose, and called the ash-pit. Thus the heat produced by the inflamed fuel is confined by the sides of the furnace, and obliged to spend great part of its force upon the subject inclosed. The second intention, viz. to prevent the dissipation of the heat, is obtained by shutting the door of the furnace; taking care that the chimney be not too wide, and that the matter to be acted upon be placed in such a manner, that the fire may have its full effect upon it as it goes up the chimney. The third intention, which is the most important, is at the same time the most difficult to answer, and depends entirely upon the proportion between the spaces betwixt the furnace-bars and the wideness and height of the chimney. This will appear from a consideration of the principles on which the degrees of inflammation are produced. These depend entirely on the current of air which passes through the inflamed fuel. As soon as the fuel is set on fire, a certain degree of heat is produced; but unless a constant influx of air is admitted through the burning fuel, the fire is instantly extinguished; nor is it possible by any means to renew the inflammation until we admit a stream of fresh air among the fuel. When this is done, a rarefaction commences in the air of the fire-place of the furnace: so that it is no longer a counterpoise to the external air, and is therefore driven up the chimney by that which enters at the ash-pit. This again passing through the fuel, is rarefied in its turn; and giving place to fresh quantities, there is a constant flow of air up the chimney. In proportion to the rarefaction of the air in the fire-place, the greater is the heat. But by a certain construction of the furnace, the under part of the chimney will become almost as strongly heated as the fire-place; by which means, though a very strong current of air is forced through the fuel, yet as great part of the heat is spent on the chimney, where it can be of no use, the fuel is wasted in a very considerable degree. To avoid this, we have no other method than to contract the throat of the chimney occasionally by a sliding-plate; which when put quite in, shuts up the whole vent; and by being drawn out more or less, leaves a larger or smaller vent at pleasure. This plate ought to be quite drawn out till the fuel is thoroughly kindled, and the furnace well heated, so that a current of air may flow strongly through the fuel. After this the plate is to be put in a certain length, so as just to prevent the smoke from coming out at the door of the furnace. The rarefaction of the air in the fire-place will solicit a very considerable draught of air, which will keep the fuel

6.Q

fuel

fuel inflamed to a great degree; at the same time that the heat, being reflected from every part of the furnace excepting that narrow passage where the smoke goes up, becomes very intense. A large quantity of fuel may be put in at once, which will consume slowly, and thus require but little attention in comparison with those furnaces where no such precaution is used. The sliding-plate may be made of cast iron in those furnaces where no great heat is excited; but in others fire-clay would be more convenient. The contrivance, however, is scarce applicable to those furnaces where great quantities of metal are to be melted; and accordingly the waste of fuel there is immense. It is computed, that the iron works of Carron in Stirlingshire consume annually as many coals as would be sufficient for a city containing 790,000 inhabitants. The fourth intention, viz. that of regulating the heat, is accomplished by allowing only a certain quantity of air to pass through the fuel. For this purpose, says Dr. Black, it is necessary to have the command of the furnace below; the parts above being frequently filled with small quantities of soot. The best method of managing this is to shut up the door of the ash-hole perfectly close, and to have a set of round holes bearing a certain proportion to one another; and their areas being as 1, 2, 4, 8, 16, &c. Seven or eight of these ought to be made in the door of the ash-pit, which will give a sufficient command over the fire. When the fire is to be increased to the utmost, all the passages both above and below are to be thrown open, and the height of the vent augmented; which, by increasing the height of the column of rarefied air, increases also the motion of that through the fuel, and of consequence also the heat of the furnace. Macquer recommends another tube applied to the ash-pit, widest at the end farthest from the furnace, and tapering gradually towards it. The intention of this is to augment the current and velocity of the air, by its being made to pass from a wider into a narrower vent; but though this is no doubt true, the air will not ultimately move with greater velocity than if the tube were not there. It can only be useful therefore in cases where the furnace is placed in a small room, and the tube itself has a communication with the external air.

FURNACE, CUPELLING, or FURNACE, ESSAYING, described in Cramer's Art of Essayng. See Plate LXXVII. fig. 1. Make with iron plates a hollow quadrangular prism, 11 inches broad and nine inches high, *aa bb*, ending at top in a hollow quadrangular pyramid, *bb cc*, seven inches high, terminating in an aperture at top seven inches square. This prism must be closed at bottom with another iron plate, which serves as a basis or bottom to it, *aa*. 2. Near the bottom make a door, *e*, three inches high, and five inches broad, that leads to the ash-hole. 3. Above this door, and at the height of six inches from the basis, make another door, *f*, of the figure of a segment of a circle, four inches broad at its basis, and 3½ inches high in the middle. 4. Then fasten three iron plates on the fore-part of this furnace. Let the first of them, *gg*, 11 inches long, and half an inch high, be fastened, so that its lower edge shall rest against the bottom of the furnace, with three or four rivets: and in such a manner, that there may be between the upper edge of the said plate and the side of the furnace a groove so wide, as that the sliders of the lower door, *kk*, may be put into it, and freely move backwards and forwards therein; these must be made of a thicker iron plate. The second iron plate, *hh*, 11 inches long, three inches high, and perfectly parallel to the foregoing plate, must be fastened in the space between the two doors, in such manner, that both the upper and the lower edges of it may form a hollow groove with the side of the furnace. One of these grooves, which is turned downwards, serves to receive the upper edge of the sliders that shut the lower door, No. 2. The other, that turns upwards, is to receive the inferior edges of the sliders of the small door above, No. 3. The third plate, *ii*, which is like the first, must be riveted close above the upper door, in such manner that it may form a groove turning downwards, and contiguous to the upper edge of the upper door, No. 3. 5. To shut both doors, No. 2 and 3, adapt to each of them two sliders made of iron plates, that they may move within the above-mentioned grooves, *kk ll*. But the two sliders belonging to the upper door, No. 3, must have each a hole near the top; that is, one a small hole one-fifth part of an inch broad, and one inch and a half long, *m*; and the other a semicircular aperture, one inch high and two inches broad, *n*. Let, besides, each slider have a handle, that they may be laid hold of when they are to be removed. 6. Moreover,

let five round holes, one inch broad, be bored in the furnace; two of which must be made in the fore-part of the furnace, *oo*, two others in the back part; all at the height of five inches from the bottom, but 3½ inches distant from each side of the furnace; and, finally, a fifth hole, *p*, at the height of one inch above the upper edge of the upper door, *f*. 7. In short, let the inside of the furnace be armed with iron hooks, jutting out half an inch, and about three inches distant from each other, to fasten the lute with which the furnace is to be covered over within. 8. Let then an iron, moveable, hollow, quadrangular pyramid, *q*, three inches high, be adapted to the upper aperture, *d*, of the furnace, at the basis seven inches broad, ending upwards in a hollow tube, *r*, three inches in diameter, two inches high, almost cylindrical, though somewhat convergent at top. This prominent tube serves to support a funnel or flue, which is almost cylindrical, hollow, made of iron plates, and two feet high; and which, when a very strong fire is required, is put perpendicularly upon the shorter tube, in such a manner, that it enters close into it, one and a half or two inches deep, and may again be taken off at pleasure, when there is no need of so strong a fire. This pyramidal cover, *q*, must have two handles, *ss*, adapted to it, that it may be laid hold of, and thus be taken off or put on again: and that this, being put on the aperture, *d*, of the furnace, may not be easily thrown down, let an iron plate be riveted to the right and left upper edge of the furnace, *cc*, and be turned down towards the inside, so as to make a furrow open before and behind, into which the lateral edges of the cover may enter and be fastened, and at pleasure be moved backwards and forwards, whenever it must be put on or moved. 9. Let a square ledge, made of a thick iron plate, be fastened at the top of the upper edge of the lower door, *e*, to support the grate and the lute; but it must be made of two pieces, that it may be easily introduced into the cavity of the furnace. This assay-oven must afterwards be covered over on the inside with lute, as follows:—That the fire may be better confined, and that the iron may not be destroyed by growing red hot, the whole inside of the furnace must be covered over with lute, one finger or one finger and a half thick. The lute fit for this is described under Chemistry. But before using this lute, first put within the furnace small iron bars, equal in length to the diameter of the oven, quadrangular, prismatical, half an inch thick, having their extremities supported by a square iron ledge, and three-fourths of an inch distant from each other; and fasten them so, that their flat sides may be oblique with regard to the transverse section of the furnace, and that the two opposite angles may look one upwards and the other downwards: the bars must not be laid flat, but edgewise; by which situation the ashes of the fuel are prevented from being detained too long between the interstices of the iron bars, and from making an obstruction that would oppose the free draught of the air. The furnace being then covered over with lute, and dried up by a gentle heat, is at last fit for docimastical operations, and especially for such as must be performed in the assay-oven. When an operation is to be made in this furnace, let through the four lower holes above described, *oo*, before and behind, and directly opposite to each other, two iron bars one inch thick, and long enough that their extremities on every side may jut a little out of the holes. These serve to support the muffle and its bottom. Then introduce the muffle through the upper aperture of the furnace, *d*, and place it upon the above described iron bars, in such a manner that the open fore-side of it may be contiguous to the inward border of the upper door, *f*. The fuel is introduced through the top of the furnace, *d*; the cover of which, *q*, on this account, must be moveable, and not very heavy. The best fuel is charcoal made of the hardest wood, especially of beech, broken into small pieces of the bigness of an inch, wherewith the muffle must be covered over some inches high. Large pieces would not answer, because they could not fall through the narrow interstices, between the sides of the muffle and those of the furnace, and of course could not sufficiently surround the circumference of the muffle; so that there would be on every side places void of fuel, and the fire would be either not strong enough or unequal. But if, on the contrary, coals too small were used, then a great part would fall immediately through the interstices of the grate into the ash-hole; the smallest parts of them would turn too soon into ashes, and by increasing the heap of ashes, obstruct the free draught of the air, which is here very requisite. A perfect management of the fire is necessary in performing operations

rations in this furnace; therefore the chemical reader must give attention to what follows. If the door of the ash-hole, *e*, is quite open; and the sliders of the upper door, *f*, drawn towards each other, so as to touch one another in the middle of the door; and if, besides, the cover, *g*, and the funnel adapted to its tube, *r*, are upon the top, *d*, of the furnace; the fire will be then in the highest degree possible; though, in the mean time, it is hardly ever necessary to put the funnel on, except in a very cold season: but if, after having disposed the furnace in the manner just described, red burning coals are put into the open upper door, *f*, of it, the fire is still more increased thereby: however, this is very seldom or never necessary. When the upper door is shut with only that slider that has a narrow oblong hole in it, *m*, then the heat becomes a little less; but it diminishes still more when shut with the other slider, that has it in a semicircular hole, *n*, which is larger than that of the first slider: nay, the heat again is less when the funnel put at the top of the cover is taken away. Finally, the door of the ash-hole being either in part or totally shut, the heat is still diminished; because the draught of air so necessary to excite the fire is thereby hindered: but if, besides all these, the upper door be opened wide, then the cold air rushing into the muffle, cools the bodies put under it, that are to be changed, to a degree incompatible with any operation, as it will entirely hinder the boiling of the lead. If, during the operation, the fire begins to decay, or to grow unequal, it is a sign that there are places void of coals between the sides of the furnace and those of the muffle; therefore, in this case, the coals must be stirred on every side with an iron rod, introduced through the upper hole, *p*, of the furnace, that they may fall together, and thus act equally and in a proper manner. However, the effect does not always uniformly answer, even when the apparatus has been made with all the exactness mentioned. The cause of this difference has most commonly its origin in the various dispositions of the air: for as every fire is more excited, in proportion as the air, more condensed, and more quickly agitated, strikes the fuel more violently (which the effect of the bellows plainly shews;) it thence appears, that in warm and wet weather, when the atmosphere is light, the fire must be less efficacious in furnaces, that likewise, when several furnaces, situated near each other, are burning at the same time, the fire is in part suffocated, because the circum-ambient air is thereby rendered more rare and lighter. The same effect is produced by the sun, especially in summer, when it shines upon the place where the furnace is situated. The atmosphere, on the contrary, being heavier in cold dry weather, excites a very great fire. The heat of the fire acts the stronger upon the bodies to be changed, as the muffle put in the furnace is less; as it has more and larger segments cut out of it; as its sides are thinner; in short, as there are more vessels placed in the hinder part of it; or the contrary. In this case, when many of the conditions requisite for the exciting of fire are wanting, the artificer, with all his skill, will hardly be able to excite the fire to a sufficient degree, to perform operations well, in common assay-ovens, even though he uses bellows, and puts coals into the upper door of the furnace. For this reason, the grate ought to be put almost three inches below the muffle, lest the air, rushing through the ash-hole, should cool the bottom of the muffle, which happens in common assay-ovens; and again, that the smaller coals, almost already consumed, and the ashes, may more easily fall through the interstices of the grate, and the larger coals still fit to keep up the fire be retained. Lastly, the above-mentioned funnel is added, that the blowing of the fire being, by means of it, increased as much as possible, this may at last be carried to the requisite degree; for the fire may always be diminished at pleasure, but cannot always be increased, without the assistance of a proper apparatus.

FURNACE, MR. WATT'S STEAM-ENGINE. The steam-engine furnace is described in the specification of the patent obtained for the invention by Mr. Watt of Birmingham. His "improved methods of constructing furnaces, or fire-places, consist in causing the smoke or flame of the fresh fuel, in its way to the flues or chimney, to pass, together with a current of fresh air, through, over, or among, fuel which has already ceased to smoke, or which is converted into coaks, charcoal, or cinders, and which is intensely hot; by which means the smoke and grosser parts of the flame, by coming into close contact with, or by being brought near unto, the said intensely hot fuel, and being mixed with the current of fresh or unburnt air, are consumed, or converted into heat, or into pure flame free from smoke." This is done, "first, by stopping up

every avenue or passage to the chimney or flues," except such as are left in the interstices of the fuel, by placing the fresh fuel above, or nearer to the external air, than that which is already converted into coaks or charcoal; and by constructing the fire-places in such a manner that the flame, and the air which animates the fire, must pass downwards, or laterally, or horizontally, through the burning fuel, and pass from the lower part, or internal end or side, of the fire-place, to the flues or chimney. In some cases, after the flame has passed through the burning fuel, it is made to pass through a very hot funnel, flue, or oven, before it comes to the bottom of the boiler, or to the part of the furnace where it is proposed to melt metals or perform other offices, by which means the smoke is still more effectually consumed. In other cases, the flame is carried immediately from the fire-place into the space under a boiler, or into the bed of a melting or other furnace. Fig. 2, Plate LXXVII. shews a section of a fire-engine boiler, and its furnace, which has been chosen for an example of the application of this new method to the heating and evaporating of water. A A is the boiler, which may be made of any form suitable to its use. B B is a flue, surrounding the boiler as usual. C is the uptake, or passage from the space under the boiler to the flues. D D is a funnel or flue for the flame to come from the fire-place to the boiler. E E is a place to contain the ashes; and F is a door to take them out at, which must be kept continually shut during the time of working. G H is the fire-place: the fresh fuel is put in at G, and gradually comes down as the fuel below consumes. The part at H is very hot, being filled with the coaks or coals which have ceased to smoke. I is an opening or openings, to admit fresh air, and regulate the fire. K is a door into the space under the boiler; and which being opened, admits air, and stops the draught of the chimney when the operation is wanted to cease. Fig. 3 is a section of the same fire-place in the other direction; in which M M is the back of the fire-place; L the brick arch on which the fuel lies; and E the ash-hole. Fig. 4 is an outside view of the same fire-place, shewing the air-holes I I, and the ash-hole door E; and fig. 5, is a plan of the same, with part of the boiler seated; taken in the line Z of fig. 2. The dotted lines represent the flues, and the darts point out the direction of the flame. The fire is first kindled upon the brick arch L, fig. 2; and when well-lighted, more fuel is gradually added until it is filled up to G. Care is taken to leave proper interstices for the air to pass, either among the fuel, or between the fuel and the front-wall N; and as much air is admitted at I I, as can be done without causing the smoke to ascend perpendicularly, which it will always do if too much air is admitted at I I. The dimensions of this fire-place are shewn by the scale, and are properly adjusted for burning about 84lb. of coals in an hour; where greater or less quantities are required to be burnt, the furnace must be enlarged or diminished; or, if much greater, more furnaces than one must be employed. Fig. 6. represents this new fire-place as applied to a furnace for melting iron and other metals, and constructed without the funnel, or perpendicular flue D in fig. 2. The same letters refer to the same parts in all these figures. Mr. Watt also constructs these new fire-places so that the part G H lies sloping, or horizontal, and otherwise varies the figure or form, and proportions; but in all cases the principle is the same; the fresh or raw fuel being placed next the external air, and so that the smoke or flame passes over or through the cooked or charred part of the fuel. He also occasionally covers the opening G, and causes the air to enter only, or principally, at I I. In particular cases, he places the fresh fuel on a grate as usual, as at A fig. 7, and beyond that grate, or near at the place where the flame passes into the flues or chimneys, he places another smaller grate B, on which he maintains a fire of charcoal, coaks, or coals, which have been previously burnt until they have ceased to smoke; which, by giving intense heat and admitting some fresh air, consumes the smoke of the first fire. Lastly, he states his new invention to consist only in the method of consuming the smoke, and increasing the heat, by causing the smoke and flame of the fresh fuel to pass through very hot funnels or pipes, or among, through or near, fuel, which is intensely hot, and which has ceased to smoke; and by mixing it with fresh air when in these circumstances; and in the form and nature of the fire-places above mentioned: the boilers and other parts of the furnaces being such as are in common use. These new invented fire-places are also applicable to furnaces for almost every other purpose.

FURNACE, MR. W. THOMPSON'S STEAM-ENGINE. In vol. iv. of the

of the Repertory is given the following account of a furnace of this sort by Mr. W. Thompson, who describes his invention to be "a furnace which will effectually consume the smoke arising from it, without requiring more coals than usual, as has been the case with former contrivances for that purpose. It may be adapted to any boiler or copper already set up, and at a very small expence. Fig. 8, is a section of an oblong boiler and fire-place. *aaaa*, The brick-work in which boilers are usually set. *AA*, The boiler. Two iron flues run through this boiler, and also go round it. *BB*, The fire-place, which must be about $\frac{1}{2}$ longer than they are generally made. An arch is constructed across the fire-place, two inches lower than the bottom of the flue under the boiler, and about the middle of the fire-place. *DDD*, Flues through which the hot air ascends, and spends its heat upon the boiler. *E*, the door of the fire-place; which must have a small shutter in it. Through this shutter the coals must be gently stirred up, by the slice or poker, taking care not to injure the arch, nor to raise too great a quantity of coals at once. *F* is a small space left behind the fire for a current of air to come through, as in the patent lamps. A brick is placed with its whole length across the fire-place, to hinder the coals from falling down the space *F*, and choking it. Fig. 9, is a front-view of the same boiler and fire-place; in which the same letters represent the same parts. *HH* are two slides, the one shifting backwards, the other forwards, to make the space *F*, for the current of air, larger or smaller, as by practice may be found best. The manner in which this furnace operates is this: the arch hinders the smoke from going up the chimney, and obliges it to pass through the fire behind it; which has a very strong draught, and burns the smoke as it passes through it. The air which comes up through the space *F* gives fresh vigour to the flame, which consumes any smoke that may be left. Too much air will have a very bad effect, as it will cool the flame; therefore the slides *HH* must be regulated in such manner as the operator may find most advantageous. The shutter in the door *E* must also be of a proper size; as its being too large or too small will be prejudicial.

FURNACE, REFINING, a furnace for refining metals. See **METALLURGY**, and **REFINING**. Fig. 10, Plate LXXVII, represents a longitudinal section of this furnace. 1. The masonry of the pillars and walls surrounding the furnace. 2. The channels for carrying off the moisture. 3. Other small channels which join in the middle of the bason. 4. The bason made of bricks. 5. A bed of ashes. 6. The hollow or bason in which the metal is melted and refined. 7. The great flame-hole. 8, 8. The two openings for the entry of the tuyeres of the bellows. 9. The vault or dome of the furnace. 10. The fire-place. 11. The grate. 12. The draught-hole. 13. A hole in the vault, which, being opened, serves to cool the furnace.

FURNACE, REVERBERATORY, FOR SMELTING ORES. Fig. 11, Plate LXXVII, represents a longitudinal section of this furnace. 1. The masonry. 2. The ash-hole. 3. A channel for the evaporation of the moisture. 4. The fire-place. 5. The grate. 6. The inner part of the furnace. 7. A bason formed of sand. 8. The cavity where the melted metal is. 9. A hole through which the scoria is to be removed. 10. The passage of the flame and smoke, or the lower part of the chimney; which is to be carried up to a height of about 30 feet. 11. A hole in the roof, through which the ore is thrown into the furnace. This furnace is 18 feet long, 12 feet broad, and $9\frac{1}{2}$ high. For the purpose of melting large quantities of ore at a time, it was formerly necessary to use bellows of an immense size, which proved inconvenient in several respects. This however has been remedied by a new method of blowing up fires by means of water; which we shall here describe. It depends on the following principle, viz. That a stream of water, running through a pipe, if by any means it is mixed with air at its entrance into the pipe, will carry that air along with it, and part with it again as soon as it comes out of the pipe; and if the air is then collected by a proper apparatus, it may with success be used for exciting the most violent degrees of heat. Machines of this kind are called water-bellows, and are represented Plate LXXVII, fig. 12. In the right hand machine, *AB* represents a stream of water falling into the funnel, whose throat is contracted at *B*; after which the stream runs through the perpendicular pipe *EF*, in the upper part of which there are some small holes represented by *cdef*. Through these holes the air has access to mix itself

with the descending water, which, being dashed against the sides of the pipe, is reduced to froth, and thus fills the whole cavity of the pipe *EF*, which is considerably larger than the throat of the funnel *B*. When this frothy stream enters the vessel *C*, the air extracts itself from the water; and as it cannot return through the pipe *EF*, because it is continually filled with a stream of liquid matter, it flies off with considerable force through the smaller pipe *D*, by which it is conveyed to the furnace. The principal thing, to be kept in view in the construction of these machines, is to mix the descending stream of water, with as great a quantity of air as possible. For this purpose the contrivance represented in the left hand machine answers much better than the former. By this the water descending from the reservoir *A* falls into a kind of cullender *B*, perforated with a great number of holes in its sides. Thus the water being forced out in a number of small streams, is very effectually dashed against the sides of the wide descending pipe, when it enters the condensing vessel *C*, and is sent off by the pipe *D*, as in the former. In some machines of this kind the constructors seem to have been of opinion, that a great height was required in the water-fall; but Dr. Lewis, who has made a great number of experiments upon the subject, shews, that an excess in height can never make up for a deficiency in the quantity of the water. Four or five feet, he thinks, is a sufficient height for the water-fall; where there is a greater height, however, it may be rendered useful, by joining two or more machines together in the manner represented in the plate; where the water, after having once emitted its air in the condensing vessel *C*, flows out into a new reservoir *E*. From thence it descends through another cullender *F*, and descending from it into a condensing vessel *G*, the air is extricated, and carried off through the pipe *H*. The upper figure, *I*, represents the cullender with the shapes of the holes and their proportional distances according to Dr. Lewis. Thus, with very little expence, where there is a sufficient quantity of water, as strong a blast of air as can be desired may be readily obtained; for several machines may be constructed, and joined together in a manner somewhat similar to that above-mentioned, until all the quantity of water is employed. But, as by this method the air is loaded with moisture, it is proper to make the condensing vessel as high as conveniently may be, that the air may arrive at the furnace in as dry a state as possible. The long slender pipes in the left hand machines represent a gauge filled with mercury or water, by which the strength of the blast may be determined. In the large iron founderies another method is used for blowing up the fires by means of a kind of air-pumps. These consist of cast iron cylinders of about three feet diameter, exactly fitted with a piston moved up and down by means of a water-wheel. In the bottom of the cylinder is a large valve like that of bellows, which rises as the piston is lifted up, and thus admits the air into the cavity of the cylinder from below. Immediately above the bottom is a tube which goes to the furnace; and as it proceeds from the cylinder is furnished with a valve opening outward. Thus, when the piston is drawn up, the valve in the bottom rises and admits the air that way into the cylinder, while the lateral valve shuts, and prevents any air from getting into it through the pipe. When the piston is thrust down, the valve in the bottom shuts, while the air being compressed in the cavity of the cylinder is violently forced out through the lateral tube into the furnace. For other furnaces used in chemical operations, see **CHEMISTRY**.

FURNEAUX, an inhabited island in the S. Pacific Ocean, first discovered by Bougainville, and afterwards by captain Cook. Lon. 143. 7. W. Lat. 17. 11. S.

FURNES, or **VURENES**, a town of France in the department of Lys, and late province of Austrian Flanders, 12 miles E. of Dunkirk.

FURRUCKABAD, a district of Hindostan Proper, in the circar of Rohilcund, about 30 miles long, on the W. bank of the Ganges.

FURRUCKABAD, the capital of the above district, 75 miles E. of Agra.

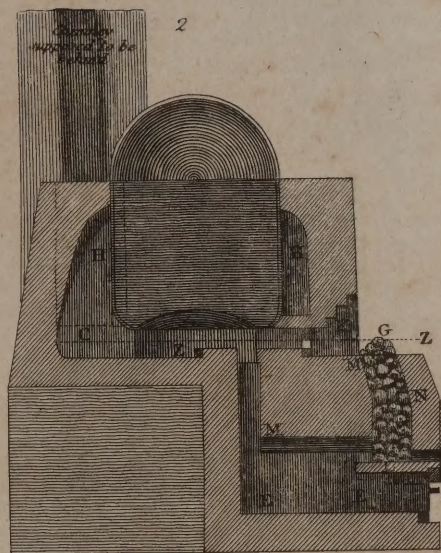
FURRUCKABA, a town of Hindostan, in Bengal, 42 miles N.N.W. of Moorshedabad.

FURSTENBERG, or **FURSTENBURG**, a county of Germany in Suabia.

FURSTENBERG, or **FURSTENBURG**, the capital of the above county, 30 miles N. W. of Constance.

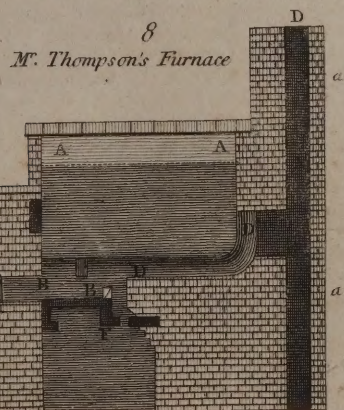
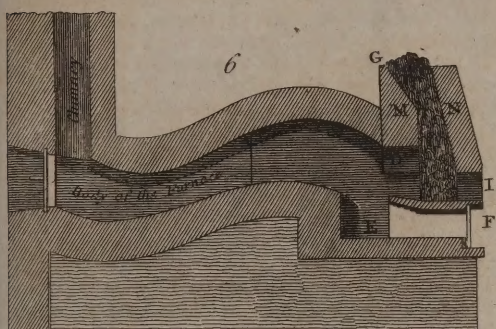
FURSTENFELD, two towns of Germany; 1. in Branden-

burg,



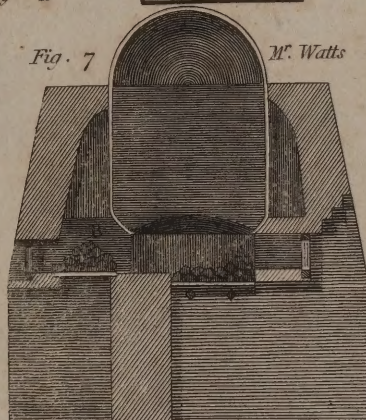
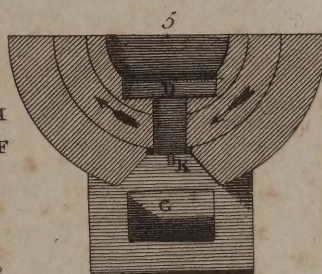
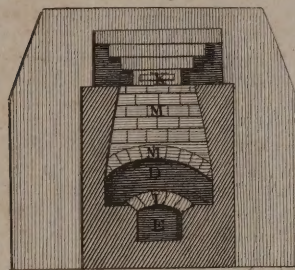
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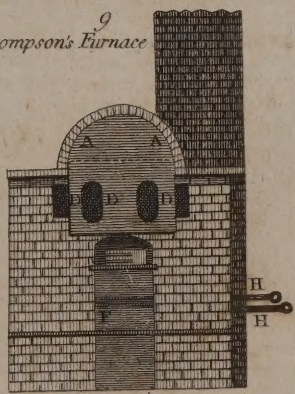
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M. Watt's Steam Engine Furnace



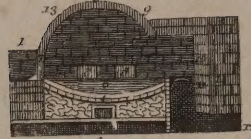
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M. Thompson's Furnace



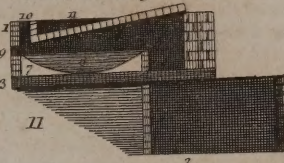
10

Refining Furnace

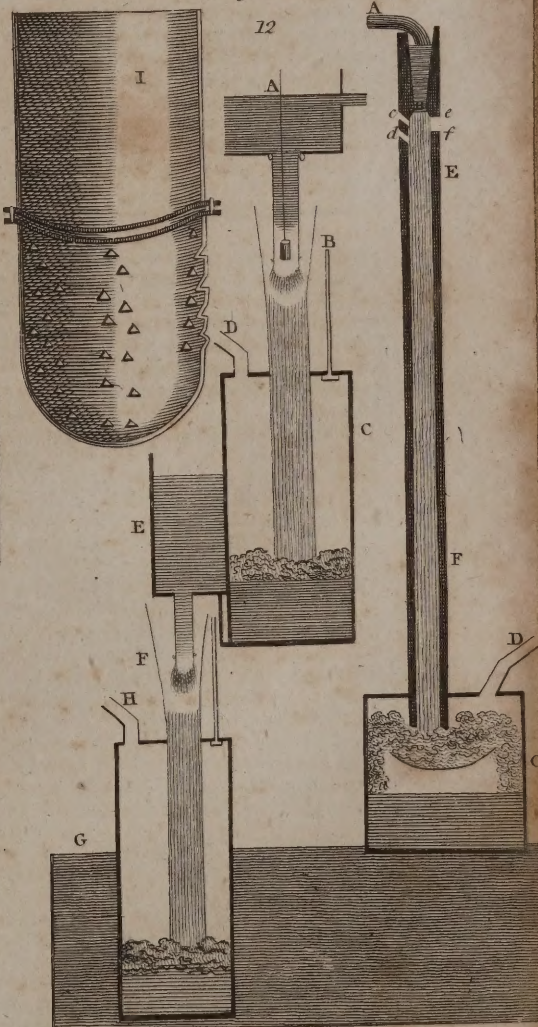


11

Reverberatory Furnace



Machine for blowing Air into Furnaces



borg, 10 miles N. of Custrins; 2. In Stiria, near Hungary, 30 miles E. of Gratz.

FURSTENWALDE, two towns of Upper Saxony; 1. In the margaviate of Meissen, two miles S. of Lauenstein. 2. In the middle Marck of Brandenburg, 26 miles E. of Berlin.

FURTH, a town of Franconia, in Anspach, four miles W. of Nuremberg.

FURTHCOMING, in law, the name of an action competent to any person who has used arrestment in the hands of his debtor's creditor, for having the subject arrested declared his property.

FURUNCLE, FURUNCULE, or BOIL, a small resisting tumour, with inflammation, redness, and great pain, arising in the adipose membrane, under the skin.

FURUSUND, an island of Sweden, in the Baltic. Lon. 18. 45. E. Lat. 59. 46. N.

FURZE, in botany. See ULEX.

FUSANUS, in botany, a genus of the monœcia order, and polygamia class of plants. The hermaphrodite calyx quinquefid; no corolla; stamina four; germen beneath; fruit a plum. One species.

FUSAROLE, in architecture, a moulding or ornament placed immediately under the echinus, in the Doric, Ionic, and Composite capitals.

FUSEE, [*fuseau*, French,] in clock-work, is that conical part drawn by the spring, and about which the chain or string is wound; for the use of which see CLOCK and WATCH.

FUSIGNANO, a market-town of Italy the late duchy of Ferrara.

FUSIL, in heraldry, a bearing of a rhomboidal figure, longer than the lozenge, and having its upper and lower angles more acute and sharp than the other two in the middle. It is called in Latin *fuscus*, "a spindle," from its shape.

FUSILIERS, FUSILEERS, or FUZILEERS, are armed as the rest of the infantry, but wear caps like the grenadiers, though somewhat shorter. There are three royal regiments of fusiliers in the British service: viz. those of the Scotch fusiliers raised in 1678; of English fusiliers, in 1685; and of Welsh fusiliers, in 1688-9.

FUSION. See CHEMISTRY and FLUIDITY.

FUST, or FAUSTUS, a goldsmith of Mentz, and one of the three earliest printers, to whom the invention of this most useful art has been ascribed. Some say, he only assisted Guttemberg at Strasburg, in his attempts to make moveable types, in 1444. Fust, in partnership with Peter Schoeffer, having, in 1462, printed a considerable number of copies of the Bible, to imitate those which were sold in MS., Fust undertook the sale of them at Paris, where the art of printing was then unknown. At first he sold his copies

for so high a sum as 500 or 600 crowns, the prices usually demanded by the transcribers. He afterwards lowered his price to 60 crowns, which created universal astonishment; but when he produced copies as fast as they were wanted, and lowered the price to 30 crowns, all Paris was agitated. The uniformity of the copies increased the wonder; informations were given into the police against him as a magician; his lodgings were searched; and a great number of copies being found, they were seized: the red ink with which they were embellished, was said to be his blood; it was seriously adjudged that he was in league with the devil; and if he had not fled, most probably he would have shared the fate of those whom ignorant and superstitious judges condemned in those days for witchcraft. Fust is said to have died of the plague at Paris, about 1466.

FUSTIAN, in commerce, a kind of cotton-stuff, which seems as if it were whaled on one side. Fustians should be altogether made of cotton-yarn, both woof and warp; but many pieces are made, the warp of which is flax, or even hemp. Fustians are made of various kinds, wide, narrow, fine, coarse; with shag or nap, and without it.

FUSTICK, in the arts, is the wood of the *morus tinctoria*, a tree that grows to a considerable size in the West Indies. It is much used in dyeing yellow, and produces a large quantity of colouring matter. It is not very hard, and its colour is yellow with orange veins.

FUSTIGATIO, in the Roman customs, a punishment inflicted by beating with a cudgel. This punishment was peculiar to free men; the slaves were scourged with whips.

FUTTOCKS, in a ship, the timbers raised over the keel, or the encompassing timbers that make her breadth. Of these there are the first, second, third, and fourth, denominated according to their distance from the keel, those next it being called first or ground futtocks, and the others upper futtocks; those timbers being put together, make a frame-bend.

FUTTYPOUR SICRI, a considerable town of Hindostan Proper, in the province of Agra, 42 miles W. of Agra.

FUTURE, or FUTURE TENSE, in grammar, denotes an inflexion of verbs, whereby they denote, that a thing will be in some time yet to come. See GRAMMAR.

FYAL, one of the Azores. It is well cultivated, and yields corn, garden-stuffs, and various fruits. It has several kinds of domesticated European animals: the people are cleanly, diligent, and fairer than those of Madeira. The chief town is Villa de Horta. Lon. 28. 36. W. Lat. 38. 32. N.

FYZABAD, a city of Hindostan Proper, in the territory of Oude; 80 miles E. of Lucknow.

G.

G, is the seventh letter of our alphabet, and the fifth consonant. In the alphabets of all the oriental languages, the Hebrew, Phœnician, Chaldee, Syriac, Samaritan, Arabic, and even the Greek, it is the third letter. The Hebrews call it *ghimel*, or *gimel*, i. e. *camel*, because it resembles the neck of that animal; and it bears the same appellation in the Samaritan, Phœnician, Chaldee; in the Syriac it is called *gamel*, in Arabic *gîm*, and in Greek *gamma*. The gamma (γ) of the Greeks is evidently the gimel ($\aleph$) of the Hebrews or Samaritans. The chief difference between the gamma and gimel consists in this, that the one is turned to the right, and the other to the left, according to the different manners of writing and reading which obtained among those nations: though Salmasius, on Solinus, vainly attempted to prove

that the G was derived from the Greek kappa. It is clear that the Latins borrowed their form of this letter from the Greeks; the Latin G being only a variation of the Greek gamma, γ ; as might easily be shewn, had our printers all the forms of this letter, which we meet with in the Greek and Latin MSS. through which it has passed from γ to G. G has two sounds, one called that of the hard G, before a, o, u, l, r; as, *gate*, *go*, *gall*. The other sound, called that of the soft G, resembles that of J, and is commonly, though not always, found before e, i; as, *gem*, *gibbet*. Before n, at the end of a word, g is commonly melted away as in the French, from which these words are commonly derived: thus, for *benign*, *malign*, *condign*, we pronounce *benine*, *maline*, *condine*. It is often silent in the middle of words before h; as, *might*.

might. The Saxon *G, g*, seems to have had generally the sound of *g* consonant; whence *gate* is by rustics still pronounced *yate*. The modern *G* takes its form from that of the Latins. It is a mute, and cannot be sounded at all without the help of a vowel. Its hard sound is formed by the reflection of the air against the palate, made by the tongue as the air passes out of the throat; which Martianus expresses thus, *G spiritus cum palato*; so that *G* is a palatal letter. *G* often sounds hard before *i*, as *give*, &c. and sometimes before *e*, as *get*, &c. It is also hard in derivatives from words ending in *g*, as *singing*, *stronger*, &c. and generally before *er*, at the end of words, as *finger*. *G* is mute before *n*, as *gnash*, *sign*. *Gh* has the sound of hard *G* in the beginning of a word, as *ghostly*; sometimes at the end it is quite silent, as *though*. But at the end of many other words *Gh* has the sound of *f*, as *laugh*, *rough*, *tough*, &c. As an abbreviation, *G* stands for *Gaius*, *Gellius*, *gens*, *genius*, &c. *G. G.* for *gemina*, *gessit*, *gesserunt*, &c. *G. C.* for *genio civitatus* or *Casaris*. *G. L.* for *Gaius libertus*, *gentio loci*. *G. V. S.* for *genio urbis sacrum*. *G. B.* for *genio bono*. And *G. T.* for *genio tutelari*. In music, *G* is the character or mark of the treble cleff; and from its being placed at the head, or marking the first sound in Guido's scale, the whole scale took the name *Gamut*. As a numeral, *G* was anciently used to denote 400; and with a dash over it, thus *G̃*, for 40,000.

GAAL, [Hb. Hebrew, *i. e.* an abomination,] the son of Ebed, the leader of the conspiracy of the Shechemites against the usurper Abimelech, the son of Gideon. See Judges, ix. 26—41.

GABALE, in mythology, a deity worshipped at Heliopolis under the figure of a lion, with a radiant head; and it is thus represented on many medals of Caracalla.

GABARA, or **GABBARA**, in antiquity, the dead bodies which the Egyptians embalmed, and kept in their houses.

GABARET, a town of France, in the department of Landes, 15 miles W. of Condom.

GABEL, [Lat. *Gabella*, *Gabium*, *Gablagium*, *i. e.* *Vectigal*,] has the same signification among the ancient English writers, that *Gabelle* had in France, before the revolution. It has been variously used, for a rent, custom, service, &c. Where it was a payment for rent, those who paid it were termed *Gablatores*. Formerly when mentioned without any addition, *gabel* signified the tax on salt, though afterwards it was applied to all other taxes. In the late French customs, the *gabelle*, or tax on salt, is said to have had its rise in 1286, under Philip IV. It was afterwards so greatly advanced by the succeeding kings, that at length it was estimated to constitute $\frac{1}{4}$ of the whole revenue of the kingdom; so that a minot of salt at last paid a duty of 52 livres, 8 sols, and 6 deniers. Philip VI. first established granaries and officers of the *gabelles*, and prohibited all others from selling salt. From that period, the commerce of salt for inland consumption continued wholly in the king's hands, every grain of it being sold by his farmers. This very odious and oppressive tax was early abolished by the National Assembly.

GABEL, in geography, a town of Bohemia, in the circle of Boleslaw, 45 miles N. of Prague.

GABELLE. See **GABEL**.

GABINIAN LAWS, in Roman antiquity, laws instituted upon several occasions by persons of the name of *Gabinus*.

GABINUS CINCTUS, in Roman antiquity, a particular way of tucking the gown, by drawing it forwards on the breast, and tying it into a knot: as the people of *Gabii* did at a solemn sacrifice, on the sudden attack of an enemy, in order to be fitter for action.

GABIONS, in fortification, are baskets made of osier-twigs, of a cylindrical form, six feet high and four wide; which, being filled with earth, serve as a shelter from the enemy's fire.

GABLE, or **GABLE-END**, of a house, is the upright triangular end from the cornice or eaves to the top of the house.

GABRES, or **GAVRES**, a religious sect in Persia and India; called also *Gebres*, *Guebres*, *Gevres*, *Gaurs*, &c. See **MAGI**. Those of this sect are dispersed through the country, and said to be the remains of the ancient Persians, or followers of Zoroaster, being worshippers of fire.

GABRES is also a name given by the Turks to the Christians, signifying infidels, or people of a false religion.

GABRIELITES, in ecclesiastical history, a sect of anabap-

tists that appeared in Pomerania, in 1530; so named from *Gabriel Scherling*; who, after having been for some time tolerated in that country, was obliged to remove, and died in Poland.

GAD, [Hb. *i. e.* a troop,] one of the 12 patriarchs, the son of Jacob by *Zilpah*, and progenitor of the tribe of the *Gadites*.

GAD, in ancient geography, a district of Transjordan Palestine, situated between Gilead and the kingdom of Bashan on the N. and that of the Amorites to the S. having the Jordan to the W. and bounded by various nations on the E. so called from the tribe of that name.

GAD, among miners, a small punch of iron, with a long wooden handle, used to break up the ore. One of the miners holds this in his hand, directing the point to a proper place, while the other drives it into the vein, by striking it with a sledge-hammer.

GADARA, in ancient geography, a strong town of the *Peæa*, in Decapolis, restored by Pompey after its demolition by the Jews.

GAD-BEE, or **GAD-FLY**. See **OESTRUS**.

GADEBUSCH, a town of Germany, 16 miles W. N. W. of Schwerin.

GADEMIR, or **GADEMIS**, a country of Africa, W. of Fezzan, containing 92 towns and villages.

GADEMIS, or **GADEMIR**, the capital of the above country, lies 300 miles from the sea-coast.

GADES, or **GADIRA**, in ancient geography, a small island in the Atlantic, on the Spanish coast, 25 miles from the Pillars of Hercules.

GADOLINITE, a mineral first found in a white felspar in the quarry of Ytterby in Sweden, and was called *gadolinite*, from *Gadolin* who first ascertained its composition. Colour perfect black, passing sometimes to brown. Found in mass. Fracture conchoidal. Scratches quartz. Brittle. Specific gravity 4.0497. Gelatinizes with hot diluted nitric acid. Before the blow-pipe decrepitates, and assumes a whitish red colour, but does not melt. With borax it melts into a topaz-yellow glass. Affects the magnetic needle. A new earth called *Yttria*, from the place where it is formed, has been discovered in it. According to the analysis of *Vauquelin*, it is composed of:

35.0	yttria
25.5	silica
25.0	oxide of iron
2.0	lime
2.0	oxide of manganese
10.5	water and carbonic acid

100.0

Klaproth, on the other hand, found

59.75	yttria
21.25	silica
18.00	oxide of iron
0.50	alumina

99.50

GADONA, or **GADUA**, a country of Africa, S. of the Senegal, containing mines of gold, iron, and nitre.

GADUS, in ichthyology, the *CON*, a genus of fishes of the order *jugulares*. Generic character: the head smooth; gill-membrane, seven-rayed; body oblong, covered with deciduous scales; fins all covered by the common skin; more than one dorsal fin, of which the rays are unarmed; ventral fins slender and ending in a point. There are twenty-three species; the most remarkable are these,

G. BARBATUS, the *POUT*, never grows to a large size, seldom exceeding a foot in length. It is distinguished from all others by its great depth; one of the size above-mentioned being near four inches deep in the broadest part. The colour of the body is white; but more obscure on the back than the belly, and tinged with yellow. It is called at Scarborough a *kleg*, and is a very delicate fish.

G. EGLESINUS, the *HADDOCK*, has a long body; the upper part of a dusky brown colour, and the belly and lower part of the sides silvery. On the back are three fins resembling those of the common cod-fish; the lateral line is black; and the tail is forked.

The

The head slopes down to the nose; on the chin is a short beard; and on each side beyond the gills is a large black spot. The fishermen assert, that in rough weather haddocks sink down into the sand and ooze in the bottom of the sea, where they shelter themselves till the storm is over; for in stormy weather they take none; and those that are taken immediately after a storm have mud on their backs. In summer they live on young herrings and other small fish; in winter on the stone-coated worms, a species of *Serpula*, which the fishermen call haddock-meat. The grand shoal of haddocks comes periodically on the Yorkshire coast. It is remarkable that they appeared in 1766, on the 10th of December, and exactly on the same day in 1767: these shoals extended from the shore near three miles in breadth, and in length from Flamborough head to Tinmouth castle, and perhaps much farther northwards. An idea may be given of their numbers by the following fact: Three fishermen, within the distance of a mile from Scarborough harbour, frequently loaded their boat with them twice a-day, taking each time about a ton of fish; when they put down their lines beyond the distance of three miles from the shore, they caught nothing but dog-fish, which shews how exactly these fish keep their limits. The best haddocks were sold at from 8d. to 1s. per score, the smaller sort at a penny and even a halfpenny per score.

G. LOTA, the **BURBOT**, in its body has some resemblance to an eel, only shorter and thicker; and its motions also resemble those of that fish: they are besides very smooth, slippery, and slinky. The head is very ugly, being flat, and shaped like that of a toad: the teeth are very small, but numerous. On the end of the nose are two small beards; on the chin another.

G. MERLANGUS, the **WHITING**, is a fish of an elegant make: the upper jaw is the longest; the eyes are large, the nose is sharp: the teeth of the upper jaw are long, and appear above the lower when closed. The colour of the head and back is a pale brown; the lateral line white, and crooked; the belly and sides are silvery, the last streaked lengthwise with yellow. These fish appear in vast shoals in spring, keeping at the distance of about half a mile to that of three from the shore. They are caught in vast numbers by the line, and afford excellent diversion. They are the most delicate, as well as the most wholesome, of any of the genus: but they do not grow to a large size, the biggest not exceeding 20 inches; the usual length being 10 or 12.

G. MERLUCIUS, the **HAKE**, is found in vast abundance on many of our coasts, and those of Ireland. There was formerly a vast stationary fishery of hake on the Nymph Bank off Waterford; immense quantities appearing there twice a-year; the first shoal coming in June, during the mackerel-season; the other in September, at the beginning of the herring-season, probably in pursuit of those fish: it was usual for six men with hooks and lines to take a 1000 hakes in one night, besides a considerable quantity of other fish. These were salted and sent to Spain, particularly to Bilbao.

G. MOLVA, the **LING**, is usually from three to four feet long, but have been caught seven feet long. The body is very slender; the head flat: the upper jaw is longest; the teeth in that jaw are small and very numerous; in the lower, few, slender, and sharp: on the chin is a small beard. They vary in colour, some being of an olive hue on the sides and back, others cinereous: the belly white. The ventral fins are white: the dorsal and anal edged with white. The tail is marked near the end with a transverse black bar, and tipped with white. Its English name *ling* is derived from its length, being a corruption of long. It abounds about the Scilly Isles, on the coasts of Scarborough, Scotland and Ireland, and forms a great branch of trade.

G. MORHUA, or the **COMMON COD**, inhabits the northern seas, both of Europe and America, in innumerable shoals, and constitutes an important article of human subsistence. Its general length is from two to three feet, and its common weight from fourteen to thirty pounds. It has occasionally, however, been known to weigh upwards of seventy. Its food consists of small fish, worms, crabs, and other testaceous fishes, and its voracity is extraordinary. It is prolific in the extreme, no less than a million of eggs having been counted in a single roe. Its sound, or air-bladder, is preserved with salt, and considered as a luxury; it is also converted into a sort of isinglass, in preparing which the inhabitants of Iceland are particularly skilful. Off the coasts of Cape Breton, Nova Scotia, and New England, and, more especially, on the great sand-bank off

Newfoundland, this fish is found in inexhaustible abundance; the neighbourhood of the Polar Seas, where they return to deposit their spawn, and the immense number of worms to be found in these sandy bottoms being the grand inducements to their preference of these situations. They are abundant also on the southern and western coasts of Iceland, but proceed towards the south only in very diminished numbers, and are rarely seen in that direction beyond the Straights of Gibraltar. Before the discovery of Newfoundland, in 1496, Iceland was the principal scene for the cod-fishery, which was speedily after that event transferred to Newfoundland, where it is conducted to such an extent, merely by the hook, baited with the herring and other small fishes, as to furnish employment for fifteen thousand British seamen, and to a more numerous portion of population at home, occupied on the various articles of manufacture, indispensable for a concern of such vast extent and importance.

G. POLLACHIUS, the **POLLACK**, has the under jaw longer than the upper; the head and body rises pretty high, as far as the first dorsal fin. The side-line is incurvated, rising towards the middle of the back, then sinking and running straight to the tail; it is broad and of a brown colour. The colour of the back is dusky, sometimes inclining to green: the sides beneath the lateral line are marked with lines of yellow; and the belly is white. This species is common on many of our rocky coasts: during summer they are seen in great shoals frolicking on the surface of the water, and flinging themselves into a thousand forms. They will then bite at any thing that appears on the top of the waves, and are often taken with a goose-feather fixed to the hook. They are very strong, being observed to keep their station at the feet of the rocks in the most turbulent and rapid sea. They are good eating. They do not grow to a very large size; the biggest seldom exceeding six or seven pounds.

GAEL, a town of France in the department of Ille and Vilaine, 1 mile S. of St. Maen, and 10 W. of Montfort.

GAELIC, belonging to the Gaels, Celtes, or ancient Scots Highlanders.

GAELICK LANGUAGE, the language of the ancient and modern Highlanders of Scotland. It is esteemed the most ancient as well as the purest dialect of the Celtic, now spoken. It has all the marks of an original language. Most of its words are expressive of some property or quality in the objects which they denote. This, with the variety of its sounds, (many of which, especially those that express the soft and mournful passions, are peculiar to it,) renders it highly adapted for poetry. It was the language of the Scottish Court, till the reign of Malcolm Canmore, and was even spoken so late as that of Robert Bruce, particularly in a parliament held by him at Ardochattan. Its alphabet consists of 18 letters, of which five are vowels. "Those who understand it, (says the Rev. Dr. James Robertson, of Callander,) know its energy and power; the ease with which it is compounded; the boldness of its figures; its majesty in addressing the Deity, and its tenderness in expressing the finest feelings of the human heart. But its genius and constitution, the structure of its nouns and verbs, and the affinity it has to some other languages are not so much attended to. These point at a very remote æra, and seem to deduce its origin from a very high antiquity. The verbs have only three tenses, which is the simplest and most natural division of time. The persons of each tense are distinguished, by adding pronominal particles to each person. The third person singular of each verb has genders, or admits of a masculine and feminine particle affixed. The moods are the indicative, imperative, and infinitive. The subjunctive differs from the indicative only by the addition of one syllable to the verb, and a conjunction before it. The imperative has only the second person in both numbers. The infinitive is often used as a substantive noun, expressive of the abstract signification of the verb. There is only one conjugation, and one declension. The cases of the nouns are marked by different particles, or by a change of the last vowel. The degrees of comparison are formed by placing certain syllables before the adjective; and the superlative frequently by a repetition of the positive."

GARTNERE, a genus of the decandria monogynia class and order. The calyx is five parted; corolla five-petaled: seed-vessel nearly globose, with wings. There is one species, a shrub of the East Indies.

GAETA,

GAETA, an ancient, and strong town of Naples, in Lavoro, 40 miles of Naples.

GÆTULI, the people of Gætulia, were among the earliest inhabitants of Africa. They were distinguished by different epithets; as Nigri, Autolotes, Dara, and Baniuræ. (Pliny.)

GÆTULIA, in ancient geography, a country of Africa, lying S. of Mauritania, divided into Gætulia Propria, and Gætulia Vetus.

GAFF, a sort of boom or bole, frequently used in small ships, to extend the upper edge of the mizen; and always employed for the same purpose on those sails, whose foremost edges are joined to the mast by hoops or lacings, and which are usually extended by a boom below. Such are the main-sails of all sloops, brigs, and schooners.

GAGE, in our ancient customs, is only properly used in speaking of moveables; for immoveables, Hypotheca is used. If the gage perish, the person who received it is not to answer for it, but only for extreme negligence, &c.

GAGE is also used for a challenge to combat. It was a pledge, which the accuser or challenger cast on the ground, and the other took up as accepting the challenge; being usually a glove, gauntlet, chaperoon, or the like.

GAGE, among letter-founders, a piece of box, or other hard wood, variously notched: used to adjust the dimensions, slopes, &c. of the different sorts of letters.

GAGE, in joinery, an instrument made to strike a line truly parallel to the straight side of any board or piece of stuff. Its chief use is for the gaging of tenons true, to fit into mortises; and for gaging stuff of an equal thickness. It is made of an oval piece of wood, fitted upon a square stick, to slide up and down stiffly thereon, and with a tooth, at the end of a staff, to score, to strike a line upon the stuff at any distance, according to the distance of the oval from it.

GAGE, in the sea-language. When one ship is to the windward of another, she is said to have the weather-gage of her. They likewise call the number of feet that a vessel sinks in the water the ship's gage; this they find by driving a nail into a pike near the end, and putting it down beside the rudder till the nail catch hold under it; then as many feet as the pike is under water is called the ship's gage.

GAGE, AQUEO-MERCURIAL, an apparatus contrived by Dr. Hales, and applied in various forms to the branches of trees, to determine the force with which they imbibe moisture. In Plate LXXVIII. fig. 1, *e, r*, is a cylindric glass, *e, g*, of an inch diameter within, and eight inches long. Into this glass is introduced the branch of a young thriving apple-tree, *b*, about three feet long, with lateral branches; the diameter of the transverse cut *i* being three-fourths of an inch. Having fitted the joint *r* to the tube at *r*, by folding a piece of sheep's skin round the stem, it is cemented with a mixture of bees-wax and turpentine melted together, in such proportion as to make a very stiff clammy paste when cold, and over the cement folds of wet bladders are bound firmly with pack-thread. To the lower end *e* of the large tube, a smaller tube *z e* is cemented, being about $\frac{1}{2}$ of an inch diameter, and 18 inches long, and in substance full $\frac{1}{3}$ of an inch thick. These tubes are cemented together at *e*, with common hard brick-dust, or powdered chalk cement, and the joint is farther secured with the cement of bees-wax and turpentine, over which a wet bladder is bound. The apparatus being thus prepared, the branch is turned downwards, and the glass-tube upwards, and then both tubes are filled with water; with the finger applied to the open end of the small tube, it is inverted and immersed in the glass-cistern *x*, full of mercury and water. In this situation the lower end of the branch was immersed six inches in water, viz. from *r* to *i*; the water was imbibed by the branch at its transverse cut *i*; and during its ascent into the sap-vessels of the branch, the mercury rose in the tube *e z* from the cistern *x*, so that in half an hour it was risen $5\frac{1}{2}$ inches high, as far as *z*. The height of the mercury indicated, in some measure, the force with which the sap was imbibed, though not the whole force; because, while the water was imbibed by the branch, its transverse cut was covered with innumerable little hemispheres of air, and many air-bubbles issued out of the sap-vessels, which partly filled the tube *e r*, as the water was drawn out of it: and therefore the height of the mercury could only be proportionable to the excess of the quantity of water drawn off, above the quanti-

ty of the air which issued out of the wood. If the quantity of air issuing from the wood had been equal to the quantity of water imbibed, it is plain that the mercury could not rise at all, because there would be no room for it in the tube: but if 9 parts in 12 of the water be imbibed by the branch, and only three such parts of air issue into the tube in the same time, the mercury must rise near six inches, and so proportionably in other cases. Dr. Hales observed, that the mercury rose highest, in most cases, when the sun was clear and warm, and that it subsided three or four inches towards evening, but rose again the next day as it grew warm, though seldom so high as at first. He adapted the size and shape of the glass apparatus to a great variety of branches of several sizes and of different kinds of trees, and repeated the experiment above described, *mutatis mutandis*, in a variety of instances. See his *Vegetable Statics*, vol. i. chap. ii. p. 84, &c.

GAGE, BUCKET SEA, an instrument contrived by Dr. Hales to find the different degrees of coolness and saltness of the sea, at different depths. It consists of a common household pail or bucket, with two heads; which have each a round hole in the middle, about four inches in diameter, covered with square valves opening upward; and that they may both open and shut together, there is a small iron rod fixed to the upper part of the lower valve, and the other end to the lower side of the upper valve. So that as the bucket descends with its sinking weight into the sea, both the valves may open by the force of the water, which thus has a free passage through the bucket. But when the bucket is drawn up, then both the valves shut by the force of the water at the upper part of the bucket; so that the bucket is drawn up full of the lowest sea-water to which it has descended. When the bucket is drawn up, the mercurial thermometer fixed in it is examined; but great care must be taken to observe the degree at which the mercury stands, before the lower part of the thermometer is taken out of the water in the bucket, lest it be affected by the different temperature of the air. To keep the bucket in a right position, there are four cords fixed to it, reaching about three feet below it; to which the sinking weight is fixed. The result of several trials with this gage was, that when it was let down to different depths, from 360 feet to 5,346 feet, in lat. 25. 13. N. and lon. 25. 12. W. it was discovered by the thermometer, that the cold increased gradually in proportion to the depths, till it descended to 3,900 feet, viz. near three-fourths of a mile, whence the mercury in the thermometer came up at 53°; and though it afterwards sunk to 5,346 feet, i. e. a mile and 66 feet, it came up no lower: the warmth of the water upon the surface, and that of the air, was all that time 84°. When the water in the bucket was become of the same temperature with that on the surface of the sea, equal quantities of both were weighed and tried by the hydrometer; that from below was found to be the heaviest, and consequently the saltest. Dr. Hales was probably led to the construction of this sea-gage from an instrument invented by Dr. Hook, and designed for the same purpose. See Plate LXXVIII. fig. 2. This consists of a square wooden bucket *C*, whose bottoms are so contrived, that as the weight *A* sinks the iron *B*, to which the bucket *C* is fastened by two handles *D, D*, on the end of which are the moveable bottoms or valves *E E*, and thereby draws down the bucket, the resistance of the water keeps up the bucket in the posture *C*, whereby the water, whilst the bucket is descending, hath a free passage through it; whereas, as soon as the bucket is pulled upwards by the line *F*, the resistance of the water to that motion beats the bucket downwards, and keeps it in the posture *G*, whereby the included water is kept from getting out, and the ambient water kept from getting in. Phil. Trans. N° 9, p. 149, and N° 24, p. 447, or Abr. vol. ii. p. 260.

GAGE, SEA, an instrument invented by Dr. Hales and Dr. Desaguliers for finding the depth of the sea; the description whereof is this: *AB*, Plate LXXVIII. fig. 3, is the gage-bottle, in which is cemented the gage-tube, *F f*, in the brass cap at *G*. The upper end of the tube *F* is hermetically sealed, and the open lower end *f* is immersed in mercury, marked *C*, on which swims a small thickness or surface of treacle. On the top of the bottle is screwed a tube of brass *H G*, pierced with several holes to admit the water into the bottle *AB*. The body *K* is a weight hanging by its shank *L*, in a socket *N*, with a notch on one side at *m*, in which is fixed the catch *l* of the spring *S*, and, passing through the hole *L*, in the shank of the weight *K*, prevents its falling out when once hung

on. On the top, in the upper part of the brass tube at H, is fixed a large empty ball, or full blown bladder I, which must not be so large but that the weight K may be able to sink the whole under water. The instrument thus constructed is used in the following manner. The weight K being hung on, the gage is let fall into deep water, and sinks to the bottom; the socket N is somewhat longer than the shank L; and therefore, after the weight K comes to the bottom, the gage will continue to descend till the lower part of the socket strikes against the weight; this gives liberty to the catch to fly out of the hole L, and let go the weight K: when this is done, the ball or bladder I instantly buoys up the gage to the top of the water. While the gage is under water, the water having free access to the treacle and mercury in the bottle, will by its pressure force it up into the tube Ff, and the height to which it has been forced by the greatest pressure, viz. that at the bottom, will be shewn by the mark in the tube which the treacle leaves behind it, and which is the only use of the treacle. This shews into what space the whole air in the tube Ef is compressed, and consequently the height or depth of the water which by its weight produced that compression, which is the thing required. If the gage-tube Ff be of glass, a scale might be drawn on it with the point of a diamond, shewing, by inspection, what height the water stands above the bottom. But the length of ten inches is not sufficient for fathoming depths at sea, since that, when all the air in such a length of tube is compressed into half an inch, the depth of water is no more than 634 feet, which is not half a quarter of a mile. If, to remedy this, we make use of a tube fifty inches long, which for strength may be a musket-barrel, and suppose the air compressed into a hundredth part of half an inch; then by saying, 1 : 99 :: 400 : 39600 inches, or 3300 feet; even this is but little more than half a mile, or 2640 feet. But since it is reasonable to suppose the cavities of the sea bear some proportion to the mountainous parts of the land, some of which are more than three miles above the earth's surface; therefore, to explore such great depths, the doctor contrived a new form for his sea-gage, or rather for the gage-tube in it, as follows: BCDE, fig. 4, is a hollow metalline globe communicating on the top with a long tube, AB, whose capacity is a ninth part of that globe. On the lower part, at D, it has also a short tube DE, to stand in the mercury and treacle. The air contained in the compound gage-tube is compressed by the water as before; but the degree of compression, or height to which the treacle has been forced, cannot there be seen through the tube; therefore, to answer that end, a slender rod of metal or wood, with a knob on the top of the tube AB, will receive the mark of the treacle, and shew it when taken out. If the tube AB be fifty inches, and of such a bore that every inch in length should be a cubic inch of air, and the contents of the globe and tube together 500 cubic inches; then when the air is compressed within a hundredth part of the whole, it is evident the treacle will not approach nearer than five inches of the top of the tube, which will agree to the depth of 3300 feet of water as above. Twice this depth will compress the air into half that space nearly, viz. two inches and a half, which correspond to 6600, which is a mile and a quarter. Again, half that space, or one inch and a quarter, will shew double the former depth, viz. 13200 feet, or two miles and a half; which is probably very nearly the greatest depth of the sea.

GAGE, WIND, an instrument for measuring the force of the wind upon any given surface. It was invented by Dr. Lind, who gives the following description of it, Philosophical Transactions, vol. lxxv. See Plate LXXVIII. fig. 5. This instrument consists of two glass-tubes, AB, CD, of five or six inches in length. Their bores, which are so much the better for being equal, are about four-tenths of an inch in diameter. They are connected together like a siphon, by a small bent glass-tube, *ab*, the bore of which is about one-tenth of an inch in diameter. On the upper end of the leg AB there is a tube of latten brass, which is kneed, or bent perpendicularly outwards, and has its mouth open towards F. On the other leg CD is a cover with a round hole G in the upper part of it, two-tenths of an inch in diameter. This cover and the kneed tube are connected together by a slip of brass *ed*, which not only gives strength to the whole instrument, but also serves to hold the scale III. The kneed tube and cover are fixed on with hard cement, or sealing-wax. To the same tube is soldered a piece of brass *e*, with a round hole in it to receive the steel spindle KL; and at *f* there is just another piece of

brass soldered to the brass hoop *gh*, which surrounds both legs of the instrument. There is a small shoulder on the spindle at *f*, upon which the instrument rests, and a small nut at *i*, to prevent it from being blown off the spindle by the wind. The whole instrument is easily turned round upon the spindle by the wind, so as always to present the mouth of the kneed tube towards it. The end of the spindle has a screw on it; by which it may be screwed into the top of a post or a stand made on purpose. It has also a hole at *L*, to admit a small lever for screwing it into wood with more readiness and facility. A thin plate of brass *k*, is soldered to the kneed tube, about half an inch round the hole G, so as to prevent rain from falling into it. There is likewise a crooked tube AB, fig. 6, to be put occasionally upon the mouth of the kneed tube F, to prevent rain from being blown into the mouth of the wind-gage when it is left out all night, or exposed in the time of rain. The force or momentum of the wind may be ascertained by this instrument, by filling the tubes half full of water, and pushing the scale a little up or down, till the 0 of the scale, when the instrument is held up perpendicularly, be on a line with the surface of the water in both legs of the wind-gage. The instrument being thus adjusted, hold it up perpendicularly, and turning the mouth of the kneed tube towards the wind, observe how much the water is depressed by it in the one leg, and raised in the other. The sum of the two is the height of a column of water which the wind is capable of sustaining at that time; and every body that is opposed to that wind will be pressed upon by a force equal to the weight of a column of water having its base equal to the altitude of the column of water sustained by the wind in the wind-gage. Hence the force of the wind upon any body, where the surface opposed to it is known, may be easily found, and a ready comparison may be made betwixt the strength of one gale of wind and that of another. The force of the wind may likewise be measured with this instrument, by filling it until the water runs out at the hole G. For if we then hold it up to the wind as before, a quantity of water will be blown out; and if both legs of the instrument are of the same bore, the height of the column sustained will be equal to double the column of water in either leg, or the sum of what is wanting in both legs. But if the legs are of unequal bores, neither of these will give the true height of the column of water which the wind sustained. But the true height may be obtained by the following formulæ. Suppose that after a gale of wind which had blown the water from A to B, fig. 7, forcing it at the same time through the other tube out at E, the surface of the water should be found standing at some level DG, and it were required to know what was the height of the column EF or AB, which the wind sustained. In order to obtain this, it is only necessary to find the height of the columns DB or GF, which are constantly equal to one another; for either of these added to one of the equal columns AD, EG, will give the true height of the column of water which the wind sustained. I. Let the diameters AC, EH, of the tubes be respectfully represented by *c* and *e*; and let *a* = AD, or EG, and *x* = DB, or GF: then it is evident that the column DB is to the column EG, as *c*²*x* to *e*²*a*. But these columns are equal. Therefore *c*²*x* = *e*²*a*; and conse-

quently $x = \frac{e^2 a}{c^2}$. II. But if at any instant of time whilst the

wind was blowing, it was observed, that, when the water stood at E, the top of the tube out of which it is forced, it was depressed in the other to some given level BF, the altitude at which it would have stood in each, had it immediately subsided, may be found in the following manner: Let *b* = AB or EF. Then it is evident that the column DB is equal to the difference of columns EF, GF. But the difference of these columns is as *b*² - *d*²*x*; and consequently $x = \frac{b^2 - d^2}{c^2 + d^2}$. For the cases when the wind blows

in at the narrow leg of the instrument: Let AB = EF = *b*, EG, or AD = *a*, GF = DB = *x*, and the diameters EH, GA, respectively = *d*, *c*, as before. Then it is evident that the column AD is to the column GF as *a*² to *d*²*x*. But the columns are equal;

therefore $d^2 x = a^2$; and consequently $x = \frac{a^2}{d^2}$. It is also evi-

dent that the column AD is equal to the difference of the columns AB,

AB, DB; but the difference of these columns is as $bc^2 - c^2x$.

Therefore, $d^2x = bc^2 - c^2x$. Whence we get $x = \frac{bc^2}{d^2 + c^2}$. The

use of the small tube of communication ab , fig. 5, is to check the undulation of the water, so that the height of it may be read off from the scale with ease and certainty. But it is particularly designed to prevent the water from being thrown up to a much greater or less altitude, than the true height of the column which the wind is able at that time to sustain, from its receiving a sudden impulse whilst it is vibrating in its ascent or descent. As in some cases the water in this instrument might be liable to freeze, and thus break the tubes, Dr. Lind recommends a saturated solution of sea-salt to be used instead of it, which does not freeze till Fahrenheit's thermometer falls to 0.

GAGO, a fertile kingdom of Africa, in Negroland, abounding in corn and gold.

GAGO, the capital of the above kingdom.

GAHNIA, in botany, a genus of the monogynia order, and hexandria class of plants. Calyx, an involucre with two or five flowers; corolla two-valved; antheræ linear, sharp-pointed at the apex, as long as the corolla; seed single and oblong. There are two species.

GAIA, or **GAJA**, a town of Italy situated, 20 miles S. of Modena.

GAILLAC, a town of France, in the department of Tarn, 8 miles N.N.W. of Castres, and 27 N.E. of Toulouse.

GAILLON, a town of France, in the department of Eure, $7\frac{1}{2}$ miles S. E. of Louviers, 9 N. W. of Vernon, and 22 from Rouen.

GAIN, in architecture, is the workmen's terms for the bevelling-shoulder of a joist or other timber. It is used also for the lapping of the end of the joist, &c. upon a trimmer or girder; and then the thickness of the shoulder is cut into the trimmer, also bevelling upwards, that it may just receive the gain; and so the joist and trimmer lie even and level with the surface. This way of working is used in floors and hearths.

GAIN THE WIND, in sea-language, is to arrive on the weather-side or to windward of some other vessel in sight, when both are plying to windward, or sailing as near the wind as possible.

GAINAGE, or **GAINAGIUM**, in ancient writers, signifies the draught-oxen, horses, wain, plough, and furniture, for carrying on the work of tillage by the sokemen and villains. Gainage is the same with wainage.

GAINAGE, is also used for the land itself, or the profit raised by cultivating it.

GAINSBOROUGH, a town of Lincolnshire, 18 miles N. W. of Lincoln. Lon. O. 40. W. Lat. 53. 27. N.

GALACTOPHAGI, and **GALACTOPOTÆ**, [from *γαλακτο*, milk; *φαγω*, to eat; and *ποτος* of *πινω*, I drink,] in antiquity, persons who lived wholly on milk, without corn or any other food. Certain nations in Scythia Asiatica, as the Getae, Nomades, &c. are famous in ancient history, as galactophagi.

GALACZ, **GALASI**, or **GALATZ**, a town of European Turkey, in Bulgaria, near the Danube, 20 miles S. S. W. of Bender.

GALANGAL. See **KEMPFERIA**.

GALANTHUS, the **SNOW-DROP**; in botany, a genus of the monogynia order, and hexandria class of plants; natural order, Spahacæ. Petals three, concave; nectarium consists of three emarginated petals; stigma simple. There is but one species, *G. Nivalis*, a bulbous-rooted flowery perennial, rising but a few inches in height, and adorned at top with small tripetalous flowers of a white colour. There are three varieties, viz. the common single-flowered snow-drop, the semi-double snow-drop, and the double snow-drop. They are beautiful little plants; and are much valued on account of their early appearance, often adorning the gardens in January or February, when scarce any other flower is to be seen.

GALARDIA, a genus of the class and order syngenesia polygamia frustranea. The receptacle is chaffy; seed crowned with a five-leaved calycle; calyx, two rows of scales, almost equal. There is one species, an annual of Louisiana.

GALATA, an island near the coast of Tunis. Lon. 9. 30. E. Lat. 38. 15. N.

GALATÆA, or **GALATHÆA**, in mythology, a sea-nymph,

daughter of Nereus and Doris. She was beloved by the Cyclops Polyphemus, whom she treated with disdain; while Acis, a shepherd of Sicily, enjoyed her affection.

GALATIA, the ancient name of a province of Asia Minor, now called Amasia. It was bounded on the E. by Cappadocia, on the S. by Pamphylia, on the N. by the Euxine sea, and on the W. by Bithynia.

GALAX, in botany, a genus of the monogynia order, and pentandria class of plants. Corolla salver-shaped; calyx decaphyllous; capsule unilocular, bivalved, and elastic. One species, viz. *G. aphylla*.

GALAXIA, a genus of the monodelphia triandria class and order. Spatha one-valved; corolla one-petaled, six-cleft; tube capillary; stigma many-parted. There are two species, herbs of the Cape.

GALAXY, that long white luminous track, which seems to encompass the heavens like a girdle; and is easily perceivable in a clear night, especially when the moon does not shine. The Greeks called it *Γαλαξίας*, of *Γαλα*, *γαλακτο*, milk, and the Romans via lactea, the milky way, on account of its colour and appearance. And their poets told many fables about the spilling of Juno's milk, &c. as the cause of its whiteness. It passes between Sagittarius and Gemini, and divides the sphere into two parts; it is unequally broad; in some parts single, in others double. The ancient poets, and even philosophers, speak of the Galaxy as the road by which the heroes went to heaven. Aristotle supposed it a kind of meteor, formed of a crowd of vapours, drawn into that part by certain large stars disposed in the region of the heavens answering hereto. Others, finding that the Galaxy was seen all over the globe, that it always corresponded to the same fixed stars, and that it transcended the height of the highest planets, set aside Aristotle's opinion; placed the Galaxy in the firmament, or region of the fixed stars, and concluded it to be nothing but an assemblage of an infinite number of minute stars. Since the invention of the telescope, this opinion has been abundantly confirmed. By directing a good telescope to any part of the milky way, where before we only saw a confused whiteness, we now descry an innumerable multitude of little stars, so remote, that a naked eye confounds them. See **ASTRONOMY**.

GALBANUM, a gum-resin which issues from the stem of an umbelliferous plant, growing in Persia, and many parts of Africa. See **BUBON**. The juice is semi-pellucid, soft, tenacious; of a strong smell, and a bitterish warm taste; the better sort is in pale-coloured masses, composed of clear white tears. Galbanum agrees in virtue with gum ammoniac, but is generally accounted less efficacious in asthmas, and more so in hysterical complaints. It is an ingredient in the gum-pills, the gum-plaster, and some other official compositions.

GALBULAR, the **JACAMAR**, in natural history, a genus of birds of the order Picæ. Bill straight, very long, quadrangular, and pointed; nostrils situated near the base of the bill, and oval; tongue pointed and short; legs feathered before, down to the toes; feet formed for climbing. There are four species. *G. alcedo*, is about the size of a lark, and is of a most elegant and brilliant plumage. It is found in the damp places of the woods of Guiana and Brazil.

GALE, **THOMAS**, D. D. and F. R. S. a learned divine, born at Scruton, in Yorkshire, in 1636. He was educated at Cambridge, and afterwards chosen head-master of St. Paul's school, London; and wrote those elegant inscriptions on the monument erected in memory of the conflagration in 1666. In 1676, he was made a prebendary in St. Paul's; and being elected a F. R. S. presented a Roman urn to the society. About 1697, he gave to the new library of Trinity college, in Cambridge, a great number of Arabic MSS.; and in 1697 was admitted dean of York. He died in that city in 1702; and was interred in the cathedral, where a monument was erected to his memory. He was a great historian, one of the best Greek scholars of his age, and corresponded with the most learned men at home and abroad. He published, 1. *Historiæ Poetiæ Antiqui Scriptores*, 8vo. 2. *Opuscula Mythologica, Ethica et Physica*, in Greek and Latin, 8vo. 3. *Herodoti Historia*, in folio. 4. *Historiæ Anglicanæ Scriptores Quinque*, in folio. 5. *Historiæ Britannicæ, Saxonice, Anglo-Danicæ, Scriptores Quindecim*, in folio. 6. *Rhetores Selecti*, &c.

GALE, in sea-language, a term of various import. When the

wind blows not so hard but that a ship may carry her top-sails a-trip, (that is, hoisted up to the highest,) they say it is a loom gale. When it blows very strong, it is a stiff, strong, or fresh gale.

GALE. When two ships are near one another at sea, and there being but little wind blowing, one of them finds more of it than the other, they say that the one ship gales away from the other.

GALEA, in antiquity, a light casque, head-piece, or morrion, which came down to the shoulders, commonly of brass.

GALEASSE, a large low-built vessel, using both sails and oars, and the largest of all the vessels that make use of the latter. It may carry twenty guns, and has a stern capable of lodging a great number of marines. It has three masts, which are never to be lowered or taken down.

GALEGA, in botany, a genus of the decandria order, and diadelphia class of plants; natural order, Papilionaceæ. Calyx composed of subulated nearly equal dents or segments; legume has oblique striz, and seeds lying between them. It has nineteen species.

GALEN, **CLAUDIUS**, prince of the Greek physicians after Hippocrates, was born at Pergamus, in Asia Minor, A. D. 131. His father being possessed of a fortune, and well versed in philosophy, astronomy, geometry, and architecture, instructed his son in the first rudiments of learning, and afterwards procured him the greatest masters of the age. Galen, having finished his studies, chose physic for his profession, studied the works of Hippocrates, and at length resolved to travel, to converse with the most able physicians in all parts, and to take every opportunity of inspecting on the spot the plants and drugs of the countries through which he passed. With this view he went to Alexandria, where he staid some years; thence he travelled through Cilicia, Palestine, Crete, Cyprus, Lemnos, and the Lower Tyria; in which last places he obtained a thorough insight into the nature of the Lemnian earth, and the opobalsamum; after which he returned home by Alexandria. Galen had been four years at Pergamus, where his practice was attended with extraordinary applause, when some commotions induced him to go to Rome, where he resolved to settle: but the proofs he gave of his superior skill, added to the respect shewn him by several persons of very high rank, created him so many enemies among his brethren of the faculty, that he was obliged to quit Rome, after having resided there four or five years. He had not long returned to Pergamus, when he was recalled by the emperors Aurelius and Verus. After their death, he retired to his native country; where he died, about A. D. 200. He wrote in Greek; and is said to have composed 200 volumes, which were unhappily burnt in the temple of Peace. The best editions of those that remain, are, those printed at Basil in 1538, in five vols. and at Venice in 1625, in seven. Galen was of a weak and delicate constitution, as he himself asserts; but he nevertheless, by his temperance and skill in physic, arrived to a great age. One of his rules was, always to rise from table with some degree of appetite. He is justly considered as the greatest physician of antiquity, next to Hippocrates; and he performed such surprising cures, that he was accused of magic.

GALENIA, in botany, a genus of the digynia order, and octandria class of plants; natural order, Succulentæ. Calyx trifid; no corolla; capsule roundish, dispermous. It has two species.

GALENIC, or **GALENICAL**, in medicine, is applied to that manner of considering and treating diseases, founded on the principles of Galen, or introduced by Galen.

GALENICAL, is more frequently used as contradistinguished from chemical. The distinction of galenical and chemical was occasioned by a division of the practitioners of medicine into two sects, Galenists and Chemists, on the introduction of chemistry into medicine. The chemists, arrogating to themselves every kind of merit and ability, stirred up an opposition to their pretensions, founded on the invariable adherence of the other party to the ancient practice.

GALENICAL MEDICINES, are those which are formed by the easier preparations of herbs, roots, &c. by infusion, decoction, &c. and by combining and multiplying ingredients; while those of chemistry draw their more intimate and remote virtues by means of fire and elaborate preparations, as calcination, digestion, fermentation, &c.

GALENISTS, a denomination given to such physicians as practise, prescribe, or write, on the Galenical principles. They stand opposed to the chemists.

GALENISTS, or **GALENITES**, in church-history, a branch of Mennonites or Anabaptists, who take in several of the opinions of the Socinians, or rather Arians, touching the divinity of our Saviour.

GALEOPSIS, in botany, a genus of the gymnospermia order, and didynamia class of plants; natural order, Verticillatæ. Corolla, upper lip a little crenated or arched; the under lip bidentate, two teeth above. There are four species.

GALERICULUM, in Roman antiquity, a cap worn both by men and women, consisting of a skin, so neatly dressed with human hair, that the artificial covering could scarcely be distinguished from the natural.

GALFALLY, a town of Ireland, in Tipperary, 32 miles S. E. of Limerick.

GALICIA, a province of Spain, bounded on the N. and W. by the ocean, on the S. by Portugal, and on the E. by Asturias and Leon. The air is temperate along the coast, but in other places, cold and moist.

GALICIA, or **GUADALAXARA**, a country of Mexico, containing seven provinces. It has mines of silver and copper, and abounds with corn. The climate is temperate. Guadalaxara is the capital.

GALICIA, the modern name given to a large country in the S. of Poland, which was seized on by the late emperor Joseph II, and annexed to the Austrian dominions. It comprehends a part of Red Russia and the palatinate of Lemberg; and is separated from Hungary by the Carpathian mountains.

GALILEE, in ancient geography, a province of Judea, bounded by mount Lebanon on the N. by the Jordan and the sea of Galilee on the E. by the Chison on the S. and by the Mediterranean on the W. It was the scene of many of our Saviour's miracles; but the bounds of the country are not now well known, nor the places where many of the towns stood. It belongs to the Turks.

GALILEANS, a sect of the Jews. Their founder was one Judas, a native of Galilee, who, esteeming it an indignity for the Jews to pay tribute to strangers, raised up his countrymen against the edict of Augustus, which had ordered a taxation of all the subjects of the Roman empire. They insisted that God alone should be owned as Lord. In other respects they were of the opinion of the Pharisees; but, as they judged it unlawful to pray for infidel princes, they separated from the rest of the Jews, and performed their sacrifices apart. As our Saviour was supposed to be a native of Galilee, and his apostles were mostly Galileans, they were suspected to be of this sect; and it was on this principle, as St. Jerome observes, that the Pharisees laid a snare for him; by asking, whether it was lawful to give tribute to Cæsar; that in case he denied it, they might have an occasion of accusing him.

GALILEO, **GALILEI**, the famous mathematician and astronomer, was the son of a Florentine nobleman, and born in 1564. He had from his infancy a strong inclination to philosophy and mathematics; and made prodigious progress in these sciences. In 1592, he was chosen professor of mathematics at Padua. In 1609, having heard that Jansen had invented a glass by which objects at a distance were rendered as visible as if near, he turned his attention to the subject, and constructed a telescope, by means of which he discovered various phenomena in the heavens, not before heard of. In 1611, Cosmo II, grand duke of Tuscany, sent for him to Pisa, where he made him professor of mathematics, with a handsome salary; and soon after inviting him to Florence, gave him the office and title of principal philosopher and mathematician to his highness. He had been but a few years at Florence, before he was convinced, that Aristotle's doctrine, however ill-grounded, was held too sacred to be called in question. Having observed some solar spots in 1612, he printed that discovery in 1613, at Rome; in which, and in some other pieces, he ventured to assert the truth of the Copernican system, and brought several new arguments to confirm it. For these he was cited before the inquisition; and, after some months' imprisonment, was released upon a simple promise, that he would renounce his heretical opinions, and not defend them by word or writing. But having afterwards, in 1632, published at Florence his "Dialogues of the two greatest Systems of the World, the Ptolemaic and Copernican," he was again cited before the inquisition, and committed to the prison of that dreadful court at Rome. On June 22, N. S. 1632, the congregation convened; and in his presence pronounced sen-

tence against him and his books, obliging him to abjure his errors in the most solemn manner; committed him to the prison of their office during pleasure; and enjoined him, as a saving penance, for three years, to repeat once a-week the seven penitential psalms: reserving to themselves, however, the power of moderating, changing, or taking away altogether, or in part, the above-mentioned punishment and penance. On this sentence, he was detained a prisoner till 1634: and his *Dialogues of the System of the World* were burnt at Rome. He lived ten years after this, seven of which were employed in making still further discoveries with his telescope. But by the continual application to that instrument, added to the damage he received in his sight from the nocturnal air, his eyes grew gradually weaker, till he became totally blind in 1639. He bore this calamity with patience and resignation, worthy of a great philosopher. The loss neither broke his spirit, nor hindered the course of his studies. He supplied the defect by constant meditation: whereby he prepared a large quantity of materials, and began to dictate his own conceptions; when, wasting away by degrees, he expired at Arcetti near Florence, in January, 1642, N. S. aged 78. His discoveries and writings have rendered essential service to philosophy. From the time of Archimedes, as M. Leibnitz observed, there had been nothing done in mechanical geometry, till Galileo, who possessing an excellent judgement, and great skill in the most abstruse points of geometry, first extended the boundaries of that science, and began to reduce the resistance of solid bodies to its laws. As observed by Dr. Hutton, "He made the evidence of the Copernican system more sensible, when he shewed from the phases of Venus, like to the monthly phases of the moon, that Venus actually revolves about the sun. He proved the revolution of the sun on his axis, from his spots; and thence the diurnal rotation of the earth became more credible. The four satellites that attended Jupiter, in his revolution about the sun, represented, in Jupiter's less system, a just image of the great Solar System, and rendered it more easy to conceive how the moon might attend the earth, as a satellite, in her annual revolution. By discovering hills and cavities in the moon, and spots in the sun constantly varying, he shewed that there was not so great a difference between celestial and sublunary bodies as the philosophers had vainly imagined. "He rendered no less service to science by treating, in a clear and geometrical manner, the doctrine of motion, which has been justly called the key of nature. The rational part of mechanics had been so much neglected, that scarcely any improvement was made in it for almost 2000 years; but Galileo has given us fully the theory of equable motions, and of such as are uniformly accelerated or retarded, and of these two compounded together. He first demonstrated, that the spaces described by heavy bodies from the beginning of their descent, are as the squares of the times; and that a body, projected in any direction that is not perpendicular to the horizon, describes a parabola. These were the beginnings of the doctrine of the motion of heavy bodies, which has been since carried to so great a height by Sir Isaac Newton. In geometry, he invented the cycloid, or trochoid, though the properties of it were afterwards chiefly demonstrated by his pupil Torricelli. He invented the simple pendulum, and made use of it in his astronomical experiments: he had also thoughts of applying it to clocks, but did not execute that design. The glory of that invention was reserved for his son Vincenzo, who made the experiment at Venice in 1649; and Huygens afterwards carried the invention to perfection. Of Galileo's invention also was the machine with which the Venetians render their laguna fluid and navigable. He also discovered the gravity of the air, and endeavoured to compare it with that of water; and opened several other inquiries in natural philosophy. He was not esteemed and followed by philosophers only; but was honoured by persons of the greatest distinction of all nations. Galileo had scholars worthy of so great a master, by whom the gravitation of the atmosphere was fully established, and its varying pressure accurately and conveniently measured, by the column of quicksilver of equal weight sustained by it in the barometrical tube. The elasticity of the air, by which it perpetually endeavours to expand itself, and while it admits of condensation, resists in proportion to its density, was a phenomenon of a new kind, (the common fluids having no such property), and of the utmost importance to philosophy. These principles opened a vast field of new and useful knowledge, and explained a

great variety of phenomena, which had been accounted for in an absurd manner before that time. It seemed as if the air, the fluid in which men lived from the beginning, had been then first discovered. Philosophers were every where busy, enquiring into the various properties and their effects; and valuable discoveries rewarded their industry. Of the great number who distinguished themselves on this occasion, we cannot but mention Torricelli and Viviani, in Italy; Pascal, in France; Otto Guricke, in Germany; and Boyle, in England." Galileo wrote a number of treatises, of which the principal published during his life-time were, "A Treatise on Mechanics," "On the Balance," and "Dialogues on the Solar System;" "The Operations of the Compass, geometrical and military," 1606; "A Discourse, addressed to the Most Serene Cosmo II. Grand Duke of Tuscany, concerning the Swimming of Bodies upon, and their Submersion in, Water," 1612; "Nuncius Sidereus," 1610, of which a "Continuation," or "An Essay on the History of Galileo's last Observations on Saturn, Mars, Venus, and the Sun, &c." was afterwards collected from letters between Galileo and his correspondents; "A Letter Concerning the Trepidation of the Moon, lately discovered, inscribed to Alphonso Antonini, with Antonini's Answer," 1638; "A Discourse of the Solar Spots, &c. with Predictions and Ephemerides of the Medicean Planets," 1613; the famous Italian piece, entitled, "Il Saggiatore," written in defence of Guiducci's "Discourse on Comets," and containing a complete account of the physiology and astronomy of our author, printed in 1623; "A Letter to Prince Leopold of Tuscany, Examining the fiftieth chapter of Licetus's *Letheosporos*;" "A Letter to Christopher Greinbergerus, Concerning the Montuosity of the Moon," 1611; "Mathematical Discourses and Demonstrations Concerning two new Sciences, Relating to Mechanics and Local Motions, together with an Appendix Concerning the Centre of Gravity in some Solids, 1638, &c. The preceding articles, together with some other treatises, written either by Galileo, or by some of his disciples, in defence of his doctrines and observations, were collected and published by Menolessi, in 1656, under the title of "L'Opere de Galileo Galilei Lynceo, nobile Fiorentino," &c. in two volumes quarto. Several of these pieces were translated into English, and published by Thomas Salisbry, in his "Mathematical Collections," in two vols. folio. A volume also of his "Letters" to several learned men, and solutions of a variety of problems, were published at Bologna, in quarto. His last disciple, Vincenzo Viviani, who proved a very eminent mathematician, methodised a piece of his master's, and published it under the title of "Quinto Libro de gli Elementi d'Euclid," &c. 1674, quarto; and he also published some other pieces of Galileo, including extracts from his "Letters to a Learned Frenchman," in which the author gives an account of the works which he intended to have published, and an extract of a letter to John Camillo, a mathematician of Naples, concerning the angle of contact. Many other of Galileo's writings were unfortunately lost to the world, owing to the superstition of those to whom they were left.

GALIPAGO ISLES, several uninhabited islands in the South Sea, on both sides of the equator, near Terra Firma, belonging to Spain. Lon. between 83. 40. and 89. 30. W. Lat. from 3° to 5° S.

GALITSCH, a town of Russia, in Kostrom, 56 miles E. N. E. of Kostrom.

GALIUM, in botany, a genus of the monogynia order, and tetrandria class of plants; natural order, Stellata. Corolla monopetalous, plain; seeds two, roundish. There are forty-eight species.

G. APERINE, **CLIVERS**, or **GOOSE-GRASS**, has a square, very rough, jointed, weak stem, two, three, or four feet long, and adhesive: the branches are opposite; the joints hairy at the base: the seeds are rough; flowers white, small, few, on slender footstalks on the tops of the branches. It is common in fields by the sides of hedges, &c. The expressed juice of this plant taken internally, and the bruised leaves applied by way of poultice, are said to have been used with success as a cure for the cancer.

G. VERUM, the **YELLOW LADY'S BED-STRAW**, has a firm, erect, brown, square, stem; the leaves generally eight in each whirl, linear, pointed, brittle, and often reflex; branches short, generally two from each joint, terminating in spikes of small yellow flowers. It grows commonly in dry ground, and on roadsides.

sides. The flowers coagulate boiling milk; and the best Cheshire cheese is said to be prepared with them. The roots dye a red not inferior to madder. In the Edinburgh Medical Commentaries we have accounts of some violent scorbutic complaints being cured by the juice of this plant.

GALL, in the animal economy, the same with bile. See **BILE** and **ANATOMY**.

GALL, in natural history, signifies any protuberance, or tumor, produced by the punctures of insects on plants and trees of various kinds; but especially the quercus, or oak; cistus, or rock-rose; glechoma hederacea, or ground-ivy; salix, or willow; hieraceum, or hawkweed; salvia, or clary; veronica, or speedwell, &c. Insects deposit their eggs in the leaves or tender branches of plants, the juice of which exudes, and in a short time forms tumors around the punctures or holes. The external coat of this excrescence is dried by the air, and during the winter affords a secure shelter to the inclosed insect, while the soft inner pulp furnishes it with sustenance till the spring approaches, when the fly perforates the shell or rind, and departs. The best of these galls are those found on oak-trees, and which are thence called oak-galls; they are deposited by the cynips quercus gemma, or oak-bud-cynips. See **CYNIPS**. A small portion of galls infused in a weak solution of vitriol in water, imparts to it a purple or violet tint; which, after the whole of the colouring matter is extracted, becomes perfectly black. Considerable quantities of this drug are used in Britain, for the making of ink.

GALL, **ST.** or **ST. GALEN**, a considerable town in Switzerland, in the Upper Thurgau, 37 miles N. E. of Zurich.

GALLA, a nation of Ethiopia, originally dwelling, as Mr. Bruce supposes, under the line, and exercising the profession of shepherds, which they still continue to do. For many years, he says, they have been constantly migrating northwards, though the cause of this migration is not known. At first they had no horses; the reason of which was, that the country they came from did not allow these animals to breed; but as they proceeded northward and conquered some of the Abyssinian provinces, they soon furnished themselves with such numbers, that they are now almost entirely cavalry, and make little account of infantry in their armies.

GALLA, a town of Arabia, 24 miles S. E. of Taas.

GALLAM, a kingdom of Africa.

GALLAM, the capital of the above kingdom, is seated on the Senegal. Lon. 9. 55. W. Lat. 14. 25. N.

GALLE, or **PORT GALLE**, a sea-port town and fort on the S. W. coast of Ceylon.

GALLEON, [*galion*, Fr.] a large ship with four or sometimes five decks, employed in the Spanish West India trade. The Spaniards send annually two fleets; the one for Mexico, which they call the flota; and the other for Peru, which they call the galleons. By a general regulation made in Spain, it has been established; that there should be twelve men of war and five tenders annually fitted out for the armada or galleons; eight ships of 600 tons burden each, and three tenders, one of 100 tons, for the island Margarita, and two of 80 each, to follow the armada; for the New Spain fleet, two ships of 600 tons each, and two tenders of 80 each; and for the Honduras fleet, two ships of 500 tons each: and in case no fleet happened to sail any years, three galleons and a tender should be sent to New Spain for the plate. They sail from Cadiz in January, that they may arrive at Porto Bello in April; where, the fair being over, they may take aboard the plate, and be at Havannah with it about the middle of June; where they are joined by the flota that they may return to Spain with the greater safety.

GALLEOT. See **GALLIOT**.

GALLERY, in gardening, an ornament made with trees of different kinds. Galleries are very common in the French gardens, but are seldom introduced into the British ones, especially since the taste for clipping trees has been exploded.

GALLERY, in a ship, that beautiful frame, which is made in the form of a balcony, at the stern of a ship without board; into which there is a passage out of the admiral's or captain's cabin, and is designed for the ornament of the ship.

GALLERY, in fortification, a covered walk across the ditch of a town, made of strong beams covered with planks, and loaded with earth: sometimes it is covered with raw hides, to defend it from the artificial fires of the besieged.

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GALLERY OF A MINE is a narrow passage or branch of a mine carried on under ground to a work designed to be blown up.

GALLEYS, low flat-built vessels, furnished with one deck, and navigated with sails and oars. The largest sort are employed only by the Venetians. They are commonly 162 feet long above, and 133 feet by the keel: 32 feet wide, with 23 feet length of stern-post. They are furnished with three masts, and 32 banks of oars; every bank containing two oars and every oar being managed by six or seven slaves, who are usually chained thereto. In the fore-part they have three little batteries of cannon, of which the lowest is of two 36 pounders, the second of two 24 pounders, and the uppermost of two 2 pounders: three 18 pounders are also planted on each quarter. The complement of men for one of these galleys is 1000 or 1200. They are esteemed very convenient for bombarding or making a descent upon an enemy's coast, as drawing but little water; and having by their oars frequently the advantage of a ship of war, in light winds or calms, by cannonading the latter near the surface of the water; by scouring her whole length with their shot, and at the same time keeping, on her quarter or bow, so as to be out of the direction of her cannon. Galley is the name also of an open boat, rowing six or eight oars, and used on the Thames by Custom-house-officers, press-gangs, and also for pleasure. The same word denotes the kitchen of a ship of war, or the place where the grates are put up, fires lighted, and the victuals generally dressed.

GALLEY-SLAVE, a person condemned, in France, to work at the oar on board a galley, being chained to the deck.

GALLEY-WORM, in zoology. See **IVULUS**.

GALL FLY, in entomology. See **CYNIPS**.

GALLI, in antiquity, a name given to the priests of Cybele, from the river Gallus in Phrygia. They were Eunuchs and Phrygians, and in their solemn processions danced, bawled, drummed, cut and slashed themselves, playing upon timbrels, pipes, cymbals, &c. and driving about an ass loaded with the sacred trumpery of their goddess.

GALLI, five small desolate islands on the coast of the Principato Citra of Naples. They are supposed to be the Syrenusæ, or islands once inhabited by the Syrens, which Ulysses passed with so much caution and hazard.

GALLIA, in ancient geography, a large country of Europe, called Galatia by the Greeks. The inhabitants were called Galli, Celtæ, Celtiberi, and Celtoscythæ. Ancient Gaul was divided into four different parts by the Romans, called Gallia Belgica, Narbonensis, Aquitania, and Celtica. Besides these grand divisions there is often mention made of Gallia Cisalpina or Citerior, and Transalpina or Ulterior, which last comprehended the whole of Gaul, properly so called, as possessed by the ancient Gauls. The inhabitants were great warriors, and overcame the Roman armies, took the city of Rome, and invaded Greece in different ages.

1. **GALLIA AQUITANICA** contained the late provinces of Poitou, Saintonge, Guienne, Berry, Limosin, Gascony, Auvergne, &c. and was situated between the Garumna, the Pyrenean mountains, and the ocean.

2. **GALLIA BELGICA** was the largest province, bounded by Germany, Gallia Narbonensis, and the German ocean; and contained the modern countries of Alsace, Lorraine, Picardy, with part of the Low Countries, of Champagne, and of the isle of France.

3. **GALLIA CELTICA**, or **LUGDUNENSIS**, was bounded by Belgium, Gallia Narbonensis, the Alps, and the ocean. It contained the countries heretofore known by the names of Lyonnois, Touraine, Franche Comté, Senenois, Switzerland, and part of Normandy. It was also called Comata, because the people suffered their hair to grow to an uncommon length.

4. **GALLIA CISALPINA**, or **CITERIOR**. By these names the Romans understood that part of Gaul which lies in Italy, on this side of the Alps, in regard to the inhabitants of Rome. They also stiled it Gallia Togata, because the Roman gowns called togæ were worn by the people.

5. **GALLIA CISPADANA** in ancient geography, was applied to a part of Italy conquered by some of the Gauls; and meant the country on this side of the Po, with respect to Rome. See **CISPADANA**.

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6. **GALLIA**

6. *GALLIA NARBONENSIS*, which contained the provinces lately called Languedoc, Provence, Dauphiné, and Savoy, was bounded by the Alps and Pyrenean mountains, by Aquitania, Belgium, and the Mediterranean. *Gallia Narbonensis* was called *Braccata*, on account of the peculiar covering of the inhabitants for their thighs.

7. *GALLIA TRANSALPINA*, or *ULTERIOR*, was the name given by the Romans to that part of Gaul, which lay beyond the Alps, in regard to Rome.

8. *GALLIA TRANSPADANA*, was the name given to that part of Italy, conquered by the Gauls, which lay beyond the Po, in respect of Rome.

GALLIARD, or *GALLIARDA*, a sort of dance anciently in great request, consisting of very different motions and actions, sometimes proceeding terra a terra, or smoothly along, sometimes capering, sometimes along the room, and sometimes across.

GALLIAMBIC VERSE, in ancient poetry, a verse consisting of six feet, viz. an anapaest or spondee; an iambus, or an anapaest, or a tribrach; an iambus; a dactyl; an anapaest.

GALLIC ACID, in chemistry, an acid obtained from the nut-gall. In an infusion of galls made with cold water, a sediment is formed which on examination is found to have a crystalline form and an acid taste. By letting an infusion of galls remain a long time exposed to the air, and removing now and then the mouldy skin which formed on its surface, a large quantity of this sediment was obtained; which beingedulcorated with cold water, redissolved in hot water, filtrated and evaporated very slowly, yielded an acid salt in crystals as fine as sand. Mr. Davy obtained the gallic acid in a state of considerable purity by the following method: Boil for some time a mixture of carbonate of barytes and infusion of nut-galls. A bluish green liquid is obtained, which consists of a solution of gallic acid and barytes. Filter and saturate with diluted sulphuric acid. Sulphate of barytes is deposited in the state of an insoluble powder, and a colourless solution of gallic acid remains behind. Gallic acid, when pure, is in the form of transparent plates or octahedrons. Its taste is acid, and somewhat astringent; and when heated it has a peculiar and rather unpleasant aromatic odour. It is soluble in one and a half parts of boiling water, and in twelve parts of cold water. When this solution is heated, the acid undergoes a very speedy decomposition. Alcohol dissolves one-fourth of its weight of this acid at the temperature of the atmosphere. When boiling hot, it dissolves a quantity equal to its own weight. It is insoluble in ether. When exposed to the action of heat, it is sublimed without alteration: but a strong heat decomposes it in part, and converts it into an acid water, carbureted hydrogen gas, carbonic acid gas, oil, and charcoal. It combines with alkaline bodies, making with them compounds called gallates. It occasions a precipitate when poured into solutions of glucina, yttria, and zircon, in acids, which distinguishes these from the other earths, none of which are precipitated from their solutions by gallic acid. Upon the metallic solutions gallic acid acts with great energy, changing the colour, and producing precipitates in many of them. Hence it is frequently used as a re-agent to detect the presence of metallic bodies. It is composed of oxygen, carbon, and hydrogen, but the proportions of each have not been accurately ascertained.

GALLINÆ, in ornithology, the fifth order of birds: the upper mandible is channelled, extending with a margin above the lower, and a little bowed; the nostrils are covered with a cartilaginous membrane; they live upon grain, dust themselves, make an artless nest, and lay many eggs. Under this order are comprehended the peacock, pheasant, turkey, the common dunghill-cock, partridge, grouse, dodo, curisspa, &c.

GALLINARA, an island on the coast of Genoa, 10 miles S. of Finale.

GALLING OF A HORSE'S BACK, a disorder, occasioned by heat, and the chafing or pinching of the saddle. To prevent it, some take a hind's skin well garnished with hair, and fit it neatly under the pannel of the saddle, so that the hairy side may be next the horse. When a horse's back is galled upon a journey, take out a little of the stuffing of the pannel over the swelling, and sew a piece of soft white leather on the inside of the pannel; anoint the part with salt butter, and every evening wipe it clean, rubbing it till it grow soft, anointing it again with butter, or, for

want of that, with grease: wash the swelling or hurt every evening with cold water and soap; and strew it with salt, which should be left on till the horse be saddled in the morning.

GALLIOPOLIS, or *GALLIPOLIS*, a post-town of the United States, in the North Western Territory, seated on the Ohio, 140 miles E. of Columbia, and 559 S. W. of Philadelphia.

GALLIOT, [*galliotte*, French,] a small galley designed only for chase, carrying only one mast, and two or three patteringoes; it can both sail and row, and has sixteen or twenty oars. All the seamen on board are soldiers, and each has a musket by him on quitting his oar.

GALLIPOLI, a sea-port town of Naples, in the province of Otranto, 21 miles W. of Otranto.

GALLIPOLI, a sea-port town of European Turkey, in the province of Romania, seated at the mouth of the sea of Marmora. Lon. 26. 59. E. Lat. 40. 24. N.

GALLIUM, in botany. See *GALIUM*.

GALLO, an island of the South Sea, near the coast of Peru. Lon. 88. 0. W. Lat. 2. 30. N.

GALLO-GRÆCIA, a country of Asia Minor, near Bithynia and Cappadocia.

GALLON, a measure of capacity both for dry and liquid things, but differs according to the quality of the thing measured: For instance, the wine-gallon contains 231 cubic inches, and holds 8 lb. avoirdupois of pure water; the beer and ale gallon contains 281 solid inches, and holds 10 lb. 3½ ounces avoirdupois of water; and the gallon for corn, meal, &c. 272½ cubic inches, and holds 9 lb. 13 ounces of pure water.

GALLOON, in commerce, a narrow thick kind of ferret, or lace, used to edge or border cloaths, sometimes made of wool, and at others of gold or silver.

GALLOP, [*galoper*, Fr. from *καλπαζειν*,] in the manege, a motion of a horse that runs at full speed, in which making a kind of leap forwards, he lifts both his fore-legs almost at the same time; when these are in the air, just upon the point of touching the ground, he lifts both his hind legs almost at once.

GALLOPER, in artillery, is the name of a carriage, which serves for a pound and a half-gun. This carriage has shafts so as to be drawn without a limber, and is thought by some to be more convenient and preferable to other field-carriages; and it may likewise serve for our light three and six pounders.

GALLOWAY, in geography, a county of Scotland, which is divided into two districts; the western, called the Upper, and the eastern, Lower.

1. *GALLOWAY, LOWER*, or the Stewartry of Kirkcudbright.

2. *GALLOWAY, UPPER*, or the county of Wigton.

GALLOWAY, MULL OF, the south cape or promontory of all Scotland, in the county of Galloway, on the Irish sea.

GALLOWES, [*gealgo*, Sax. *galge*, Dut. which some derive from גלגל, high, others from *gallu*, Welsh, power: but it is probably derived like *gallow*, to fright, from *agalwan*, the gallows, being the great object of legal terror,] a beam laid over two posts, on which malefactors are hanged.

GALLOWES, among our ancestors, was called *furca*, fork; a name by which it is still denominated abroad, particularly in France and Italy. In this latter country, the reason of the name still subsists; the gallows being a real fork drove into the ground, across the legs whereof is laid a beam, to which the rope is tied.

GALLY, in printing, a frame into which the compositor empties the lines out of his composing-stick, and in which he ties up the page when it is completed. The gally is formed of an oblong square board, with a ledge on three sides, and a groove to admit a false-bottom, called a gally-slice.

GALOPINA, in botany, a genus of the tetrandria digynia class and order. Calyx none; corolla four-cleft; seeds two, naked. There is one species, viz. *G. circeoides*, a native of the Cape of Good Hope.

GALWAY, a county of Ireland, in the province of Connaught, bounded by Clare, Tipperary, King's County, Roscommon, and the sea.

GALWAY, the capital of the above county, 96 miles W. of Dublin. Lon. 9° W. Lat. 53° 18' N.

GALVANI, LEWIS, an eminent physiologist, born at Bologna.

logna in 1737. From his youth he was strongly attached to the Roman Catholic religion. He studied medicine under Beccari, Jacconi, Galli, and professor Galeazzi, whose daughter he married. He was created lecturer on anatomy in the university of Bologna in 1762. He soon acquired a very high reputation as an anatomist and physiologist, and great crowds attended his lectures. His extensive knowledge, and industry in making experiments led to a discovery, from which he had the honour of giving his name to a new subject of philosophical inquiry. Happening to have some frogs lying on the table of his laboratory, skinned for the purpose of making soup as a restorative for his wife, who was in a declining state of health, one of his assistants chanced to bring the point of a scalpel near the crural nerves of a frog, which was near the conductor. Instantly the muscles of the limb were agitated with strong convulsions. This was observed by Madame Galvani, a woman of quick understanding, and a scientific turn, and she immediately mentioned it to her husband. He repeated

the experiment; and soon found that the convulsion only took place when a spark was drawn from the conductor, at the time the scalpel was in contact with the nerve. This induced him to go through a series of experiments, which have laid the foundation of Galvanism. Galvani was a man of an amiable character in private life, and possessed of great sensibility. The death of his wife in 1790, threw him into a profound melancholy. On refusing to take the civic oath exacted by the new constitution of the Cisalpine Republic, he incurred the deprivation of his posts and dignities. A prey to melancholy, and reduced almost to indigence, he retired to the house of his brother James, a man of very respectable character, where he indulged his grief. The republican governors, probably ashamed of their conduct towards such a man, passed a decree for his restoration to his professional chair and its emoluments; but it was then too late. He died in 1798, on November 5, aged sixty, being much lamented by his friends and the public.

GALVANISM.

GALVANISM, (so called from Dr. Galvani, the discoverer,) that branch of philosophy which investigates and explains the phenomena arising from the action or influence of certain bodies so disposed as to form a continued chain, or circle of communication with each other. Dr. Galvani was led to the discoveries, which gave rise to this department of science, by an incidental circumstance, mentioned in the last article, which shewed the effects of a small quantity of electricity on the nerves and muscles of a frog. From a series of experiments on this subject, principally performed on dead frogs, he found that a small quantity of electricity is capable of bringing the muscles into action, even after the animal has been dead a considerable time. He also found that independent of any apparent electricity, the same motions may be produced in the dead animal, or even in a detached limb, merely by making a communication between the nerves and the muscles, with substances that are conductors of electricity. If the circuit of communication consists of non-conductors of electricity, as glass, sealing-wax, and the like, no motion will take place. Similar experiments were also successfully instituted upon other animals; and as the power seemed to be inherent in the animal parts, those experiments, or the power which produces the motion of the muscles in those experiments, were denominated animal electricity. But it being now fully ascertained, that by the mere contact of metallic and other conducting substances, some electricity is generated, it is evident that the muscular motions in the above-mentioned experiments are produced by that electricity. Dr. Galvani, in making his experiments, used to skin the legs of a frog recently dead, and to leave them attached to a small part of the spine, but separated from the rest of the body. Any other limb may be prepared in a similar manner; viz. the limb is deprived of its integuments, and the nerve which belongs to it is partly laid bare. If the limbs thus prepared, for instance the legs of a frog, are situated so that a little electricity may pass through them, be it by the immediate contact of an electrified body, or by the action of electric atmospheres (as when the preparation is placed within a certain distance of an electrical machine, and a spark is taken from the prime conductor); the prepared legs will be instantly affected with a kind of spasmodic contraction, sometimes so strong as to jump a considerable way. When the electricity is caused to pass through the prepared frog by the immediate contact of the electrified body, a much smaller quantity of it is sufficient to occasion the movements, than when it is made to pass from one conductor to another, at a certain distance from the prepared animal. The movements are much stronger when the electricity is caused to pass through a nerve to the muscle or muscles, than through any other part. The sensibility of the prepared animal is greatest at first, but it diminishes by degrees till it

vanishes entirely. Animals with cold blood, and especially frogs, retain that sensibility for several hours, sometimes even for a day or two. With other animals the sensibility does not last long after death, and sometimes not above a few minutes. The like movements may be produced in the prepared animal without the aid of any apparent electricity. In an animal recently dead, detach one end of a nerve from the surrounding parts, taking care to cut it not too near its insertion into the muscle; remove the integuments from over the muscles which depend on that nerve; take a piece of metal, as a wire, and touch the nerve with one extremity of it, and the muscles with its other extremity; on doing which you will find that the prepared limbs move in the same manner as when some electricity is passed through them. This, however, is not the most effectual way of forming the communication; yet it will generally succeed, and the experiment will answer whether the preparation be laid upon conductors or upon electrics. If the communication between the nerve and the muscle be formed by the interposition of non conductors of electricity, such as glass, sealing-wax, &c. then no movements will take place. When the application of the metal or metals is continued upon the parts, the contractions will cease after a certain time, and on removing the metal, seldom, if ever, any contraction is observed. The conducting communication between the muscle and the nerve may consist of one or more pieces, and of the same, or much better, of different bodies connected together, as metals, water, a number of persons, and even wood. But it must be observed, that the various bodies, which form this circuit, must be placed in full and perfect contact with each other, which is done by pressure, or by the interposition of water, &c. The less perfect conductors will answer only at first, when the prepared animal is vigorous; but when the power begins to diminish, then the more perfect conductors will only answer, and even these will produce various effects. The most effectual way that has hitherto been discovered of producing those movements in prepared animal parts is by the application of two metals, of which silver and zinc seem upon the whole to be best, though silver and tin, or copper and zinc, and other combinations, are not much inferior to them. If part of the nerve proceeding from a prepared limb is wrapped up in a bit of tin-foil, or only laid upon zinc, and a piece of silver laid with one end upon the bare muscle, and with the other upon the above-mentioned tin or zinc, the motion of the prepared limb will be very vigorous. The two metals may be placed not in contact with the preparation, but in any other part of the circuit, which may be completed by means of other conductors, as water, &c. The best preparation for this experiment is made in the following manner. Separate with a pair of scissors the head and upper extremities of a frog from the rest of the body. Open

the integuments and muscles of the abdomen, and remove the entrails, by which means you will lay bare the crural nerves. Then pass one blade of the scissors under the nerve, and cut off the spine with the flesh close to the thighs, by which means the legs will remain attached to the spine by the nerves alone. This done, leave a small bit only of the spine attached to the crural nerves, and cut off all the rest. Thus you will have the lower limbs G, H, fig. 1, Plate LXXIX, of the frog adhering to the bite of spine A B, by means of the crural nerves C, D. These legs must be flayed in order to lay bare the muscles; and a bit of tin-foil should be wrapped round the spine A B. With this preparation the experiment may be performed in various ways, but the two which follow are the best. Hold the preparation by the extremity of one leg, the other leg hanging down, with the armed bundle of nerves and spine lying upon it. In this situation interpose a piece of silver, as a half-crown, between the lower thigh and the nerves, so that it may touch the former with one surface, and the metallic coating of the latter with the other surface, or with its edge; and you will find that the hanging leg will vibrate very powerfully, sometimes so far as to strike against the hand of the operator, which holds the other leg. Otherwise, place two wine-glasses, both full of water, contiguous to each other, but not actually touching. Put the thighs and legs of the preparation in the water of one glass, and laying the nerves over the edges of the two glasses, let the bit of spine with its armour (viz. tin-foil) touch the water of the other glass. Things being thus prepared, if you form the communication between the waters of the two glasses, by means of silver, or put the fingers of one hand into the water of the glass that contains the legs, and holding a piece of silver in the other, you touch the coating of the nerves with it, you will find that the prepared legs move so powerfully as sometimes to jump fairly out of the glass. Different metals, properly disposed were soon found to affect several of the senses in a remarkable manner. Let a man lay a piece of metal, as zinc, upon his tongue, and a piece of some other metal, as silver, under the tongue; on forming the communication between those two metals, either by bringing their outer edges in contact, or by the interposition of some other piece of metal, he will perceive a peculiar sensation, a kind of irritation, accompanied with a sort of cool and subacid taste, not exactly like, and yet not much different from, that which is produced by artificial electricity. The sensation seems to be more distinct when the metals are of the usual temperature of the tongue. The silver or gold may be applied to any other part of the mouth, to the nostrils, to the ear, or to other sensible parts of the body, whilst the zinc is applied to the tongue; and on making the communication between the two metals, the taste will be perceived upon the tongue. The effect is rather more remarkable when the tongue touches the zinc in a small part, and the silver in a great portion of its surface, than vice versa. Instead of the tongue, the two metals may also be placed in contact with the roof of the mouth, as far back as possible; and on completing the communication, the taste or irritation will be perceived. Different persons are variously affected by this application of metals; with some the sensation or taste is so slight as to be hardly perceived, whilst with others it is very strong, and even disagreeable. Some persons feel merely a pungency, and not properly a taste. In order to affect the sense of sight by means of metals, let a man in a dark place put a slip of tin-foil upon the bulb of one of his eyes, and let him put a piece of silver, as a spoon or the like, in his mouth. On completing the communication between the spoon and the tin-foil, a faint flash of white light will appear before his eyes. This experiment may be performed in a more convenient manner, by placing a piece of zinc between the upper lip and the gums, as high up as possible, and a silver piece of money upon the tongue; or else by putting a piece of silver high up in one of the nostrils, and a piece of zinc in contact with the upper part of the tongue; for in either case the flash of light will appear whenever the two metals are made to communicate, either by the immediate contact of their edges, or by the interposition of other good conductors. By continuing the contact of the two metals, the appearance of light is not continued, it being only visible at the moment of making the contact, and sometimes, though rarely, at the instant of separation: it may therefore be repeated at pleasure, by disjoining, and again connecting, the two metals. When the eyes are in a state of inflammation, the appearance of light is much stronger. When the science was advanced no farther than

the knowledge of the above-mentioned facts, it was doubtful whether the convulsions of prepared animal limbs, and the sensations which are produced by the application of metallic substances, were owing to some electrical property peculiar to the animal parts, which might perhaps be conducted through the metals from one part to the other; or to a small quantity of electricity, which might be supplied by the metals themselves. The latter supposition however was soon verified by the result of various experiments, which prove in the most convincing manner that electricity is produced by the mere contact, not only of metallic substances, but likewise of other bodies. The electricity thus produced by the mere contact of two bodies is so very small as not to be perceived without great care, and without using some of those artifices for discovering small quantities of electricity, which have been mentioned above. But the discoveries of the ingenious Mr. Volta have shewn a method of increasing that electricity to a most extraordinary degree. The action of metallic substances upon the organs of living, or of recently dead animals, has been fully manifested by the above-mentioned discoveries of Galvani and others: but, previously to those discoveries, a variety of facts, frequently asserted, imperfectly known, and often disbelieved, indicated a peculiar action arising from a combination of different metallic bodies in certain cases. It had been long asserted, that when porter (and some other liquors also) is drunk out of a pewter-pot, it has a taste different from what it has when drunk out of glass or earthenware. It has been observed, that pure mercury retains its metallic splendour during a long time; but its amalgam with any other metal is soon tarnished or oxidated. The Etruscan inscriptions, engraved upon pure lead, are preserved to this day; whereas some medals of lead and tin, of no great antiquity, are much corroded. Works of metal, whose parts are soldered together by the interposition of other metals, soon tarnish about the places where the different metals are joined. When the copper-sheeting of ships is fastened on by means of iron nails, those nails, but particularly the copper, are readily corroded about the place of contact. It had been observed that a piece of zinc might be kept in water for a considerable time, with hardly oxidating at all; but that the oxidation would soon take place if a piece of silver happened to touch the zinc, whilst standing in water. The discoveries of Galvani induced many able philosophers to repeat the experiments on this subject; among whom Volta, Aldini, Valli, and Dr's. Monro, Fowler, and Creve, particularly distinguished themselves, and fully confirmed the truth of the effects. Galvani had supposed that these phenomena were produced by the electricity of the animal conveyed between the nerves and muscles through the conductor applied. This hypothesis was successfully opposed by Volta, who made it evident, that the electricity is excited by means of the contact of the different substances, and that they do not act merely as conductors. This view of the subject led the ingenious Volta to the discovery of the pile, called the Voltaic pile, by which the Galvanic influence may be extended to almost any degree. Volta invented two forms of this instrument represented in fig. 16, and 17, and to be described in this article. Volta transmitted an account of this truly admirable discovery, to the Royal Society London, soon after it was made. Several experiments were soon made with this apparatus, by the philosophers of this country; the first of any note were performed by Messrs. Nicolson and Carlisle. Mr. Cruickshank of Woolwich, paid considerable attention to this subject, and to him we are indebted for the discovery of the Galvanic battery or trough, fig. 19, being a much more convenient form of the Voltaic pile. It was soon found from repeated experiments that the pile or battery performed the parts of a powerful agent in chemistry, and water; sulphuric acid, &c. were decomposed by it. Mr. Davy, professor of chemistry at the Royal Institution, discovered that the electricity is produced by a chemical action of the different substances on each other, and that the effect is greater or less as this action is so; and that therefore two dissimilar metals are not essential to the Galvanic process. This ingenious and truly indefatigable philosopher has at length, by the application of his principle, succeeded in the decomposition of the fixed alkalis and some of the earths, which had before been ranked among the simple bodies. This brilliant discovery appears to open an extensive field for further investigations and acquisitions to our stock of knowledge. The identity, however, of the Galvanic and electric fluid had been disputed by many philosophers,

philosophers, till all doubt was removed by the experiments of Dr. Wollaston, who decomposed water, and produced several other Galvanic effects, by common electricity, which before had not been attempted, and which had been considered as objections to the theory which considers the Galvanic and electric fluids to be the same; so that the principal difference between electricity and Galvanism consists in the mode of exciting, accumulating, and applying the fluid. From the various researches of philosophers the following principles have been established:

1. In common electricity the fluid is excited by the rubbing of an electric or non-conductor, and without the electric no effect of this nature can be produced: in Galvanism the fluid is excited by the conductor alone, without the intervention of electrics, being evolved by the chemical agency of the different substances employed. For the more easily understanding of Galvanic operations, the conductors of electricity have been divided into two classes. 1. Dry and good conductors as metals and charcoal. 2. Water and other oxidating fluids, and the substances which contain those fluids, being the less perfect conductors; this second class may be subdivided into species.

2. To produce the Galvanic action, three different substances at least, which are conductors of electricity, must be placed in contact, so as to form a circuit from one to another; for no sensible effect is produced from two conductors, nor from three when the communication between any two of them is broken by an electric: hence such a combination of three different conductors is called a simple Galvanic circle. This circle may be variously formed: thus if a liquid, as diluted muriatic acid, be put into the vessel A B, fig. 2, and two wires inserted through the cork at B as the wire *z* of zinc, and the wire *c* of platina, silver, or copper, while the wires remain separated at the top no action takes place on the wire *c*, but as soon as the circuit is completed by bringing the wires into contact at the top, the Galvanic action is perceived by the evolution of gas from the wire *c*; separate the wires the effect ceases, connect them again and it is renewed. Thus we see that the circuit must be completed, in order to occasion these striking phenomena, as here the wire *z* communicates with the liquid, the liquid with the wire *c*, and the wire *c* again with the wire *z*, forming, as above stated, a simple Galvanic circle. In like manner if the tube A B, fig. 3, be filled with a liquid, and wires of different metals be inserted through the corks A and B, and these be made to communicate at C G, the circle will be formed, and the like appearances will ensue. These effects will likewise take place if the wires, instead of being brought into contact, be connected by any good conductor, which has no particular chemical action on the others. When the circle is formed as above by two conductors of the first class and one of the second, it is called a Galvanic circle of the first order, but when two of the conductors are of the second class, and one of the first, a Galvanic circle of the second order. Thus let one of the glass-vessels, A B, fig. 4, be filled with diluted nitrous acid, and the other with water, and connected by the copper wire *ab*, a simple Galvanic combination is formed of the second order. If one extremity of a prepared frog be placed in one of the vessels, when the other extremity is brought into contact with the liquid of the other vessel, convulsions will take place. The combination would be more powerful if a solution of the sulphuret of potash be put in the glass-vessel B D, fig. 20, and a silver cup, or salt-cellar A, nearly filled with diluted nitric acid, be placed within it, the communication between the liquids being formed by the prepared frog, the convulsions are strongly excited by the Galvanic influence. If the three conductors be all of the first class, or all of the second, then the effect is seldom sensible. In this case such conductors of the second class as differ more from each other, are more likely to produce a sensible effect than those of the first class. But a proper active simple combination must consist of three different bodies; viz. of one conductor of one class, and two different conductors of the other class. Thus (denoting the bodies of the first class by means of large capital letters, and those of the second class by small letters) the combinations of fig. 5 and 6, are active; but those of fig. 7, 8, 9, 10, and 11, are not active; because that of fig. 7, 8, or 9, consists of two bodies only, and that of fig. 10, or 11, consists of three bodies, of which two are of the same sort, and of course act as a single body. In a single active Galvanic combination, or as it is commonly called, in a simple Galvanic circle, the two bodies of one class must touch each other in one or more

points, at the same time that they are connected together at other points by the body of the other class. Thus, when a prepared frog is convulsed by the contact of the same piece of metal in two different places; then the fluids of those parts, which must be somewhat different from each other, are the two conductors of the second class, and the metal is the third body, or the conductor of the first class. If two metals are used, then the fluids of the prepared animal, differing but little from each other, may be considered as one body of the second class. Thus also, when a person drinks out of a pewter mug, the saliva or moisture of his under lip is one fluid or one conductor of the second class, the liquor in the mug is the other, and the metal is the third body, or conductor of the first class.

3. It seems to be indispensably requisite, that in a simple Galvanic circle, the conductor or conductors of one class should have some chemical action upon the other conductor or conductors; without which circumstance the combination of three bodies will have either no Galvanic action at all, or a very slight one. Farther, the Galvanic action seems to be proportionate to the degree of chemical agency; which seems to shew that such chemical action is the primary cause of the electric phenomena. The most active circles of the first order, are two solids of different degrees of oxidability and a fluid capable of oxidating at least one of the solids. Thus gold, silver, and water, do not form an active Galvanic circle; but the circle will become active if a little nitric acid, or any fluid decomposable by silver, is mixed with the water. A combination of zinc, silver, and water, forms an active Galvanic circle; and the water is found to oxidate the zinc, provided the water holds some atmospherical air, and especially if it contains oxygen gas. But zinc, silver, and water containing a little nitric acid, form a more powerful Galvanic circle, the fluid being capable of acting both upon the zinc and upon the silver. The most powerful Galvanic combinations of the second order, are when two conductors of the second class have different chemical actions on the conductors of the first class, at the same time that they have an action upon each other. Thus copper, or silver, or lead, with a solution of an alkaline sulphuret, and diluted nitrous acid, forms a very active Galvanic circle.

The following tables contain a list of the best combination, beginning with the most powerful, and proceeding in order.

Table of Galvanic circles of the first order, viz. which consist of two conductors of the first class, and one of the second.

Zinc with gold, or charcoal, or silver, or copper, or tin, or iron, or mercury; and water containing a small quantity of any of the mineral acids.

Iron, with gold, or charcoal, or silver, or copper, or tin, and a weak solution of any of the mineral acids, as above.

Tin, with gold, or silver, or charcoal, and a weak solution of any of the mineral acids, as above.

Lead, with gold, or silver, and a weak acid solution, as above.

Any of the above metallic combinations, and common water, viz. water containing atmospherical air, or especially water containing oxygen air.

Copper with gold, or silver, and a solution of nitrate of silver and mercury; or the nitric acid; or the acetous acid.

Silver, with gold, and the nitric acid.

Table of Galvanic circles of the second order, viz. which consist of one conductor of the first class, and two of the second.

Charcoal, or	with water, or with	and a solution of ni-
Copper, or	a solution of any	trous acid, or oxyge-
Silver, or	hydrogenated alka-	nated muriatic acid,
Lead, or	line sulphurets, ca-	&c. capable of act-
Tin, or	pable of acting on	ing upon all the me-
Iron, or	the first three me-	tals.
Zinc,	tals only;	

The action of a simple Galvanic circle seems to be in some measure dependent upon the quantity of surface of contact between the acting bodies. A higher temperature, within certain limits, renders the activity of the circle greater than a lower temperature. The activity of a Galvanic circle is not altered by the interposition of such conductors as have no action upon the adjoining conductors of the circle. Thus if a circle consists of zinc, gold, and water; and if you interpose a piece of iron, or of silver, or both, between

between the zinc and the gold; the activity of the circle will not be altered. Hence it appears that the action of a Galvanic circle may be conveyed through extraneous conductors to a considerable distance; but it must be observed, that the activity is weakened by the great length of the conductors, especially if they are of an imperfect nature. 4. When the three bodies which form a Galvanic circle of the first order are laid one upon the other, but the lower and the upper one do not touch each other; then these two extremes are in opposite electric states, viz. the extremity which is next to that metallic surface that touches the body of the second class, is positive, and the opposite extremity is negative. Thus let copper, zinc, and moistened leather, be laid one upon the other, as in fig. 12, and the upper end W, viz. the wetted leather, will be found possessed of positive electricity; whilst the lower end C, or the copper, will be found negative. 5. The Galvanic effects may be increased to almost any degree, by connecting several of the above-mentioned active combinations, or by a repetition of the same simple Galvanic combination (the most active simple combinations forming the most powerful batteries, and vice versa) provided the simple combinations are disposed so as not to counteract each other. Those batteries are said to be of the first or of the second order, according as the simple combinations, of which they consist, are of the first or of the second order. Thus, if a piece of zinc is laid upon a piece of copper, and a piece of moistened card upon the zinc; then a similar arrangement of three other such pieces laid upon them, and a third arrangement upon this, &c. all in the same order; the whole will form a battery of the first order. But if the arrangement be made by connecting a piece of copper with a piece of cloth moistened with water; the latter with a piece of cloth moistened with a solution of sulphate of potass, and this again with another piece of copper, &c. the whole will form a battery of the second order. The above-mentioned restriction, viz. that the parts of a battery must not counteract each other, will be easily understood by considering that every simple, but interrupted Galvanic combination, has a positive and a negative end; or that in every complete Galvanic circle, the electric fluid circulates in one way only. Thus, if two simple combinations are disposed as in fig. 14, this arrangement will not have any Galvanic power, because the actions of the two simple combinations, or the two currents of electricity, are opposed to each other; the two positive ends being called *p*, and the two negative ends *n*. But if those fixed bodies are disposed as in fig. 15, then the combination will be very active; because, according to the hypothesis, the direction of the electric fluid in each simple arrangement tends the same way, and probably the one accelerates the other. What has been said above of the arrangement of two simple Galvanic combinations, must be likewise understood to hold good with respect to the connection of any number of the same; viz. that they must not counteract each other; or if a certain number of them counteract each other, then the remaining only form the active part of the battery. For instance, if a battery consists of 40 simple combinations, and if 12 of them are placed in a direction contrary to the others; then these 12 will counteract 12 others, and of course the whole battery will have no more power than if it consisted of 16 simple combinations properly disposed. This points out a method of comparing the powers of two batteries; for if those batteries are connected in an inverted order, viz. the positive end of one to touch the negative end of the other; then, on connecting the two other extremities, or on applying them to proper instruments, the whole power will be annihilated, if the separate batteries had equal power; otherwise the power of the whole will be the excess of the power of the most powerful battery above that of the weakest; and the direction, viz. its being positive or negative, will shew to which battery it belongs. It must be observed, with respect to the inactive arrangement of fig. 14, that if one of the separate bodies Z, is removed, then the remaining five bodies will form an active combination; for in that case, W, become one body, and S, S, likewise act as one body. It is almost superfluous to observe, that (as has been said with respect to simple circles) in a Galvanic battery the interposition of conductors that have no particular action, or of the conductors of the same class as the adjoining bodies, does not alter the effect of the battery. These simple arrangements being well understood, the effect of uniting two or more simple Galvanic circles, it will be easy to construct the battery several ways.

We shall here describe the two methods first used and invented by Volta, fig. 16 and 17, and that of Mr. Cruickshank now generally employed, fig. 19. The construction, fig. 16, Volta denominates, a *couronne de tasses*, consisting of glass-tumblers, or china-cups, partly filled with water, or salt and water, &c. and two plates unconnected with each other, viz. a plate of zinc and a plate of silver, are plunged in the fluid of each cup, excepting the first and last cups; but each of those plates must have a sort of tail or prolongation, by which they are so connected that the silver plate of one cup communicates with the zinc-plate of the next, and so on; or they may be connected by some other conductor. The battery, fig. 17, consists of pieces of silver, about as big as half-crowns, pieces of zinc, of an equal size to those of silver, and pieces of card, or cloth, or leather, or other bibulous substance, a little smaller in diameter than the metallic pieces, and soaked in water or in other proper fluid. Those pieces are disposed in the order of silver, zinc, and wet cloth, &c. as indicated by the letters, S, Z, W. The pieces of card, or cloth, &c. must be well soaked in the fluid; but before they are applied, they should be squeezed, in order that the superfluous fluid may not run down the outside of the pile, or insinuate itself between the contiguous pieces of silver and zinc. Those pieces, especially if soaked in plain water, lose their moisture pretty soon, so that they can hardly serve longer than for a day or two; after which time the pile must be decomposed, the metallic pieces cleaned, those of cloth or card soaked again, and the whole arranged as before. The three rods R, R, R, are of glass or of baked wood; and the piece of wood, O, slides freely up, or down the rods. This serves to prevent the falling of the pieces. When such battery is to be very powerful, viz. is to consist of numerous pieces, the best way is to form two or three or more piles, and to join them by pieces of metal, as *c c* in fig. 18, where two piles are joined together, so that *a* is the negative extremity, and *b* is the other or positive extremity of the whole arrangement, or of the two piles considered as one. The battery, fig. 19, consists of a wooden box, or trough, the depth and breadth of which corresponds with the size of the plates. It is of such a length, in general, as to contain fifty plates, allowing a space of about three-eighths of an inch, between each pair of plates. The spaces between the plates are formed by grooves, which are to receive the plates. The plates are first soldered together in pairs, one of copper or silver, and the other of zinc, making one plate of the two. The trough being lined with a cement, formed of bees'-wax and resin, the plates which are previously warmed, are pressed into the grooves, in such order, that the zinc-side of each compound-plate may face one way, and the copper or silver the other. The pair of plates of zinc and silver, which, in the pile, are simply laid upon each other, are in the trough, soldered together, and cemented into the grooves; and the cavity or cells formed by the spaces between each pair of plates, in the trough, being filled with a solution of salt or other appropriate liquid, stands in the stead of the pieces of moistened cloth, between the plates of the pile. Two or more of such batteries may be joined, as has been said of the preceding battery. See fig. 24. It need hardly be observed, that instead of zinc, copper, and water, other combinations may be made according to the table. At present the last-described batteries are constructed with copper, zinc, and water mixed with a small proportion of nitric or muriatic acid. For the construction of such batteries it is immaterial whether the metals are quite pure or slightly alloyed. The wood of which the trough is made should be the oldest and hardest mahogany that can be procured, as being less liable to warp, and it ought to be well put together to prevent leaking. The plates should be of copper and zinc, for though silver be somewhat better than copper, it is not so in proportion to the price. The zinc-plates may be cut out of sheets of malleable zinc, and the copper-plates may be so thin as one ounce to twenty-four square inches of surface. They may be made a little larger than the zinc to lap over the edge at the top, where it may more conveniently be soldered; the other edges need not be soldered, they being sufficiently secured by the cement in the grooves. The length of a trough should be about two feet; they become unwieldy when larger. After the plates are inserted by warming them sufficiently to melt the cement in the grooves, and the whole is polished up, by applying a hot iron, the parts may be varnished with copal, or with common spirit varnish. The action of all these batteries is greatest when

when they are first completed or filled with the fluid; and it declines in proportion as the metal is oxidated, or the fluid loses its power. Hence, after a certain time, not only the fluid must be changed, but the metallic pieces must be cleaned by removing the oxidated surface; which is done either by filing or by rubbing them with sand or sand-paper, or by immersing them for a short time in diluted muriatic acid, and then wiping them with a coarse cloth. The metallic pieces of the battery, fig. 19, may be cleaned by the last method, and may be wiped by introducing a stick with a rag into the cells. When experiments are to be made all the cells of the trough must be filled, within about half an inch of the top, with a liquid, composed of water, with about one twenty-fifth part of the muriatic or the nitric acid. The plates of the trough are shorter than the depth of the trough, by about three-fourths of an inch; so that the trough may be leaned on one side in the filling, for the purpose of letting the liquid run equally into all the cells. If a number of troughs are to be connected together, the communication must be made by pieces of metal, which are inserted into the liquid of one cell of each trough, as represented in fig. 24, at *a, b, c*. In making the connection, it is to be observed, that the zinc-surface of one trough must correspond with the copper one of another, and the zinc of the latter with copper of a third, and so on, for the connecting metals are of strong wire answer very well. After all the troughs are connected together, let the two unconnected ends, at which the experiments are to be made, be as near together as possible. A connection being now formed between the two ends, one of which we shall term the zinc-end, and the other the copper-end, the united energy of the whole will be transmitted through the connecting medium. We may now proceed to notice some of the more striking effects of these combinations. The chemical action of bodies upon each other is increased by the Galvanic arrangement so much, that some of them are by that means enabled to act upon bodies that otherwise they would have no action upon. Fig. 3, represents a glass-tube about four inches long. Two corks are thrust into its apertures *A* and *B*. An oblong piece of zinc, *CD*, is fixed into one of the corks, and is made to project within and without the tube. *EFG* is a silver wire, which being fixed into the other cork, projects with the extremity *E*, within the tube; and its other extremity is bent so as to come near the projecting part of the zinc *C*. Remove one of those corks, and fill the tube with water, in which you must mix a drop or two of muriatic acid; then replace the cork, and you will find that the zinc is acted upon by the diluted acid, is oxidated by it, and bubbles of gas are evolved from it; but the silver wire *E* remains untouched, and no gas whatever is evolved from it. Now, if you bend the silver wire, *FG*, so that its end *G* may touch the zinc at *C*, then the Galvanic circle of silver, zinc, and diluted acid is completed, in consequence of which the diluted acid is enabled to act stronger upon the zinc *D*, which is manifested by the more copious evolution of gas, and is besides enabled to act upon the silver wire; for now you will observe the evolution of gas from the silver *E* also. Break the contact between *G* and *C*, and the silver *E* will cease to yield gas. Form it again, and gas will again proceed from the silver. Instead of silver, zinc, and diluted muriatic acid, you may in the same manner use gold, tin, and diluted nitric acid; and by completing the circle, the acid will be enabled to act upon the gold. It has been observed, that whenever an oxidating influence is exerted at one of the places of contact of the perfect and imperfect conductors, a deoxidating action appears to be produced at the other place. Thus when iron, which oxidates rapidly when forming a circle with silver and common water, is arranged with zinc and common water, it remains perfectly unaltered, whilst the zinc is rapidly acted upon. Fig. 2, represents a more convenient method of performing this experiment. The muscular parts of animals recently dead, and making part of the circuit, will be convulsed as above described. The effects thus produced by a single galvanic circle, become abundantly more striking and interesting from the proper combination of several that is from the action of the Galvanic battery. The battery not only convulses the prepared limbs of a frog, or produces the appearances of a flash of light before the human eye; but it shews all the phenomena of electricity in a very considerable degree. It gives the shock; it affects the electrometer; shews a luminous spark, accompanied with an audible report;

it burns metallic and other combustible bodies; and continues in action for a very long time, viz. until the chemical action between the component parts of the battery is quite exhausted. The following contain a more particular, yet concise, enumeration of those wonderful effects. When the Galvanic battery of the first order consists of twenty repetitions of simple combinations, if you touch with one hand one extremity of the battery, as at *b*, in any one of the above-described batteries (see figs. 17, 18, 19), and apply your other hand to the other extremity of the battery, as at *a*, you will feel a very slight shock, like that which is communicated by a Leyden phial weakly charged, and it will be hardly felt beyond the fingers, or at most the wrists. This shock is felt as often as you renew the contact. If you continue the hands in contact with the extremities *b* and *a*, you will perceive a slight but continued irritation; and, when the hand or other part of the body, which touches the extremity of the battery, is excoriated or wounded, this sensation is disagreeable, and rather painful. The dry skin of the human body is seldom capable of conducting this shock; therefore the touching finger should be well moistened with water, or salt and water. It will be better to immerse a wire that proceeds from one extremity of the battery, in a bason of water, wherein you may plunge one of your hands; then grasping with your other hand well moistened a large piece of metal, for instance, a large silver spoon, touch the other end of the battery with it, and the shock will be felt more distinctly. By this means the shock has been felt when the battery consisted of less than twenty repetitions. Instead of one person, several persons may join hands (which must be well moistened with water,) and on completing the circuit, they will all feel the shock at the same instant. But the strength of the shock is much diminished by its passing through the several persons, or, in general, by passing through less perfect conductors. The shock from a battery consisting of fifty or sixty repetitions of the most active combinations of the first order may be felt as far as the elbows; and the combined force of five or six such batteries will give a shock perhaps much stronger than most men would be willing to receive. The prepared limbs of a frog or other animal are violently convulsed, but soon exhausted of their irritability by the action of a Galvanic battery. This shock is similar to that of a large common electrical battery weakly charged, and not to that of a small Leyden phial fully discharged. The difference consists in this, viz. that the latter contains a small quantity of electric fluid highly condensed; hence its discharge will force its way through perhaps an inch of air; whereas the former contains a vast quantity of electricity, but little condensed; hence its spark, viz. its course through the air, is so very short, that the fingers must be brought almost into perfect contact in order to receive the shock; and such is the case with the Galvanic battery; for the shock from a very powerful battery of this sort will hardly ever force its way through the air, when the extremities of the circle of communication are more than the fortieth of an inch distant, even when those extremities consist of perfect conductors. In this case a small, but very vivid, spark is seen at that extremity, accompanied with an audible, but not strong, report. There is no perceptible difference of appearance between the spark of the positive and that of the negative end of the battery. The first effect of the shock seems to be proportional to the number of plates nearly, without regard to their size. Thus if the number of plates be the same, the first perceptible action is nearly the same, though the plates of the one battery be several times larger than the other; but, in the latter case, the effect is continued with less interruption, as the plates are larger, till at length a constant tremor is produced. If a wire, proceeding from one extremity of a pretty strong battery, be made to communicate with the inside coating, and a wire, which proceeds from the other extremity of the battery, be made to communicate with the outside coating of a common large jar or electrical battery; the latter will become weakly, but almost instantaneously, charged, in the same manner as if it had been charged by a few turns of a common electrical machine; and with that charge you may either give the shock or affect the electrometer, &c. From this and several other experiments it appears that a Galvanic battery produces a vast quantity of electric fluid, but which is little condensed; and indeed it cannot be supposed that the electric fluid could proceed in a very condensed state from an arrangement of bodies, which, whether more or less, are, however,

all good conductors of electricity; for if the fluid were much condensed at one extremity of the battery, and much rarefied at the other extremity, the condensation would soon be made through the pile itself. Indeed, it is difficult to comprehend how this compensation does not take place in all cases. Having mentioned above, that the charge of a battery may be communicated to a common electrical battery, it is almost superfluous to observe, that the same may be communicated to a condenser, or to a multiplier, and from it to the electrometer. If the battery consist of two hundred repetitions, the electrometer will be affected by the simple contact. The spark, or the discharge of a Galvanic battery, when sent through thin inflammable bodies that are in contact with common or oxygen air, sets them on fire, and consumes them with wonderful activity. It fires gunpowder, hydrogen gas, phosphorus, and other combustibles; it renders red-hot, fuses, and consumes very slender metallic wires and metallic leaves. The mode of applying the power of the battery for such purposes is shewn in fig. 21, where AB represents a powerful Galvanic battery; ACDF is a wire which communicates with the last plate of the battery at A; BKIHG is another wire which communicates with the last plate at B. DE, HI, are two glass-tubes, through which those wires pass, and into which they are fastened sufficiently steady. Those tubes serve to move the wires by; for if the operator applies his fingers to the middlemost parts of those tubes, he may move the wires wherever he pleases, without the fear of receiving a shock. If the two extremities F, G, are brought sufficiently near to each other, the spark will be seen between them. It is between those extremities that the combustible substances, or metallic leaf, &c. is to be placed, in order to be fired or consumed. This figure represents the situation of the wires in the act of inflaming gunpowder. A battery consisting of two hundred pairs of metallic plates (viz. copper and zinc, each five inches square) melted twenty-three inches of very fine iron wire. A platina-wire about $\frac{1}{4}$ inch in diameter, was melted into a globule. Fig. 24 is the representation of a compound battery of the same kind, fastened together with the conductors *a, b, c*. A more convenient method is, to fasten the wires to the ends of the universal dischargers E and F, fig. 25, and placing the substances between the points ST on the table HG; also to the ends ST may be adapted spring-sockets for receiving bits of charcoal, or wires of different sorts, &c. When charcoal is to be deflagrated it must be prepared with great care from boxwood, lignum vite, or beech, small bits may have the outside taken off, and be put among sand in a crucible, and heated till the wood be charred. It is best to let it remain in the sand till it is wanted for use, when a piece may be fixed to each rod of the discharger connected with the battery. When the contact is made, a most brilliant deflagration takes place, and may be continued a considerable time, by moving the charcoal as it burns. When oils, alcohol, &c. are to be inflamed, it is best to cover thin metallic substances or charcoal with them. Under the exhausted receiver of the air-pump, the Galvanic battery acts less powerfully than in the open air; but in oxygen air it acts with increased power. The flash of light which appears before the eye of the experimenter, when the eye itself, or some other part not very remote from it, is put in the circuit of a Galvanic combination, does not appear much greater when a battery is employed than when two plates are employed in the manner which has been already mentioned; but when the battery is used, the sensation of a flash may be produced in various ways. If one hand or both be placed in perfect contact with one extremity of the battery, and almost any part of the face brought into contact with the other extremity of the battery, the flash will appear very distinctly; the experimenter being in the dark, or keeping his eyes shut. This flash appears very strong, when a wire which proceeds from one extremity of the battery is held between the teeth, and rests upon the tongue, whilst the other wire is held in the hand. In this case the lips and the tongue are convulsed, the flash appears before the eyes, and a very pungent taste is perceived in the mouth. If any part of the human body, forming part of the circuit of a Galvanic battery, be kept some time in that situation, the irritation or numbness is more or less distinct, and more or less painful, according to the sensibility of the parts concerned. This application is likely to prove most useful as a remedy in various disorders. It is said that it has already proved beneficial in deafnesses and in rheumatisms. It highly deserves to

be tried by medical persons. The most extraordinary phenomena of a Galvanic battery are the chemical effects and the modifications which are produced by it upon the bodies concerned, or upon such as are placed in the circuit, some of which we shall here exhibit. AB, fig. 22, represents a glass-tube, full of distilled water, and having a cork at each extremity. EF is a brass or copper wire, which proceeds from one extremity of a Galvanic battery, and passing through the cork A, projects within the tube. HG is a similar wire, which proceeds from the other extremity of the battery, and comes with its extremity G within the distance of about an inch or two from the wire F. In this situation of things, you will find that bubbles of gas proceed in a constant stream from the surface G of the wire which proceeds from the negative end of the battery; these bubbles of gas, ascending to the upper part of the tube, accumulate by degrees. This gas is pure hydrogen, and may be inflamed. At the same time the other wire F deposits an oxide in the form of a stream or cloud, which gradually accumulates in a greenish form in the water, or on the sides of the tube, and is a perfect oxide of the brass. The wire F is readily discoloured and corroded. If you interrupt the circuit, the production of gas and of oxide ceases immediately. Complete the circuit, and the production of gas re-appears. This production of gas may be observed even where the battery consists of not more than six or eight repetitions of silver, zinc, and water. In short, if the power of the battery be sufficient to oxidate one of the wires of communication, the other wire will afford hydrogen gas; both extremities of the wires being in water. In this experiment it seems that the hydrogen is separated from the water, and is converted into a gaseous state by the wire connected with the negative extremity of the battery; whilst the oxygen unites with and oxidates the wire connected with the positive end of the battery. If you connect the positive end of the battery with the lower wire of the tube, and the negative with the upper, then the hydrogen proceeds from the upper wire, and the lower wire is oxidated. If two wires of gold or platinum are used, which are not oxidable; then the stream of gas issues from each, the water is diminished, and the collected gas is found to be a mixture of hydrogen and oxygen. It explodes violently. A little hole must be made in the lower cork B, to let out the water as the gas evolves. A more suitable apparatus for these experiments, is shewn in fig. 23. AB is a glass-cup, having two platina-wires. Fz and Ec, passing through two perforations in the bottom of the vessel AB; this vessel is partly filled with water, and there is introduced the tube D, close at the top, and filled with water, in some other vessel from which it is transferred, with the mouth downward, by means of a small cup containing water; this is then put over the wires z and c in the vessel AB, and the whole put on the stand GHI, which has a glass-top GH, made to receive AB, and having two notches at *m*, and *n* to receive the wires Fz and Ec. These wires being connected with the two ends of the battery, the gas will be given out by the wires, and collected in the tube D; if a tube be placed over each, the gases will be obtained separately. Or vessels may be suspended over a cup of water, they being filled with water. See fig. 27. In all the batteries of the first order, when the connection is completed, changes take place, which denote the evolution of influences capable of producing from common water oxygen and hydrogen, acid and alkali, in different parts of the body. Thus in the battery with a series of zinc-plates, silver-wires, and common water, oxide of zinc is formed on all the plates of zinc, whilst hydrogen is produced from the silver-wires; and if the water in contact with them be tinged with red cabbage-juice, it becomes green. And in the battery with silver, gold, and weak nitric acid, the silver is dissolved, whilst the acid becomes green, and slowly evolves gas at its points of contact with the gold. The chemical agencies exerted in the compound batteries of the first order can be best observed by the substitution of single metallic wires for some of the plates; for, in this case, the changes taking place in the series with wires, will be exactly analogous to those produced in the series with plates; silver, and all the more oxidable metals, oxidating in water, in the usual place, and gold and platina evolving oxygen gas. Thus, when into two small glass-tubes, connected by a moist animal substance, and filled with distilled water, two gold wires are introduced from a large battery in the proper order, oxygen is produced in one quantity of water, and hydrogen in the other, nearly in the proportions in which they are required to form

form water by combustion: and if the process be continued for some time, the apparatus being exposed to the atmosphere, the water, in the oxygen-giving tube, will become impregnated with an acid (apparently the nitrous); whilst that in the hydrogen-giving tube will be found to hold in solution a fixed alkali. Let the glass-vessel A, fig. 26, have the two tubes, Z and C, ground into its two necks. At the ends, Z and C, of the tubes, are tied bits of bladder, so that any liquid in the tubes may have no tendency to enter the vessel A. The vessel being previously filled with some liquid, the tubes are so inserted that no air may exist between the ends of the tubes; the tubes are also provided with two small caps of ivory or wood, through which the platina-wires, *pp*, are passed, reaching the bottom so near as not to pierce the bladders. The tubes being filled with water, and the wire from the zinc-end of the battery connected with the wire of the tube Z, while that of the copper is attached to that of the tube C, the decomposition of water will speedily commence, the wire in Z affording oxygen gas, while that of C affords hydrogen gas. In a very short time, the liquid of the tube Z, will be found to contain muriatic acid; or rather, the oxy-muriatic; and the tube C, will at the same time be found to contain a fixed alkali. If the tubes be filled with infusion of cabbage, the signs of alkali and acid are very soon observed, from the liquid of Z becoming red, and that of C green. If the connection be reversed, the liquids repossess the blue colour, and if the process be continued, that of Z becomes green, and C red. From some experiments it would appear probable, that the quantities of hydrogen, produced in series, are small, and the quantities of alkali great, in proportion as the surfaces of contact of the least oxidable metals with the water are more extended. All the oxygenated solutions of bodies possessing less affinity for oxygen than nascent hydrogen, are decomposed when exposed to the action of the metal occupying the place of the least oxidable part of the series in the compound circle. Thus, sulphur may be produced from sulphuric acid; and copper and other metals precipitated in the metallic form from their solvents. It is well known that hydrogen gas, in its nascent state, reduces the oxides of metals. Accordingly when the tube, fig.

22 or 23, is filled with a solution of acetite of lead in distilled water, and a communication is made with the battery as above described, no gas is perceived to issue from the wire which proceeds from the negative end of the battery; but, in a few minutes, beautiful metallic needles are perceived on the extremity of this wire; these soon increase, and assume the form of a fern or other vegetable. The lead thus separated is in its perfect metallic state, and very brilliant. When a solution of sulphate of copper is employed, the copper is precipitated in its metallic state; but instead of appearing in crystals, it forms a kind of button, which adheres firmly to the end of the wire. On making the experiment with a solution of nitrate of silver, the silver is precipitated in the form of a beautiful metallic brush, the metal shooting into fine needle-like crystals. If iron be immersed in a solution of sulphate of copper, the latter metal will be precipitated into a metallic form, and will adhere to the surface of the former. Upon silver merely immersed in the same solution, no such effect is produced: but as soon as the two metals, viz. the silver and the copper, are brought into contact, the silver receives a coating of copper. A measure of the intensity of the power in Galvanic batteries, producing chemical changes, may be derived from the quantity of gas it is capable of evolving from water in a given time. By the powerful action of a large Galvanic battery, the illustrious Mr. Davy, professor at the Royal Institution, effected the decomposition of the fixed alkalis, which had hitherto been attempted in vain. A small bit of alkali is laid on a plate of platina connected with one end of the battery, and bringing another piece of platina connected with the other end of the battery into contact with it. A portion of black matter is soon formed, in which is found imbedded small metallic globules; which substance is found to be the base of the alkali, and has been deprived of its oxygen by the Galvanic agency. This base is found to be a metal: that obtained from potass is denominated potassium, and that which constitutes the base of soda is called sodium. These metals are very inflammable, and decompose water, with a bright flash and slight explosion. The same ingenious philosopher has also in some degree succeeded in decomposing the alkaline earths.

GAMBIA, a great river of Africa, which, running from E. to W. falls into the Atlantic ocean, S. of Cape Verd. It overflows annually like the Nile, and is navigable for ships of 150 tons, 500 miles from its mouth.

GAMBEZON, or **GAMBA**, in antiquity, a kind of soft quilted waistcoat, worn under the coat of mail to prevent its hurting the body. It is made of wool or cotton, quilted between two stuffs, and was also called counterpoint.

GAMBOGE, a concreted vegetable juice, partly of a gummy, and partly of a resinous, nature. It is brought to us either in form of orbicular masses, or of cylindrical rolls of various sizes, and is of a dense, compact, and firm texture, and of a beautiful yellow. It is chiefly brought to us from Cambaja, in the East Indies, called also Cambodja and Cambogia; and thence it has obtained its names of cambadium, cambogium, and gambogium. It is obtained from the stalagmites cambogioides, a tree of the East Indies, by wounding the shoot. It is a very rough and strong purge; it operates both by vomit and stool, and both ways with much violence, almost in the instant in which it is swallowed, but yet without griping. It requires caution and judgement in administering it; but those who know how to give it properly, find it an excellent remedy in dropsies, cachexies, jaundice, asthmas, catarrhs, and in the worst cutaneous eruptions. Its dose is from two or three grains to six, eight, or ten: four grains generally operate briskly without vomiting, and eight or ten grains usually vomit briskly, and afterwards purge downwards. It is at present much more esteemed by painters in water-colours than by physicians.

GAME, in law, signifies birds, or prey, taken or killed by fowling or hunting. The property of such animals *feræ naturæ* as are known under the denomination of game, with the right of pursuing, taking, and destroying them, is vested in the king alone, and from him derived to such of his subjects as have received the grants of a chase, a park, or free warren. By the law of nature, indeed, every man, from the prince to the peasant, has an equal

right of pursuing, and taking to his own use, all such creatures as are *feræ naturæ*, and therefore the property of nobody, but liable to be seized by the first occupant. But it follows, (says Blackstone,) from the very end and constitution of society, that this natural right, as well as many others belonging to man as an individual, may be restrained by positive laws enacted for reasons of state, or for the supposed benefit of the community. This restriction may be either with respect to the place in which this right may, or may not, be exercised; with respect to the animals that are the subjects of this right; or with respect to the persons allowed or forbidden to exercise it. And, in consequence of this authority, we find, that the municipal laws of many nations have exerted such power of restraint; have in general forbidden the entering on another man's grounds, for any cause, without the owner's leave; have extended their protection to such particular animals as are usually the objects of pursuit; and have invested the prerogative of hunting and taking such animals in the sovereign of the state only, and such as he shall authorise. Many reasons have concurred for making these constitutions: as, 1. For the encouragement of agriculture and improvement of lands, by giving every man an exclusive dominion over his own soil. 2. For the preservation of the several species of these animals, which would soon be extirpated by a general liberty. 3. For prevention of idleness and dissipation in husbandmen, artificers, and others of lower rank; which would be the unavoidable consequence of universal licence. 4. For prevention of popular insurrections and resistance to the government, by disarming the bulk of the people: which last is a reason oftener meant than avowed, by the makers of forest or game laws. Nor, certainly, in these prohibitions is there any natural injustice, as some have weakly enough supposed: since, as Puffendorf observes, the law does not hereby take from any man his present property, or what was already his own; but barely abridges him of one means of acquiring a future property, that of occupancy; which indeed the law of nature would allow him, but

of which the laws of society have in most instances very justly and reasonably deprived him. Yet, however defensible these provisions in general may be, on the footing of reason, or justice, or civil policy, we must, notwithstanding, acknowledge, that, in their present shape, they owe their immediate original to slavery. It is not till after the irruption of the northern nations into the Roman empire, that we read of any other prohibitions, than that natural one of not sporting on any private grounds without the owner's leave. With regard to the rise and original of our present civil prohibitions, it will be found, that all forest and game laws were introduced into Europe at the same time, and by the same policy, that gave birth to the feudal system; when those swarms of barbarians issued from their northern hive, and laid the foundation of most of the present kingdoms of Europe on the ruins of the western empire. For when a conquering general came to settle the economy of a vanquished country, and to part it out among his soldiers or feudatories, who were to render him military service for such donations; it behoved him, in order to secure his new acquisitions, to keep the rustici or natives of the country, and all who were not his military tenants, in as low a condition as possible, and especially to prohibit them the use of arms. Nothing could do this more effectually than a prohibition of hunting and sporting: and therefore it was the policy of the conqueror to reserve this right to himself, and such on whom he should bestow it; which were only his capital feudatories, or greater barons. And, accordingly, we find, in the feudal constitutions, one and the same law prohibiting the rustici in general from carrying arms, and also proscribing the use of nets, snares, or other engines for destroying the game. This exclusive privilege well suited the martial genius of the troops, who delighted in a sport, which in its pursuit and slaughter bore some resemblance to war. *Vita omnis* (says Caesar, speaking of the ancient Germans) in *venationibus atque in studiis rei militaris consistit*. And Tacitus in like manner observes, that *quoties bella non ineunt, multum venatibus, plus per otium transigunt*. And indeed, like some of their modern successors, they had no other amusement to entertain their vacant hours; they despising all arts as effeminate, and having no other learning than was couched in such rude ditties as were sung at the solemn carousals, which succeeded these ancient huntings. And it is remarkable, that in those nations where the feudal policy remains the most unaltered, the forest or game laws continue in their highest rigour. In France, before the revolution, all game was properly the king's; and in some parts of Germany it is death for a peasant to be found hunting in the woods of the nobility. With us in Britain, also, hunting has ever been esteemed a most princely diversion and exercise. The whole island was replenished with all sorts of game in the times of the Britons; who lived in a wild and pastoral manner, without inclosing or improving their grounds; and derived much of their subsistence from the chace, which they all enjoyed in common. But when husbandry took place under the Saxon government, and lands began to be cultivated, improved, and inclosed, the beasts naturally fled into the woody and desert tracts, which were called the forests; and, having never been disposed of in the first distribution of lands, were therefore held to belong to the crown. These were filled with great plenty of game, which our royal sportsmen reserved for their own diversion, on pain of pecuniary forfeiture for such as interfered with their sovereign. But every freeholder had the full liberty of sporting upon his own territories, provided he abstained from the king's forests. However, upon the Norman conquest, a new doctrine took place; and the right of pursuing and taking all beasts of chace or venary, and such other animals as were accounted game, was then held to belong to the king, or to such only as were authorised under him. And this, as well upon the principles of the feudal law, that the king is the ultimate proprietor of all the lands in the kingdom, they being all held of him as the chief lord, or lord paramount of the fee, and that therefore he has the right of the universal soil, to enter thereon, and to chase and take such creatures at his pleasure: as also upon another maxim of the common law, that these animals are *bona vacantia*, and, having no other owner, belong to the king by his prerogative. As therefore the former reason was held to vest in the king a right to pursue and take them any where, the latter was supposed to give the king, and such as he should authorise, a sole and exclusive right. This right, thus vested in the crown, was exerted with the utmost rigour, at and after the time of

the Norman establishment; not only in the ancient forests, but in the new ones which the Conqueror made, by laying together vast tracts of country, depopulated for that purpose, and reserved solely for the king's royal diversion; in which were exercised the most horrid tyrannies and oppressions, under colour of forest-laws for the sake of preserving the beasts of chace; to kill any of which, within the limits of the forest, was as penal as the death of a man. And, in pursuance of the same principle, king John laid a total interdict upon the winged as well as the four-footed creation; *capturam avium per totam Angliam interdixit*. The cruel and unsupportable hardships, which these forest-laws created to the subject, occasioned our ancestors to be as zealous for their reformation, as for the relaxation of the feudal rigours and the other exactions introduced by the Norman family; and accordingly we find the immunities of *charta de foresta* as warmly contended for, and extorted from the king with as much difficulty, as those of *magna charta* itself. By this charter, confirmed in parliament, (9 Hen. III.) many forests were disafforested, or stripped of their oppressive privileges, and regulations were made in the regimen of such as remained; particularly killing the king's deer was made no longer a capital offence, but only punished by a fine, imprisonment, or abjuration, of the realm. And by a variety of subsequent statutes, together with the long acquiescence of the crown without exerting the forest-laws, this prerogative is now become no longer a grievance to the subject. But as the king reserved to himself the forest for his own exclusive diversion, so he granted out from time to time other tracts of land to his subjects under the names of chaces or parks; or gave them licence to make such in their own grounds; which indeed are smaller forests in the hands of a subject, but not governed by the forest-laws; and by the common law no person is at liberty to take or kill any beasts of chace, but such as hath an ancient chace or park; unless they be also beasts of prey. As to all inferior species of game, called beasts and fowls of warren; the liberty of taking or killing them is another franchise, or royalty, derived likewise from the crown, and called free warren; a word which signifies preservation or custody: as the exclusive liberty of taking and killing fish in a public stream or river is called a free fishery; of which, however, no new franchise can at present be granted by the express provision of *magna charta*, c. 16. The principal intention of granting a man these franchises, or liberties, was in order to protect the game, by giving him a sole and exclusive power of killing it himself, provided he prevented other persons. And no man but he who has a chace or free warren, by grant from the crown, or prescription, which supposes one, can justify hunting or sporting upon another man's soil; nor indeed, in thorough strictness of common law, either hunting or sporting at all. However new this doctrine may seem, it is a regular consequence from what has been before delivered, that the sole right of taking and destroying game belongs exclusively to the king. This appears, as well from the historical deduction here made, as because he may grant to his subjects an exclusive right of taking them; which he could not do, unless such a right was first inherent in himself. And hence it will follow, that no person whatever, but he who has such derivative right from the crown, is by common law intitled to take or kill any beast of chace, or other game whatsoever. It is true, that, by the acquiescence of the crown, the frequent grants of free warren in ancient times, and the introduction of new penalties of late by certain statutes for preserving the game; this exclusive prerogative of the king is little known or considered; every man that is exempted from these modern penalties looking upon himself as at liberty to do what he pleases with the game: whereas the contrary is strictly true, and that no man, however well qualified he may vulgarly be esteemed, has a right to encroach on the royal prerogative by the killing of game, unless he can shew a particular grant of free warren; or a prescription which presumes a grant; or some authority under an act of parliament. As to the latter, there are but two instances wherein an express permission to kill game was ever given by statute; the one by 1 Jac. I. c. 27, altered by 9 Jac. I. c. 11, and virtually repealed by 22 and 23 Ca. II. c. 25, which gave authority, so long as they remained in force, to the owners of free warren, to lords of manors, and to all freeholders having 40*l.* per ann. in lands of inheritance, or 80*l.* for life or lives, or 400*l.* personal estate, (and their servants), to take partridges and pheasants upon their own, or their masters free warren, inheritance, or freehold; the

the other by 5 Ann. c. 14, which empowers lords and ladies of manors to appoint game-keepers, to kill game for the use of such lord or lady; which with some alteration still subsists, and plainly supposes such power not to have been in them before. The truth of the matter is, that these game-laws do indeed qualify nobody, except in the instance of a game-keeper, to kill game: but only to save the trouble and formal process of an action by the person injured, who perhaps too might remit the offence, these statutes inflict additional penalties to be recovered either in a regular or summary way, by any of the king's subjects, from certain persons of inferior rank who may be found offending in this particular. But it does not follow that persons excused from these additional penalties are therefore authorised to kill game. The circumstance of having 100*l.* per ann. and the rest, are not properly qualifications but exemptions. And these persons so exempted from the penalties of the game-statutes, are not only liable to actions of trespass by the owners of the land; but also, if they kill game within the limits of any royal franchise, they are liable to the actions of such who may have the right of chase or free warren therein. Upon the whole, it appears, that the king, by his prerogative, and such persons as have, under his authority, the royal franchise of chase, park, or free warren, (see these articles,) are the only persons who may acquire any property, however fugitive and transitory, in these animals *feræ naturæ*, while living; which is said to be vested in them *propter privilegium*. And such persons as may thus lawfully hunt, fish, or fowl, *ratione privilegii*, have only a qualified property in these animals: it not being absolute or permanent, but lasting only so long as the creatures remain within the limits of such respective franchise or liberty, and ceasing the instant they voluntarily pass out of it. It is held indeed, that if a man starts any game within his own grounds, and follows it into another's, and kills it there, the property remains in himself. And this is grounded on reason and natural justice; for the property consists in the possession; which possession commences by the finding it in his own liberty, and is continued by the immediate pursuit. And so, if a stranger starts game in one man's chase or free warren, and hunts it into another liberty, the property continues in the owner of the chase or warren; this property arising from privilege, and not being changed by the act of a mere stranger. Or if a man starts game on another's private grounds, and kills it there, the property belongs to him on whose grounds it was killed, because it was also started there; this property arising *ratione soli*. Whereas if, after being started there, it is killed in the grounds of a third person, the property belongs not to the owner of the first ground, because the property is local; nor yet to the owner of the second, because it was not started in his soil; but it vests in the person who started and killed it, though guilty of a trespass against both the owners. See **LAW, RESPECTING GAME**.

GAMES, in antiquity, were public diversions, exhibited on solemn occasions. Such among the Greeks were the Olympic, Pythian, Isthmian, Nemean, &c. games; and, among the Romans, the Apollinarian, Circensian, Capitoline, &c. games. See **APOLLINARIAN, OLYMPIC, PYTHIAN, &c.**

GAMES, MODERN, are usually distinguished into those of exercise and address, and those of hazard. To the first belong chess, tennis, billiards, &c. and to the latter those performed with cards, or dice, as back-gammon, ombre, picquet, whist, &c. See these articles.

GAMELIA, in Grecian antiquity, a nuptial feast, or rather sacrifice, held in the ancient Greek families on the day before a marriage.

GAMELION, in the ancient chronology, was the eighth month of the Athenian year, containing twenty-nine days, and answering to the end of January and beginning of February.

GAMELORA, an island in the Mediterranean, near the N. E. coast of Tunis, three miles E. of Cape Zibech.

GAMET, an island of Denmark, three miles from the Continent, and eight W. S. W. of Ripen.

GAMING, the art of playing or practising any game, particularly those of hazard; as cards, dice, tables, &c. Gaming has at all times been considered as of pernicious consequence to the commonwealth; and is therefore severely prohibited by law. It is esteemed a practice intended to supply, or retrieve, the expences occasioned by luxury; it being a kind of tacit confession, that the company therein engaged do, in general, exceed the bounds of

their respective fortunes; and therefore they cast lots to determine upon whom the ruin shall at present fall, that the rest may be saved a little longer. But, taken in any light, it is an offence of the most alarming nature; tending, by necessary consequence, to promote public idleness, theft, and debauchery, among those of a lower class; and, among persons of a superior rank, it has frequently been attended with the sudden ruin and desolation of ancient and opulent families, an abandoned prostitution of every principle of honour and virtue, and too often has ended in suicide. To restrain this pernicious vice among the inferior sort of people, the statute 33 Hen. VIII. c. 9, was made; which prohibits to all but gentlemen, the games of tennis, tables, cards, dice, bowls, and other unlawful diversions there specified, unless in the time of Christmas, under pecuniary pains and imprisonment. And the same law, and also the statute 23 Geo. II. c. 24, inflict pecuniary penalties, upon the master of any public house, wherein servants are permitted to game, as well as upon servants themselves who are found gaming there. But this is not the principal ground of complaint; it is the gaming in high life that demands the attention of the magistrate; a passion to which every valuable consideration is sacrificed, and which we seem to have inherited from our ancestors, the ancient Germans; whom Tacitus describes to have been bewitched with the spirit of play to a most exorbitant degree. "They addict themselves (says he) to dice (which is wonderful) when sober, and as a serious employment; with such a mad desire of winning or losing, that, when stript of every thing else, they will stake at last their liberty, and their very selves. The loser goes into a voluntary slavery; and, though younger and stronger than his antagonist, suffers himself to be bound and sold. And this perseverance in so bad a cause they call the point of honour; *ea est in re prava pervicacia, ipsi fidem vocant*." One would almost be tempted to think Tacitus was describing a modern Englishman. When men are thus intoxicated with so frantic a spirit, laws will be of little avail: because the same false sense of honour that prompts a man to sacrifice himself, will deter him from appealing to the magistrate. Yet it is proper that laws should be, and be known publicly, that gentlemen may consider what penalties they wilfully incur, and what a confidence they repose in sharpers; who, if successful in play, are certain to be paid with honour, or, if unsuccessful, have it in their power to be still greater gainers by informing.

GAMING, CHANCE IN. Hazard, or chance, is a matter of mathematical consideration, because it admits of more and less. Gamblers either set out upon an equality of chance, or are supposed to do so. This equality may be altered in the course of the game, by the greater good fortune or address of one of the gamblers, whereby he comes to have a better chance, so that his share in the stakes is proportionably better than at first. This more and less runs through all the ratios between equality and infinite difference, or from an infinitely little difference till it come to an infinitely great one, whereby the game is determined. The whole game, therefore, with regard to the issue of it, is a chance of the proportion the two shares bear to each other. The probability of an event is greater or less, according to the number of chances by which it may happen, compared with all the chances by which it may either happen or fail. M. de Moivre, in a treatise de Mensura Sortis, has computed the variety of chances in several cases that occur in gaming, the laws of which may be understood by what follows. Suppose p the number of cases in which an event may happen, and q the number of cases wherein it may not happen, both sides have the degree of probability, which is to each other as p to q . If two gamblers, A and B, engage on this footing, that, if the cases p happen, A shall win; but if q happen, B shall win, and the stake be

a ; the chance of A will be $\frac{p a}{p+q}$, and that of B, $\frac{q a}{p+q}$; consequently,

if they sell the expectancies, they should have that for them respectively. If A and B play with a single die, on this condition, that, if A throw two or more aces at eight throws, he shall win; otherwise B shall win; What is the ratio of their chances? Since there is but one case wherein an ace may turn up, and five wherein it may not, let $a = 1$, and $b = 5$. And again, since there are eight throws of the die, let $n = 8$; and you will have $\frac{a + b n - b n - 1}{n a b n - 1}$, to $\frac{b n + n a b n - 1}{n a b n - 1}$: that is, the chance of A will be to that of B as 663991 to 1015625, or nearly as two to three. A and B are engaged at single quito; and, after playing some time, A wants four.

four of being up, and B 6; but B is so much the better gamester, that his chance against A upon a single throw would be as three to two; What is the ratio of their chances? Since A wants four, and B six, the game will be ended at nine throws; therefore, raise $a + b$ to the ninth power, and it will be $a^9 + 9a^8b + 36a^7b^2 + 84a^6b^3 + 126a^5b^4 + 126a^4b^5 + 84a^3b^6 + 36a^2b^7 + 9ab^8 + b^9$; call a 3; and b 2, and you will have the ratio of chances in numbers, viz. 1759077 to 194048. A and B play at single quito, and A is the best gamester, so that he can give B two in three: What is the ratio of their chances at a single throw? Suppose the chances as z to 1, and raise $z + 1$ to its cube, which will be $z^3 + 3z^2 + 3z + 1$. Now since A could give B two out of three, A might undertake to win three throws running; and consequently the chances in this case will be as z^3 to $3z^2 + 3z + 1$. Hence $z^3 = 3z^2 + 3z + 1$; or $2z^3 = z^3 + 3z^2 + 3z + 1$. And therefore $z\sqrt[3]{2} = z + 1$; and consequently, $z = \sqrt[3]{2} - 1$. The chances, therefore, are

$\sqrt[3]{2} - 1$, and 1, respectively. Again, suppose I have two wagers depending, in the first of which I have three to two the best of the lay, and in the second, seven to four; What is the probability I win both wagers? I. The probability of winning the first is $\frac{3}{5}$, that is the number of chances I have to win, divided by the number of all the chances: the probability of winning the second is $\frac{7}{11}$; therefore, multiplying these two fractions together, the product will be $\frac{21}{55}$, which is the probability of winning both wagers. Now, this fraction being subtracted from 1, the remainder is $\frac{34}{55}$, which is the probability I do not win both wagers: therefore the odds against me are 34 to 21. II. If I would know what the probability is of winning the first, and losing the second, I argue thus; the probability of winning the first is $\frac{3}{5}$, the probability of losing the second is $\frac{4}{11}$; therefore multiplying $\frac{3}{5}$ by $\frac{4}{11}$, the product $\frac{12}{55}$ will be the probability of my winning the first, and losing the second; which being subtracted from 1, there will remain $\frac{43}{55}$, which is the probability I do not win the first, and at the same time lose the second. III. If I would know what the probability is of winning the second, and at the same time losing the first, I say thus: The probability of winning the second is $\frac{7}{11}$; the probability of losing the first is $\frac{2}{5}$; therefore, multiplying these two fractions together, the product $\frac{14}{55}$ is the probability I win the second, and also lose the first. IV. If I would know what the probability is of losing both wagers, I say, the probability of losing the first is $\frac{2}{5}$, and the probability of losing the second is $\frac{4}{11}$; therefore the probability of losing them both is $\frac{8}{55}$; which, being subtracted from 1, there remains $\frac{47}{55}$; therefore, the odds of losing both wagers is 47 to 8. This reasoning is applicable to the happening or failing of any events that may fall under consideration. Thus if I would know what the probability is of missing an ace four times together with a die, this I consider as the failing of four different events. Now the probability of missing the first is $\frac{5}{6}$, the second is also $\frac{5}{6}$, the third $\frac{5}{6}$, and the fourth $\frac{5}{6}$; therefore the probability of missing it four times together is $\frac{5}{6} \times \frac{5}{6} \times \frac{5}{6} \times \frac{5}{6} = \frac{625}{1296}$; which being subtracted from 1, there will remain $\frac{671}{1296}$ for the probability of throwing it once or oftener in four times: therefore the odds of throwing an ace in four times, is 671 to 625. But if the flinging of an ace was undertaken in three times, the probability of missing it three times would be $\frac{5}{6} \times \frac{5}{6} \times \frac{5}{6} = \frac{125}{216}$; which being subtracted from 1, there will remain $\frac{91}{216}$ for the probability of throwing it once or oftener in three times: therefore the odds against throwing it in three times are 125 to 91. Again, suppose we would know the probability of throwing an ace once in four times, and no more: since the probability of throwing it the first time is $\frac{1}{6}$, and of missing it the other three times, is $\frac{5}{6} \times \frac{5}{6} \times \frac{5}{6}$, it follows, that the probability of throwing it the first time, and missing it the other three successive times, is $\frac{1}{6} \times \frac{5}{6} \times \frac{5}{6} \times \frac{5}{6} = \frac{125}{1296}$; because it is possible to hit every throw as well as the first, it follows, that the probability of throwing it once in four throws, and missing it the other three, is $\frac{125}{1296} = \frac{1}{10.368}$; which being subtracted from 1, there will remain $\frac{1295}{1296}$ for the probability of throwing it once, and no more, in four times. Therefore, if one undertake to throw an ace once, and no more, in four times, he has 500 to 796 the worst of the lay, or five to eight very near. Suppose two events are such, that one of them has twice as many chances to come up as the other; what is the probability that the event, which has the greater number of chances to come up, does not happen twice before the

other happens once, which is the case of flinging seven with two dice before four once? Since the number of chances is as two to one, the probability of the first happening before the second is $\frac{2}{3}$, but the probability of its happening twice before it, is but $\frac{2}{3} \times \frac{2}{3}$ or $\frac{4}{9}$; therefore it is five to four, seven does not come up twice before four once. But, if it were demanded, what must be the proportion of the facilities of the coming up of two events, to make that which has the most chances come up twice, before the other comes up once? The answer is 12 to 5 very nearly: whence it follows, that the probability of throwing the first before the second is $\frac{12}{17}$, and the probability of throwing it twice is $\frac{12}{17} \times \frac{12}{17}$, or $\frac{144}{289}$; therefore the probability of not doing it is $\frac{145}{289}$; therefore the odds against it are as 145 to 144, which comes very near to an equality. Suppose there is a heap of 13 red cards, and another heap of 13 black cards, What is the probability, that, taking one card at a venture out of each heap, I shall take out the two aces? The probability of taking the ace out of the first heap is $\frac{1}{13}$, the probability of taking the ace out of the second heap is $\frac{1}{13}$; therefore the probability of taking out both aces is $\frac{1}{13} \times \frac{1}{13} = \frac{1}{169}$, which being subtracted from 1, there will remain $\frac{168}{169}$; therefore the odds against me are 168 to 1. In cases where the events depend on one another, the manner of arguing is somewhat altered. Thus, suppose that out of one single heap of 13 cards of one colour I should undertake to take out first the ace; and, secondly, the two: though the probability of taking out the ace be $\frac{1}{13}$, and the probability of taking out the two be likewise $\frac{1}{13}$; yet, the ace being supposed as taken out already, there will remain only 12 cards in the heap, which will make the probability of taking out the two to be $\frac{1}{12}$; therefore the probability of taking out the ace, and then the two, will be $\frac{1}{13} \times \frac{1}{12}$. In this last question the two events have a dependence on each other; which consists in this, that one of the events being supposed as having happened, the probability of the other's happening is thereby altered. But the case is not so in the two heaps of cards. If the events in question be n in number, and be such as have the same number a of chances by which they may happen, and likewise the same number b of chances by which they may fail, raise $a + b$ to the power n . And if A and B play together, on condition that if either one or more of the events in question happen, A shall win, and B lose, the probability of A's winning will be

$\frac{a + b^n - b^n}{a + b^n}$; and that of B's winning will be $\frac{b^n}{a + b^n}$;

for when $a + b$ is actually raised to the power n ; the only term in which a does not occur is the last b^n ; therefore all the terms but the last are favourable to A. Thus if $n = 3$, raising $a + b$ to the cube $a^3 + 3a^2b + 3ab^2 + b^3$, all the terms but b^3 will be favourable to A; and therefore the probability of A's winning will be $\frac{a^3 + 3a^2b + 3ab^2}{a^3 + 3a^2b + 3ab^2 + b^3}$, or $\frac{a + b^3 - b^3}{a + b^3}$; and the probability of B's winning will be $\frac{b^3}{a + b^3}$.

But if A and B play on condition, that if either two or more of the events in question happen, A shall win; but in case one only happen, or none, B shall win; the probability of A's winning will be $\frac{a + b^n - nab^{n-1} - b^n}{n + b^n}$; for the only two terms

in which aa does not occur are the two last, viz nab^{n-1} and b^n . See CHANCES. The reader may also consult "Clarks laws of Chance," and "Simpson's Nature and Laws of Chance."

GAMING, LAWS AGAINST. By stat. 16. Car. II. c. 7, if any person by playing or betting shall lose more than 100l. at one time, he shall not be compellable to pay the same; and the winner shall forfeit treble the value, one moiety to the king, the other to the informer. The statute 9 Ann. c. 14, enacts, that all bonds and other securities, given for money won at play, or money lent at the time to play withal, shall be utterly void: that all mortgages and incumbrances of lands, made upon the same consideration; shall be and enure to the heir of the mortgager: that, if any person at one time loses 10l. at play, he may sue the winner, and recover it back by action of debt at law; and, in case the loser does not; any other person may sue the winner for treble the sum so lost; and the plaintiff in either case may examine the defendant himself upon oath: and that in any of these suits no privilege

vilege of parliament shall be allowed. The statute farther enacts, that if any person cheats at play, and at one time wins more than 10l. or any valuable thing, he may be indicted thereupon, and shall forfeit five times the value, shall be deemed infamous, and suffer such corporal punishment as in case of wilful perjury. By several statutes of the reign of king George II. all private lotteries by tickets, cards, or dice (particularly the games of faro, basset, ace of hearts, hazard, passage, rolly-polly, and all other games with dice, except backgammon), are prohibited under a penalty of 200l. for him that shall erect such lotteries, and 50l. a-time for the players. Public lotteries, unless by authority of parliament, and all manner of ingenious devices, under the denomination of sales or otherwise, which in the end are equivalent to lotteries, were before prohibited by a great variety of statutes under heavy pecuniary penalties. But particular descriptions will be ever lame and deficient, unless all games of mere chance are at once prohibited: the invention of sharpers being swifter than the punishment of the law, which only hunts them from one device to another. The statute 13. Geo. II. c. 19, to prevent the multiplicity of horse-races, another fund of gaming, directs that no plates or matches under 50l. value shall be run, under penalty of 200l. to be paid by the owner of each horse running, and 100l. by such as advertise the plate. By statute 18 Geo. II. c. 34, the statute 9 Ann. is farther enforced, and some deficiencies supplied: the forfeitures of that act may now be recovered in a court of equity; and, moreover, if any man be convicted, upon information or indictment, of winning or losing at any sitting 10l. or 20l. within 24 hours, he shall forfeit five times the sum. Thus careful has the legislature been to prevent this destructive vice: which may shew that our laws against gaming are not so deficient, as ourselves and our magistrates in putting those laws in execution.

GAMMON. See BACK-GAMMON.

GAMMONING, among seamen, a term denoting the several turns of a rope which are taken round the bowsprit, and reeved through holes in knees of the head, for the greater security of the bowsprit.

GAMMUT. See GAMUT.

GAMPS, a town of the Helvetic republic, partly in the canton of Schweitz, and partly in that of Glaris; 5 miles S. of Appenzel.

GAMUT, [*gama*, Ital.] the scale of musical notes.

GAMUT, **GAMMUT**, or **GAM-UT**. See MUSIC. The invention of this scale is owing to Guido Aretin, monk of Arezzo, in Tuscany, about A. D. 1009; though it is not so properly an invention, as an improvement on the diagram or scale of the ancients. See ARETIN. Several alterations have been made in the gamut; M. le Maire, particularly, has added a 7th note; viz. *sz*; and the English usually throw out both *ut* and *sz*, and make the other five serve for all.

GAN, a city of China, of the first rank; capital of the province of Se-tchuen.

GAN, a town of France, in the department of the Lower Pyrenees, $4\frac{1}{2}$ miles S. of Pau.

GANARA, a populous and fertile country of Africa, on the banks of the Niger.

GANARA, the capital of the above country. Lon. 16. 0. E. Lat. 12. 20. N.

GANDELU, a town of France, in the department of Aisne, 8 miles W. N. W. of Chateau Thierry.

GANDER, in ornithology. See ANAS.

GANDIA, a sea-port of Spain in Valencia, 28 miles S. of Valencia.

GANDJA, or **GANGEA**, a town of Asia, in Georgia, 15 miles N. W. of Baku, and 100 S. E. of Teflis.

GANDICOT, or **GANDICOTTA**, a town and fort of Hindostan, in the circar of Cuddapa, on a mountain near the Penner, 87 miles N. W. of Nellore.

GANDINA, or **GANDINO**, a populous town of Italy, 10 miles N. W. of Bergamo.

GANET ISLANDS, a cluster of small isles, near the E. coast of Labrador. Lon. 56. 10. W. Lat. 54. 0. N.

GANG, in sea-affairs, a select number of a ship's crew appointed on any particular service, and commanded by an officer suitable to the occasion.

GANG-BOARD is a plank with several steps nailed to it, for the

convenience of walking into, or out of, a boat upon the shore, where the water is not deep enough to float the boat close to the landing-place.

GANG-WAY, a narrow platform, or range of planks, laid horizontally along the upper part of a ship's side, from the quarter-deck to the fore-castle, and is peculiar to ships that are deep-waisted, for the convenience of walking more expeditiously fore and aft than by descending into the waist: it is fenced on the outside by iron stanchions, and ropes or rails, and in vessels of war with a netting, in part of which the hammocks are stowed. In merchant-men it is frequently called the gang-board. The same term is applied to that part of a ship's side, both within and without, by which persons enter and depart; it is provided with steps nailed upon the ship's side, nearly as low as the surface of the water, and sometimes furnished with a railed accommodation ladder.

GANGELT, a town of Germany, in Westphalia, now in the department of the Roer, 12 miles S. S. E. of Ruremond.

GANGES, a large and celebrated river of India. It rises in the mountains which border on Little Thibet, in 96° lon. E. and 35° 45' lat. N. It crosses several kingdoms, running from N. to S. and falls into the bay of Bengal by several mouths. The waters are lowest in April and May, and highest before the end of September. It overflows yearly like the Nile; and renders Bengal as fruitful as the Delta in Egypt. The people in these parts hold the water of this river in high veneration; and it is visited annually by a prodigious number of pilgrims from all parts of India. The British have several settlements on this river. The greatest happiness that many of the Indians wish for, is to die in this river.

GANGES, a town of France, in the department of Herault, 20 miles N. E. of Lodeve, and 21 N. of Montpellier.

GANGES ISLANDS, two small islands between Borneo and the Gulf of Siam. Lon. 106. 45. E. Lat. 4. 55. N.

GANGLION, [*γανγλιον*,] in anatomy, a knot frequently found in the course of the nerves, and which is not morbid; for wherever any nerve sends out a branch, or receives one from another, or where two nerves join together, there is generally a ganglion or plexus, as may be seen at the beginning of all the nerves of the medulla spinalis, and in many other places of the body.

GANGLION, in surgery, a hard tubercle, generally moveable, in the external or internal part of the carpus, upon the tendons or ligaments in that part; usually without any pain to the patient.

GANGRENE, is a very great and dangerous degree of inflammation, wherein the parts affected begin to corrupt. See MEDICINE and SURGERY.

GANI, or **COULOR**, a town of India, 131 miles E. of Bag-nagar.

GANJAM, a town of Hindostan, on the bay of Bengal. Lon. 85. 20. E. Lat. 19. 22. N.

GANTLOPE, in sea-affairs, commonly pronounced gantlet, is a race which a criminal is sentenced to run in a vessel of war for felony, or some other heinous offence. The whole ship's crew is disposed in two rows, standing face to face on both sides the deck, each person being furnished with a small twisted cord, having two or three knots in it; the delinquent is then stripped naked above the waist, and obliged to pass forward between the two rows, a certain number of times, rarely exceeding three, during which, every person is enjoined to give him stripes as he runs along: this is called "running the gantlet," and is seldom inflicted but for crimes which excite general antipathy among the seamen.

GANYMEDES, in mythology, a beautiful youth of Phrygia, son of Tros and brother to Ilus, kings of Troy; or, according to Lucian, the son of Dardanus. Jupiter was charmed with him; and carrying him away, made him his cup-bearer in the room of Hebe.

GAOL, [*geol*, Welsh; *geole*, Fr.] a prison, or place of legal confinement. Every county has two gaols, one for debtors, which may be any house where the sheriff pleases; the other for the peace and matters of the crown, which is the county-gaol. If a gaol be out of repair, or insufficient, &c. justices of peace, in their quarter-sessions, may contract with workmen for the rebuilding or repairing of it: and by their warrant order the sum agreed on for that purpose to be levied on the several hundreds, and other divisions

divisions in the county by a just rate, 11 and 12 Will. III. c. 19. See PRISON.

GAOL-DELIVERY. The administration of justice being originally in the crown, in former times our kings in person rode through the realm once in seven years, to judge of and determine crimes and offences; afterwards justices in eyre were appointed; and since, justices of assize and gaol-delivery, &c. A commission of gaol-delivery is a patent, in nature of a letter from the king to certain persons, appointing them his justices, or two or three of them, and authorising them to deliver his gaol, at such a place, of the prisoners in it: for which purpose it commands them to meet at such a place, at the time they themselves shall appoint; and informs them, that, for the same purpose, the king hath appointed his sheriff of the same county to bring all the prisoners of the gaol, and their attachments, before them at the day appointed. The justices of gaol-delivery are empowered by the common law to proceed upon indictments of felony, trespass, &c. and to order to execution or reprieve: they may likewise discharge such prisoners, as on their trials are acquitted, and those against whom, on proclamation being made, no evidence has appeared: they have authority to try offenders for treason, and to punish many particular offences, by statute 2 Hawk. 24, 2 Hale's Hist. Placit. Cor. 35.

GAOLER, the keeper of a gaol or prison. Sheriffs are to make such gaolers for whom they will be answerable: but if there be any default in the gaoler, an action lies against him for an escape, &c. yet the sheriff is most usually charged; 2 Inst. 592. Where a gaoler kills a prisoner by hard usage, it is felony; 3 Inst. 52. No fee shall be taken by gaolers, but what is allowed by law, and settled by the judges, who may determine petitions against their extortions, &c. 2 Geo. II. c. 22.

GAONS, a certain order of Jewish doctors, who appeared in the East, after the closing of the Talmud. The word Gaons signifies excellent, or sublime; as in the divinity-schools we formerly had Irrefragable, Sublime, Resolute, Angelic, and Subtile doctors.

GAP, in geography, a town of France, the capital of the department of the Upper Alps, 15 miles S. of Grenoble. Lat. 44° 33' 47" N. Lon. from Greenwich 6° 4' 47" E.

GAPENCOIS, a late county of France, of which Gap was the capital. It is now included in the department of Upper Alps.

GARABUSA, an island in the Mediterranean, near the W. coast of Candia. Lon. 41. 8. E. Lat. 35. 36. N.

GARAMA, in ancient geography, the capital of the Garamantes in Lybia Interior; near the spring of the Cinyphus, now in ruins.

GARBE, in heraldry, a sheaf of any kind of grain, borne in several coats of arms, and said to represent summer.

GARBOARD-STRAKE, the plank next the keel of a ship, one edge of which is run into the rabbet made in the upper edge of the keel on each side.

GARCINIA, in botany, a genus of the monogynia order, and dodecandria class of plants; natural order, Bicornes. Calyx four-leaved, inferior; petals four; berry eight-seeded, crowned with the peltate stigma. There are three species.

GARD, in geography, a department of France, comprehending part of the late province of Languedoc. Nismes is the capital.

GARD, an ancient Roman aqueduct in France, 9 miles N. E. of Nismes, erected, it is supposed, by Agrippa, in the time of Augustus Cæsar, to convey to Nismes the water of the spring of Eure, which rises near Uzes.

GARDA, an open town of Maritime Austria, in the Veronese,

N. of Lacize, 17 miles N. W. of Verona. Lat. 45. 34. N. Lon. from Greenwich 10. 58. E.

GARDANT, or **GUARDANT**, in heraldry, denotes any beast full-faced and looking right forward.

GARDEIAH, a town of Africa, the capital of Beni-Mezzab. Lon. 2. 30. E. Lat. 32. 15. N.

GARDEN. See **GARDENING**.

GARDEN BAY, a bay on the E. coast of Newfoundland. Lon. 54. 50. W. Lat. 49. 42. N.

GARDENS, FLOATING. Abbé Clavigero, in his History of Mexico, says, that when the Mexicans were brought under subjection to the Colhuan and Tepanecan nations, and confined to the miserable little islands on the lake of Mexico, they had no land to cultivate, until necessity compelled them to form moveable fields and gardens, which floated on the waters of the lake. The method which they adopted, to make these, and which they still practise, is extremely simple. They plait and twist together willows and roots of marsh-plants or other materials, which are light, but capable of supporting the earth firmly united. Upon this foundation they lay the light bushes which float on the lake; and over all, the mud and dirt which they draw up from the bottom. Their regular figure is quadrangular; their length and breadth various; but generally they are about eight perches long, and not more than three in breadth, and have less than a foot of elevation above the surface of the water. These were the first fields which the Mexicans had after the foundation of Mexico; there they first cultivated maize, pepper, and other plants. In time, as these fields became numerous from the industry of the people, they cultivated gardens of flowers and odoriferous plants, which they employed in the worship of their gods, and for the recreation of their nobles. At present they cultivate flowers and every sort of garden-herbs upon them. Every day at sun-rise, innumerable vessels loaded with various kinds of flowers and herbs, cultivated in those gardens, arrive by the canals, at the great market-place of that capital. All plants thrive in them surprisingly; the mud of the lake affords a very fertile soil, and requires no water from the clouds. In the large gardens there is commonly a little tree, and even a little hut to shelter the cultivator, and defend him from rain or the sun. When the Chinampa, or owner of a garden, wishes to change his situation, to remove from a disagreeable neighbour, or to come nearer to his own family, he gets into his little vessel, and by his own strength alone if the garden is small, he tows it after him, and conducts it wherever he pleases. That part of the lake, where these floating gardens are, is a place of high recreation, where the senses receive all possible gratification.

GARDENS, HANGING, in antiquity, gardens raised on arches by Nebuchadnezzar, king of Babylon, to gratify his wife Amyctis, daughter of Astyages, king of Media. Q. Curtius makes them equal in height to the walls of the city, viz. 50 feet. They contained a square of 400 feet on every side, and were carried up into the air in several terraces laid above one another, and the ascent from terrace to terrace was by stairs ten feet wide. The arches sustaining the whole pile were raised above one another, and it was strengthened by a wall, surrounding it on every side, of 22 feet in thickness. The mould or earth was of such a depth as to admit the largest trees to take root and grow: and it was covered with various kinds of trees, plants, and flowers. In the upper terrace there was an engine, whereby water was drawn up out of the river for watering the whole garden.

GARDENIA, in botany, a genus of the pentandria monogynia class and order; natural order, Contorta. Corolla one-petaled, contorted or twisted; stigma lobed; berry inferior, two to four-celled, many-seeded. There are fifteen species.

GARDENING.

GARDENING, is a branch of agriculture applied to the management and cultivation of gardens.

HISTORY.

Gardening, says Mr. Walpole, in his History of Modern Gardening, was probably one of the first arts that succeeded to that of

building houses, and naturally attended property and individual possession. Culinary, and afterwards medicinal herbs, were the objects of every head of a family: it became convenient to have them within reach, without seeking them at random in woods, in meadows, and on mountains, as often as they were wanted. When the earth ceased to furnish spontaneously all those primitive luxuries,

ries, and culture became requisite, separate inclosures for rearing herbs grew expedient. Fruits were in the same predicament; and those most in use, or that demanded attention, must have entered into and extended the domestic inclosure. Noah planted a vineyard, and drank of the wine. Thus we acquired vineyards, as well as kitchen-gardens, and orchards. No doubt the prototype of all these sorts was the garden of Eden; but as Paradise was a great deal larger than any gardens we read of afterwards, being inclosed by the rivers Pison, Gihon, Hiddekel, and Euphrates; as every tree, that was pleasant to the sight and good for food grew in it; and as two other trees were likewise found there, of which not a slip or sucker remains; it does not belong to the present discussion. After the Fall, nobody was suffered to enter into the garden; and the poverty and necessities of our first ancestors hardly allowed them time to make improvements in imitation of it, supposing any plan had been preserved. A cottage and a slip of ground for a cabbage and a gooseberry-bush, such as we see by the side of a common, were in all probability the earliest seats and gardens; a well and bucket succeeded to the Pison and Euphrates. As settlements increased, the orchard and vineyard followed; and the earliest princes of tribes possessed just the necessities of a modern farmer. The eastern gardens appear to have been planted adjoining to the house or palace to which they belonged. Thus, king Ahasuerus went immediately from the banquet of wine to walk in the garden of the palace. Esther vii. 7. The garden of Cyrus, at Sardis, mentioned by Xenophon, seems to have been contiguous to the palace; as was that of Attalus, mentioned by Justin, l. 36, c. 4. The hanging-gardens at Babylon were not so much adjacent to the palace as a part of the palace itself, since several of the royal apartments were beneath them. Diod. lib. 2. We are not certain what the taste for gardening was among the Greeks. The Academus was a wooded shady place; and the trees appear to have been of the olive-species. It was situated beyond the limits of the walls, and adjacent to the tombs of the heroes; and though we are not informed of the particular manner in which this grove was laid out, it may be gathered from Pausanius's Attica, that it was elegantly ornamented. At the entrance was an altar dedicated to Love. Within the Academus, were the altars of Prometheus, the Muses, Mercury, Minerva, and Hercules; and at a small distance was the tomb of Plato. So that, in all probability, it was highly adapted by art, as well as nature, to philosophic reflection and contemplation. A taste for gardening does not appear to have prevailed among the Romans, otherwise than as a matter of utility, till a very late period; at least the writers on husbandry, Cato, Varro, Columella, and Palladius, make no mention of a garden as an object of pleasure, but solely with respect to its productions of herbs and fruits. The gardens of Lucullus are the first we find mentioned of remarkable magnificence; though indeed from the extravagance to which these were arrived, it is evident, they could not be the first. Plutarch speaks of them as incredibly expensive, and equal to the magnificence of kings. They contained artificial elevations of ground to a surprising height, of buildings projected into the sea, and vast pieces of water upon land. In short, his extravagance was so great, that he acquired the appellation of the Roman Xerxes. It is not improbable, from the consideration of Lucullus having spent much time in Asia, in a situation wherein he had an opportunity of observing the most splendid constructions of this kind, that these gardens might be laid out in the Asiatic style. The vast masses of building said to have been erected, might have borne some resemblance, in the arrangement and style, to the Babylonian gardens. In the paintings found at Herculaneum are a few traces of gardens, as may be seen in the second volume of the prints. They are small square inclosures, formed by trellis-work and espaliers, and regularly ornamented with vases, fountains, and caretides, elegantly symmetrical, and proper for the narrow spaces allotted to the garden of a house in a capital city. From these remarks, it appears how naturally and insensibly the idea of a kitchen-garden slid into that which has for so many ages been peculiarly termed a garden, and by our ancestors in this country distinguished by the name of a pleasure-garden. A square piece of ground was parted off in early ages for the use of the family:—to exclude cattle, and ascertain the property, it was separated from the fields by a hedge. As pride and design of privacy increased, the inclosure was dignified by walls; and in climes where fruits were not lavished by

the ripening glow of nature and soil, fruit-trees were assisted and sheltered from surrounding winds by the like expedient; for the inundation of luxuries, which have swelled into general necessities, have almost all taken their source from the simple fountain of reason. When nature and prospect were thus excluded, by the custom of making square gardens inclosed with walls, pomp and solitude combined to call for something that might enrich and enliven the insipid and inanimated partition. Fountains, first invented for use, which grandeur loves to disguise and throw out of sight, received embellishments from costly marbles, and at last, to contradict utility, as it were, tossed their waste of waters into air in spouting columns. Art, in the hands of rude man, had at first been made a succedaneum to nature; in the hands of ostentatious wealth, it became the means of opposing nature; and the more it traversed the march of the latter, the more nobility thought its power was demonstrated. Canals, measured by the line were introduced in lieu of meandering streams, and terraces were hoisted aloft in opposition to the facile slopes that imperceptibly unite the valley to the hill. Balustrades defended these precipitate and dangerous elevations, and flights of steps rejoined them to the sub-jacent flat from which the terrace had been dug. Vases and sculpture were added to the unnecessary balconies, and statues furnished the lifeless spot with mimic representations of the excluded sons of men. Thus difficulty and expence were the constituent parts of those sumptuous and selfish solitudes; and every improvement that was made, was but a step farther from nature. The tricks of water-works to wet the unwary, not to refresh the panting spectator, and parterres embroidered in patterns like a petticoat, were but the childish endeavours of fashion and novelty to reconcile greatness to what it surfeited on. To crown these impotent displays of false taste, the sheers were applied to the lovely wildness of form with which nature has distinguished each various species of tree and shrub. The venerable oak, the romantic beech, the useful elm, even the aspiring circuit of the lime, the regular round of the chesnut, and the almost moulded orange-tree, were corrected by such fantastic admirers of symmetry. The compass and square were of more use in plantations than the nurseryman. The measured walk, the quincunx, and the etoile, imposed their unsatisfying sameness on every royal and noble garden. Trees were headed, and their sides pared away; many French groves seem green chests set upon poles. Seats of marble, arbours, and summer-houses, terminated every vista; and symmetry, even where the space was too large to permit its being remarked at one view, was so essential, that, as Pope observed,

— each alley has a brother,
And half the garden just reflects the other.

In Kip's Views of the Seats of our Nobility and Gentry, we see the same firesome and returning uniformity. Every house is approached by two or three gardens, consisting perhaps of a gravel-walk and two grass-plats or borders of flowers. Each rises above the other by two or three steps, and as many walls and terraces, and so many iron gates, that we recollect those ancient romances in which every entrance was guarded by giants or dragons. Yet though these and such preposterous inconveniences prevailed from age to age, good sense in this country had perceived the want of something at once more grand and more natural. And different authors gave descriptions of gardens which they considered as the models of perfection. But as no succeeding generation in an opulent and luxurious country contents itself with the perfection established by its ancestors, more perfect perfection was still sought; and improvements had gone on, till London and Wise had stocked all our gardens with giants, animals, monsters, coats of arms, and mottoes, in yew, box, and holly. Absurdity could go no farther, and the tide turned. Bridgman, the next fashionable designer of gardens, was far more chaste; and whether from good sense, or that the nation had been struck by the admirable paper in the Guardian, No. 173, he banished verdant sculpture, and did not even revert to the square precision of the foregoing age. He enlarged his plans, disdained to make every division tally to its opposite; and though he still adhered much to straight walks with high-clipped hedges, they were only his great lines; the rest he diversified by wilderness, and with loose groves of oak, though still within surrounding hedges. As his reformation gained footing, he ventured, in the royal garden at Richmond, to introduce

roduce cultivated fields, and even morsels of a forest-appearance, by the sides of those endless and tiresome walks that stretched out of one into another without intermission. But this was not till other innovators had broke loose too from rigid symmetry. "But the capital stroke, the leading step to all that has followed, was the destruction of walls for boundaries, and the invention of fosses—an attempt then deemed so astonishing, that the common people called them Ha! Ha's! to express their surprise at finding a sudden and unperceived check to their walk. A sunk fence may be called the leading step, for these reasons. No sooner was this simple enchantment made, than levelling, mowing, and rolling, followed. The contiguous ground of the park without the sunk fence was to be harmonized with the lawn within; and the garden in its turn was to be set free from its prim regularity, that it might assort with the milder country without. The sunk fence ascertained the specific garden; but that it might not draw too obvious a line of distinction between the neat and the rude, the contiguous out-lying parts came to be included in a kind of general design; and when nature was taken into the plan, under improvements, every step that was made pointed out new beauties, and inspired new ideas. At that moment appeared Kent, painter enough to taste the charms of landscape, bold, and opinionative enough to dare and to dictate, and born with a genius to strike out a great system from the twilight of imperfect essays. He leaped the fence, and saw that all nature was a garden. He felt the delicious contrast of hill and valley changing imperceptibly into each other, tasted the beauty of the gentle swell or concave scoop, and remarked how loose groves crowned an easy eminence with happy ornaments; and while they called in the distant view between their graceful stems, removed and extended the perspective by delusive comparison. Thus the pencil of his imagination bestowed all the arts of landscape on the scenes he handled. The great principles on which he worked were perspective, light, and shade. Groups of trees broke too uniform or too extensive a lawn; evergreens and woods were opposed to the glare of the champaign; and where the view was less fortunate, or so much exposed as to be beheld at once, he blotted out some parts by thick shades, to divide it into variety, or to make the richest scene more enchanting by reserving it to a farther advance of the spectator's step. Thus, selecting favourite objects, and veiling deformities by screens of plantations; sometimes allowing the rudest waste to add its soil to the richest theatre: he realized the compositions of the greatest masters in painting. Where objects were wanting to animate his horizon, his taste as an architect could bestow immediate termination. His buildings, his seats, his temples, were more the works of his pencil than of his compasses. We owe the restoration of Greece and the diffusion of architecture to his skill in landscape. But of all the beauties he added to the face of this beautiful country, none surpassed his management of water. Adieu to canals, circular basins, and cascades tumbling down marble steps, that last absurd magnificence of Italian and French villas. The forced elevation of cataracts was no more. The gentle stream was taught to serpentine seemingly at its pleasure; and where discontinued by different levels, its course appeared to be concealed by thickets properly interspersed, and glittered again at a distance, where it might be supposed naturally to arrive. Its borders were smoothed, but preserved their waving irregularity. A few trees scattered here and there on its edges sprinkled the tame bank that accompanied its meanders; and when it disappeared among the hills, shades descending from the heights leaned towards its progress, and framed the distant point of light under which it was lost, as it turned aside to either hand of the blue horizon. Thus, dealing in none but the colours of nature, and catching its most favourable features, men saw a new creation opening before their eyes. The living landscape was chastened or polished, not transformed. Freedom was given to the forms of trees: they extended their branches unrestricted; and where any eminent oak, or master-beech, had escaped maiming, and survived the forest, bush and bramble was removed, and all its honours were restored to distinguish and shade the plain. Where the united plumage of an ancient wood extended wide its undulating canopy, and stood venerable in its darkness, Kent thinned the foremost ranks, and left but so many detached and scattered trees, as softened the approach of gloom, and blended a chequered light with the thus lengthened shadows of the remain-

ing columns. Succeeding artists have added new master-strokes to these touches; perhaps, improved or brought to perfection some that have been named. The introduction of foreign trees and plants, which we owe principally to Archibald D'Argyle, contributed essentially to the richness of colouring so peculiar to our modern landscape. The mixture of various greens, the contrast of forms between our forest-trees and the northern and West Indian firs and pines, are improvements more recent than Kent, or but little known to him. The weeping willow, and every florid shrub, each tree of delicate or bold leaf, are new tints in the composition of our gardens."

GARDENING, in the perfection to which it is now brought in Britain, is entitled to a place of considerable rank among the liberal arts. "It is," says Mr. Wheatley, "as superior to landscape-painting as a reality to a representation: it is an exertion of fancy; a subject for taste; and being realized now from the restraint of regularity, and enlarged beyond the purposes of domestic convenience, the most beautiful, the most simple, the most noble scenes of nature, are all within its province. For it is no longer confined to the spots from which it takes its name; but regulates also the disposition and embellishments of a park, a farm, a forest, &c. and the business of a gardener is to select and apply whatever is great, elegant, or characteristic, in any of them; to discover, or to shew, all the advantages of the place upon which he is employed; to supply its defects, to correct its faults, and improve its beauties." But though all these encomiums are justly due to gardening, upon the large scale of an ornamental garden, including a park, farm, forest, &c. yet our limits here require, that we treat on that part of gardening which regards usefulness and convenience more than ornament.

OF THE CHOICE OF GROUND FOR A GARDEN.

In the choice of a place proper for a garden, the most essential points to be considered are, the situation, the soil, the exposure, water, and prospect.

I. The situation ought to be such as is wholesome, and in a place neither too high nor too low; for if a garden be too high, it will be exposed to the winds, which are very prejudicial to trees; and if it be too low, the dampness, the vermin, and the venomous creatures that breed in ponds and marshy places, will add much to its insalubrity. The best situation is on the side of a hill, especially if the slope be easy, and almost imperceptible; if a good deal of level ground be near the house; and if it abound with springs of water; for, being sheltered from the fury of the winds and the violent heat of the sun, a temperate air will be enjoyed; and the water that descends from the top of the hill, either from springs or rain, will not only supply fountains, canals, and cascades for ornament, but, when it has performed its office, will water the adjacent valleys, and, if it be not allowed to stagnate, will render them fertile and wholesome.

II. A good soil is next to be considered; for it is scarce possible to make a fine garden in a bad soil. There are indeed methods of meliorating ground, but they are very expensive; and sometimes, when the expence has been bestowed of laying good earth three feet deep over the whole surface, a whole garden has been ruined, when the roots of the trees have reached the natural bottom. To judge of the quality of the soil, observe whether there be any heath, thistles, or such-like weeds, growing spontaneously in it; for they are certain signs that the ground is poor. Or if there be large trees growing thereabouts, observe whether they grow crooked, ill-shaped, and grubby; and if they be of a faded green, and full of moss, or infested with vermin; in all such cases, the place is to be rejected. But if it be covered with grass fit for pasture, the depth of the soil may be tried. To know this, dig holes in several places, six feet wide and four deep; and if there be three feet of good earth it will do very well, but less than two will not be sufficient. The quality of good ground is neither to be stony nor too hard to work; neither too dry, too moist, nor too sandy and light; nor too strong and clayey, which is the worst of all for gardens.

III. The next requisite is water; the want of which is one of the greatest inconveniences that can attend a garden, and will bring a certain mortality upon whatever is planted in it, especially in the greater droughts, that often happen in a hot and dry situation in summer; besides its usefulness in fine gardens for making fountains,

fountains, canals, cascades, &c. which are the greatest ornaments of a garden.

IV. The last thing to be considered, is the prospect of a fine country; and though this is not absolutely necessary, yet it is one of the most agreeable beauties of a fine garden: besides, if a garden be planted in a low place that has no kind of prospect, it will not only be disagreeable but unwholesome.

OF LAYING OUT AND PLANTING GARDENS.

Gardens are usually distinguished into Flower-Gardens, Fruit-Gardens, and Kitchen-Gardens. The first being designed for pleasure and ornament, should be placed in the most conspicuous part, that is, next to the back or front of the house; and the two latter, being designed for use, should be placed less in sight. But though the fruit and kitchen gardens are here mentioned as distinct, yet they are now usually united; as they equally require a good soil and exposure, and should both be placed out of the view of the house. In the laying out and planting of gardens, the beauties of nature should always be studied; for the nearer a garden approaches to nature, the longer it will please. According to Mr. Miller, the area of a handsome garden may take up 30 or 40 acres, but no more; and the following rules should be observed in the disposition of it. There ought always to be a descent of at least three steps from the house to the garden; this will render the house more dry and wholesome, and the prospect on entering the garden more extensive. The first thing that ought to present itself to view should be an open lawn of grass; which ought to be considerably broader than the front of the building; and if the depth be one-half more than the width, it will have a better effect: if on the sides of the lawn there are trees planted irregularly, by way of open groves, the regularity of the lawn will be broken, and the whole rendered more like nature. For the convenience of walking in damp weather, this lawn should be surrounded with a gravel-walk, on the outside of which should be borders three or four feet wide for flowers; and from the back of these the prospect will be agreeably terminated by a slope of ever-green shrubs; which, however, should never be suffered to exclude agreeable prospects, or the view of handsome buildings. These walks may lead through the different plantations, gently winding about in an easy natural manner; which will be more agreeable than either those long straight walks, too frequently seen in gardens, or those serpentine windings that are twisted about into so many short turns as to render it difficult to walk in them; and as no garden can be pleasing where there is a want of shade or shelter, these walks should lead as soon as possible into plantations, where persons may walk in private, and be sheltered from the wind. Narrow rivulets, which have a constant stream, if they are judiciously led about the garden, have a better effect than large stagnating ponds or canals so frequently made in large gardens. When wildernesses are intended, they should not be cut into stars and other ridiculous figures, nor formed into mazes or labyrinths, which in a great design appear trifling. In a word, the several parts of a garden should be diversified; but in places where the eye takes in the whole at once, the two sides should be always the same. In designs, the aim should be always at what is natural. The general disposition of a garden and of its parts ought to be accommodated to the different situations of the ground, to humour its inequalities, to proportion the number of sorts of trees and shrubs to each part, and to shut out from the view of the garden no objects that may become ornamental. But these extended views of the subject are not to our present purpose. A practical attention to a garden, is by some esteemed a degrading employment. It is true, indeed, that pastoral and agricultural manners, if we may form a judgement from the dignified descriptions of Virgil, are greatly degenerated. The employments of the shepherds and husbandmen are now become mean and sordid. The work of the garden is usually left to a peasant. Nor is it unreasonable to assign the labour, which wears without amusement, to those who are sufficiently amused by the prospect of their wages. But the operations of grafting, of inoculating, of pruning, of transplanting, are curious experiments in natural philosophy; and that they are pleasing as well as curious, those can testify who remember what they felt on seeing their attempts in these branches of practical gardening attended with success. Among the employments suitable to old age, Cicero has enumerated the superintendence of a

garden. It requires no great exertion of mind or body; and its satisfactions are of that kind which please without violent agitation. Its influence on health is an additional reason for an attention to it at an age when infirmities abound. But it is not the extensive garden alone that calls our attention, or yields us pleasure. The possessor of an acre, or a small portion, may receive a real pleasure, from observing the progress of vegetation, even in a plantation of culinary plants. A very limited tract, properly attended to, will furnish ample employment for an individual. Nor let it be thought a mean care; for the same hand that raised the cedar, formed the hyssop on the wall. Even the orchard, cultivated solely for advantage, exhibits beauties unequalled in shrubbery; nor can the greenhouse produce an appearance to excel the blossom of the apple and the almond. The kitchen-garden ought to be situated on one side of the house, near the stables, from whence the dung may be easily conveyed into it; and after having built the wall, borders should be made under them, which, according to Mr. Miller, ought to be eight or ten feet broad. Upon these borders, exposed to the south, many sorts of early plants may be sown; and upon those exposed to the north, may be sown some late crops, taking care not to plant any deep-rooting plants, especially beans and pease, too near the fruit-trees. Next proceed to divide the ground into quarters; the best figures for these are a square or an oblong, if the ground will admit of it; otherwise they may be of that shape which will be most advantageous. The size of these quarters should be proportioned to that of the garden; if too small, the ground will be lost in walks, and the quarters being inclosed by espaliers of fruit-trees, the plants will draw up slender, for want of a more open exposure. The walks should also be proportioned to the size of the ground; these in a small garden should be six feet broad, but in a large one ten, and on each side of the walk there should be allowed a border three or four feet wide between it and the espalier. In these borders may be sown small sallads, or any other herbs that do not take deep root or continue long; but they should not be sown or planted with the same plants two years together. In the quarter nearest to the stables, and best defended from the cold winds, should be the hot-beds, for early cucumbers, melons, &c. and to these there should be a passage from the stables, and a gate through which a small cart may enter. The most important points of general culture consist in well digging and manuring the soil, and giving a proper distance to each plant, according to their different growths: as also in keeping them clear from weeds: for which purpose, always observe to keep the dunghills free from them, otherwise their seeds will be constantly brought in and spread with the dung.

THE GARDENER'S CALENDAR.

Under this head we proceed to point out what is proper to be done in the different months of the year, in the Kitchen-Garden, Flower-Garden, Orchard, &c. It is necessary, however, to mention here, that the arrangement in the following Calendar was originally drawn up for the climate of England; but will suit those parts of Scotland where the climate is mild equally well, upon allowing a difference of ten or twelve days later for sowing or planting. Where the seasons are still more backward, a proportional allowance will be made by the judicious gardener, or practitioner in this pleasant art.

JANUARY.

KITCHEN-GARDEN. Cauliflower-plants under glasses and frames should be covered with pea-straw, or mats, to defend them from the frost. Celery and endive should be dug up as soon as the frost begins, for daily use, and the other covered with straw. Cucumbers for the first crop, to come in early in March, should now be sown. As soon as they are three or four days old put each into a small pot; and every week sow more to have plenty of plants. Dung should be wheeled into the kitchen-garden in frosty weather, when other work cannot be done. Ground lying vacant should be dug up, if omitted in October, and thrown up into ridges. Hotbeds and loam should be prepared for asparagus, cucumbers, and melons. Lettuces under glasses should be examined, and if they be killed, sow more on a hotbed. Mushroom-beds will require regular attendance, and frost and rain must be

kept out by dry straw and mats. Onions, to draw young, should be sown on a warm border. Peas under the south wall, for the first crop, should have the earth drawn up to them in a dry day, and sticks placed to them to defend them from the violence of the winds; and sow the second crop. Plant asparagus for the fourth crop. Beans for the second crop of mazagans. Beets, cabbages, carrots, parsneps for seed. Mint and potatoes on a hotbed. Onions for eschalions and seed. Radishes for the second crop sow in a warm situation, and the first crop on a hotbed. Small sallading, as cress, mustard, rape, radishes, sow every week on a hotbed. Sow carrots for the first crop, and the second of peas. Sow on hotbeds, carrots and cucumbers for the first crop. Cress, mustard, radish, and rape for sallads; sow likewise turneps.

FLOWER-GARDEN AND SHRUBBERY. Anemones which were planted in the autumn will require to be covered with pea-straw, rotten tan, or mats. Auricula and polyanthus seeds may now be sown in boxes or pots in mild weather. Auriculas should be sheltered from violent rains and frost by mats; and at the end of the month fresh earthed. Beds for bulbous roots which have not been planted in October or November, should be digged and thrown up into ridges, that they may be planted the first fine weather. Carnations must be sheltered from violent rains and frost by mats. Plant all sorts of bulbous roots, crocuses, as jonquils, narcissuses, polyanthus-narcissuses, snow-drops, tulips, &c. Plant flowering-shrubs which are hardy, and flower early, as almonds, double-flowering cherries, honey-suckles, lilacs, mezeoreons, roses, &c. Trenches should be cut to carry off the water, if it stand any where, after heavy rains.

FRUIT-GARDEN AND ORCHARD. Apple-trees should be pruned as soon as the violent frosts are over. Espaliers ought always to be repaired before the buds of the trees begin to open. The fruit-room should be often examined, to pick out all fruit which begins to decay; and nail mats before the windows to keep out the frost. Ground for planting should be prepared by digging the holes ready; and if wet, a cart-load of good loam should be brought for each standard-tree, and formed into a little hill before the tree be planted. Scrape off the moss from all fruit-trees. Orchards in general are much neglected, by not cutting out the dead wood and branches that cross each other. Pear-trees require pruning, both standards, espaliers, and against walls, as soon as the weather becomes mild. Prune currants, gooseberries, and raspberries in pots may be placed on hotbeds for forcing. Vines should not be pruned till towards the end of the month.

GREENHOUSE. Air may be given to the plants, if the weather be mild. Fire must be made if it freeze, and particularly when it begins to thaw, or if it be foggy weather to dry the house; for dampness is as prejudicial as cold. Succulent plants, such as aloes, ficoides, &c. should not have any water this month. Water for all sorts of plants should be the softest that can be got; rain-water is the best; the chillness should be taken off by letting it stand in the house some days before it is used; and this month it should be given very sparingly. Windows in frosty weather should be kept very close, by pasting strips of paper where the wind blows in; if the windows must be covered with mats, take them down in the day-time to admit the light.

FEBRUARY.

KITCHEN-GARDEN. Sow melons at the beginning of the month for the first crop, and when about three days old, plant each in a small pot. Plant mint in pots on a hotbed. Defend mushroom-beds from wet. Sow parsley for edgings, and some curled, very thin on a bed, to grow large for garnishing of dishes, and the large-rooted. Sow parsneps on ground digged very deep. Peas should be earthed in dry weather, and will require sticking. Sow marrowfats and other large sorts, and the third crop of hotspurs. Plant asparagus for forcing, for the last crop. Beans for a third crop: Windsors, for the first; Cauliflowers from under the glasses; endives for blanching and seed: eschalots, garlic, and rochambole; horse-radish, lettuces, from under glasses; leeks, onions, and parsley for seed; potatoes on hotbeds, for the first crop. Uncover radishes in mild weather, and put the straw on again at night. Sow beets, cabbages, carrots, cauliflowers, coleworts, fennel, leeks, lettuces, mustard, onions, parsley, parsneps, peas, radishes, spinach. Sow on hotbeds, cauliflowers, celery, cress, cucumbers, melons, mustard, radish, rape for sallads. Sow spinach, the first crop, and hoe the winter-crop

if it be too thick. Water should be carried away, if it stands after heavy rains, by cutting trenches.

FLOWER-GARDEN AND SHRUBBERY. Plant anemones and ranunculuses: box for edgings at the end of the month; bulbous and tuberous roots of all sorts; flowering shrubs and ornamental trees: forest-trees of all sorts, except evergreens. Shrubby should be digged over and raked smooth, to destroy the young weeds beginning to shoot; but the trees should first be pruned. Shrubs of all sorts should have the suckers taken off, and, if small, be planted in beds a foot asunder until they are stronger; and any sorts may now be planted. Sow at the end of the month hardy annuals and mignonette.

FRUIT-GARDEN AND ORCHARD. Apple and pear trees should be finished pruning the first mild weather. Plant cuttings of currants and gooseberries. Prepare grafts of apples and pears. Place hurdles against peaches, nectarines, and apricots, in the beginning of the month; they should be about two feet higher than the walls, that they may be set sloping; and must be fastened with stakes, and remain there till the fruit is set. Sow kernels of apples and pears, for stocks. Planting all sorts of fruit-trees should be finished early in the month, and the roots covered with mulch. Pruning wall-trees should be finished. Strawberries may be planted at the end of the month, and the old beds dressed; those on hotbeds must be frequently watered. Vines, finish pruning before they bleed. Wall-trees, as apricots, nectarines, peaches, plums, pears, should be finished pruning in the month, and those done in October must be examined, and the dead ends cut off.

GREENHOUSE. Admit air, very freely in mild weather. Earth the top of the pots, but first take out the old an inch deep. Fire must be made in foggy weather to dry the house. Leaves this month decay very fast; therefore they will require picking off almost every day, but especially from the geraniums. Myrtles, oranges, winter-cherries, and some others, water frequently, but not too much at a time. Succulent plants, as aloes, ficoides, &c. must not have any water given them in this month, for it will cause them to rot. Water the plants which require it frequently, but very sparingly; for too much moisture in the house will injure the plants. Windows may be opened for a few hours in the middle of the day, but should be shut again about two o'clock, or whenever it begins to be foggy.

MARCH.

KITCHEN-GARDEN. Alisanders sown in autumn, should be hoed to a foot asunder, and more seed sown. Aromatic shrubs and herbs on beds, weed and fresh earth, early in the month; sow and plant more of all sorts. Dress artichokes, and take the suckers off for a fresh plantation. Plant artichokes, asparagus, beans, cives, cucumbers, Jerusalem artichokes, lettuces, melons, mushrooms, potatoes, and tarragon. Plant aromatic herbs and shrubs; as balm, camomile, lavender, mint, pennyroyal, rosemary, rue, sage, savory, thyme, &c. Pot and sweet-herbs should now be sown. Slip pot-marjoram, savory, and thyme. Weed potatoes, and plant the principal crop. Sow radishes, the fourth crop, and rampions. Sow alisanders, angelica, asparagus, basil, beets, borage, broccole, broccoli, burnet, cabbages, capscums, carrots, cauliflowers, celery, celeriac, chardons, chervil, clary, corianders, cress, cucumbers, dill, fennel, hyssop, kidney-beans, leeks, lettuces, marjoram, marigolds, melons, mustard, nasturtiums, onions, parsley, parsneps, peas, purslane, radishes, rampions, salsify, savory, scorzonera, sea-kale, skirrets, sorrel, spinach, tarragon, thyme, tomatoes, turneps, water-cresses. Weed spinach, and sow the second crop. Turneps, sow the first crop. Sow water-cresses, in a moist place, or where it may be constantly supplied with waste water from the pump. Destroy weeds, while small, which will save future trouble.

FLOWER-GARDEN AND SHRUBBERY. Anemones and ranunculuses, if any remain unplanted, must not be deferred longer than the first mild day. Anemones in flower should be covered with mats in windy or rainy weather. Annual flowers of all the hardy sorts in the Catalogue at the end of the calendar may be sown about the middle of the month in small patches where they are to remain; hollow the earth out in the form of a basin, fifteen inches over, and an inch deep, and sow the seeds very thin all over it, and not a small patch in the middle, as is too frequently the custom. Box for edgings, in mild weather. Bulbous roots in beds should

should be covered with mats in rainy or stormy weather, and the earth stirred gently up with one's fingers to destroy the weeds. Carnations should be potted. Evergreen shrubs, and trees of all sorts, may be planted in mild weather; then cover the roots with turf turned downwards, moss, fern, pea-straw, or some such things, to keep the ground moist, which is better, and gives less trouble than watering. Plant flowering shrubs and forest-trees of all sorts, early in the month, and cover the roots. Mignonette, sown last month, should be transplanted, and more of it sown. Myrtles, winter-cherries, and other hardy greenhouse-plants, planted against walls, should have the mats rolled up in fine weather, and the dust washed off from the leaves, but covered again at night. Perennial and biennial flowers must be sown on beds, very thin, that they may be strong; those sown last year should be transplanted, and the old roots of the perennials divided. Plant annuals from the first hot-bed: Biennials and perennials from the seedbed: Box for edgings: Evergreens of all sorts: Perennials, by dividing their roots, and seedlings of last year's sowing: Shrubs and trees early in the month: Strawberries and thrift for edging. Shrubberies should be pruned early in the month: the suckers taken off, and planted a foot at least asunder, and the rows two feet apart; the ground hoed or digged, and then raked over, that it may appear neat and clean.

FRUIT-GARDEN AND ORCHARD. Apricot, nectarine, and peach-trees, should have hurdles placed before them, to defend the blossoms from hail: or else stick branches of yew, fern, or fir, amongst them, but hurdles are the best. Fig-trees which have mats nailed over them should have them taken away by degrees, towards the end of the month. Graft trees, and cut down the budded ones. Planting and pruning trees of all sorts should be finished at the beginning of the month. Strawberry-beds should now be attended to; hoe them and stir up the earth between them; then spread some very rotten dung and earth over them. Those on hotbeds want frequent watering, and the dead leaves should be constantly picked off, to let the sun come to the fruit. New plantations may now be made. Vines may now be layered; plant cuttings.

GREENHOUSE. Give air freely in the middle of the day, except the wind be very cold. Earth the tops of the pots, but take the old earth out an inch deep. Place geraniums near the windows to prevent their being drawn up weak. Myrtles, winter-cherries, and other hardy plants, will want fresh potting, and, if the weather be mild, may be taken out to make more room, but set them in a sheltered place at first. Sow kernels in pots, good strong seed, and if they are set an inch asunder, they will grow faster. Succulent plants may now have a little water, but not much at a time. Water the plants in the middle of the day, and only when the sun shines.

APRIL.

KITCHEN-GARDEN. April being the latest time for sowing the principal crops of the kitchen-garden, if any thing directed to be performed last month were omitted, or the weather would not permit, let it be done early in this. Aromatic herbs and shrubs of all the following sorts should now be planted, as balm, camomile, pennyroyal, peppermint, spearmint, tansey, lavender, rosemary, rue, sage, southernwood, wormwood, &c. Finish both sowing and planting asparagus early in the month. Let the beds be forked and raked smooth, and watered twice a week with drainings of a dunghill. Cut off every bud, however small; for, if they be left on, they weaken the others; this method is in general only practised by the London kitchen-gardeners. Never suffer any weeds to remain after they are in an inch high, for they weaken the asparagus very much. Beans in flower should have their tops cut off; and draw the stalks of the first crop close to the wall by strings, and earth them up. Plant the third crop of Windsors. Kale and brocoli should have the first crop pricked out, and the second sown. Cabbages of the early sort should have their leaves tied up to forward their cabbaging. Prick out from the seedbed the third crop of sugarloaf, the second of red, and the first of savoys. Pick out capsicums, from the seedbed, to prevent their growing weak, upon another hotbed. Weed carrots, thin the first crop, and sow the second to draw young. Search for caterpillars upon cabbages and apple-trees particularly. Sow cress and mustard, every week. Cucumber-beds must be attended to, and plenty of air given them, when mild; and, if the heat declines, fresh dung must be added to

the sides. Sow kidney-beans, the second crop, and the first of the scarlet-flowering. Tie up lettuces, to assist their cabbaging; those in beds should be thinned to a foot distance; others planted out, and the fourth crop sown very thin in an airy place. Melon-beds will require to be kept up to a good heat, and the second and third crop planted out. Thin Parsley for garnishing dishes, and leave those plants which have the best curled leaves. Sow the large-rooted. Earth up peas frequently, and stick them as soon as any tendrils appear. Sow the third crop of marrowfat. Plant beans and mushrooms.

FLOWER-GARDEN AND SHRUBBERY. Anemones in stormy weather will still require covering with mats. Annual flowers on hotbeds will require thinning, and some of the strongest must be planted into single pots. Hardy annuals, if not already sown as directed in March, should be deferred no longer, and sown very thin. Auriculas in bloom must be constantly attended to, and defended from violent winds, but yet have plenty of air in mild weather; the seedbeds will want frequent and gentle waterings. Balm of gilead may be sown or slipped, but the strongest plants will be raised from seed. Biennial and perennial flowers finish sowing early in the month. Bulbous-rooted flowers, which were planted in boxes or glasses, as soon as the flowers are decayed, should be planted in the ground, to strengthen the roots. Carnation-seed may now be sown, and stir up the earth frequently of those in pots. Crocus-leaves are by many persons cut off; but it greatly weakens the young roots, for the old ones decay, and new roots are formed every year; if they hang over in the walks, tie them up in a knot. Finish planting evergreen-trees and shrubs, and sow the seed. Plant annuals from the hotbeds into pots, and plunge them into another hotbed: Biennials and perennials on the borders: Myrtles, heaths, and other hardy greenhouse-plants: Hollies and quick for hedges: Strawberries and thrift for edgings: Shrubs and trees of all sorts early in the month: Tuberose in pots on a hotbed. Water seedling-heads of flowers, shrubs, and trees, often, but very little at a time. Shrubberies should be finished digging and raking, and frequently hoed when any weeds appear.

FRUIT-GARDEN AND ORCHARD. Apricots commonly growing in clusters require to be thinned three different times: as soon, therefore, as they are the size of a horse-bean, it is proper to begin. Budded fruit-trees, such as apricots, cherries, nectarines, peaches, plums, must be examined to pull off all the shoots which come from the stock. Caterpillars may now be readily found in their webs, but more particularly on apple-trees. Grafted fruit-trees, as apples, cherries, pears, must often be examined to put off the shoots below the grafts; and replace any clay which has cracked or fallen off. Apply hog's-dung to any fruit-trees which are blighted. Take away hurdles when the fruit is set. Finish planting and pruning nectarines and peaches. Planting and pruning should be entirely finished early in the month; and if any trees be removed so late, it should be those which have been planted in baskets and trained. Search for snails in the holes of walls. Finish dressing and planting strawberry-beds, but plant only strong runners of the last year.

GREENHOUSE. Give air, very freely, by keeping the windows open all day, except in storms of hail. American aloes may have water very often, and should be fresh potted. Earth the tops of all the pots, with the compost which each plant requires: and shift those which are in too small pots. Geraniums should be removed as near as possible to the windows, to prevent their being drawn up weak; branches which begin to rot must be cut off, and decayed leaves constantly pulled off. Inaroh-orange and lemon-trees. Constantly pull off decayed leaves from all plants, but especially the geraniums. Myrtles, if prevented from being set out last month, may be removed in this, but it should be in a sheltered place. Prune and fresh-pot any plants that may need it. Orange-trees must be fresh-potted after the myrtles are taken out; leaves which are mildewed must be cleaned with a sponge and water a little warm, and the stems well brushed.

MAY.

KITCHEN-GARDEN. Aromatic herbs and shrubs may still be sown and planted. Artichokes should have the young-shoots pulled off, lest they rob the principal one. Asparagus-beds ought to be frequently weeded, and in very dry weather watering them will be proper. Beans will require to have their tops cut off as they

they come into flower, and the earth drawn up to their stems. Prick out the second crop of kale, and be sure to have plenty of plants, for in all long frosty winters its utility is fully proved. Cabbages will often want hoeing and earthing up. Plant the second crop, and the first of red. Sow the fourth crop, and the second of savoys. Cabbage-turneps, turneprooted-cabbages, American and white Scotch cabbages, and Anjou boorecole, must now be sown; whether they are intended for feeding cattle, or for eating. They are most profitable when very large, therefore sow the seed very thin. Sow cress and mustard every week on a cool border; and hoe that which is intended for seed. Cucumbers for the fourth crop may be planted out, and let some be against walls, both for seed and superior flavour. Sow now in the open ground. If plants be attacked with black flies, fumigate them with tobacco-smoke. Endive, thin the first crop and sow the second. Eschallots, garlic, and rocambole, may have a few roots taken up for present use. Hoe or weed the beds of beets, carrots, leeks, lettuces, onions, parsley, parsnips, turneps, &c. and thin them before they are too much crowded. Sow kidney-beans the third crop of dwarfs, and the second of runners. Thin lettuces in beds, and then sow the fifth crop. Melons on the tan-bed must be thinned.

FLOWER-GARDEN AND SHRUBBERY. Bulbous roots, which flower early, as aconites, anemones, crocuses, irises, snow-drops, and several others, should be taken up as soon as the leaves are withered, and before they entirely disappear, for then they are more readily found. Those in boxes or glasses, which have done flowering, should be put into the ground to strengthen the roots. Carnations will require sticks to be placed to them as soon as they begin to spindle, and the earth should be often stirred up. Evergreen-shrubs and trees lately planted must be frequently watered, and they may also be layered. Weed, roll, and mow, the grass-walks often. Gravel-walks will require frequent rolling. Hyacinths, as soon as the leaves begin to decay, should be taken up, then laid on a ridge of earth with their leaves downwards, and covered with earth two or three inches thick, to harden and ripen the roots. Insects of various sorts, as earwigs, caterpillars, snails, &c. should be searched for and destroyed. Mignonette may be sown in the open ground, for a succession in the autumn. Myrtles, heaths, and other hardy greenhouse-plants against walls, will often require watering. Plant bulbous roots which have been forced, in boxes, or glasses, into the open ground, to strengthen the roots. Ranunculuses should be weeded, and the earth gently stirred with the fingers. Rose-trees infected with green flies or grubs must be constantly examined; wash off the flies with water, and pinch those leaves which have grubs in them with the finger and thumb. To have roses late in autumn, cut off every flower-bud which now appears, from two or three trees, and water them well for about ten days afterwards. Seeds of every sort of flowers which are ripe should be gathered.

FRUIT-GARDEN AND ORCHARD. Apricots should be thinned for the second time, and all foreright shoots pulled off. Blighted trees should have hog's dung spread over the border; then fork up the ground and water it well. Pull off curled leaves, water the trees all over, and strew tobacco-dust on the leaves; or fumigate them with tobacco-smoke, which will greatly help to destroy the insects. Examine budded trees often, and pull off improper shoots. Caterpillars must be searched for upon apple-trees, and destroyed. Disbud all the wall-trees, by pulling off buds which come out in improper places. Espalier-trees should be examined to disbud them and train in the shoots. Grafted trees should have the clay taken off, if properly united. Nectarines and peaches will require thinning for the first time, and the trees to be disbudded. Forced strawberries should have the dead leaves pulled off, and be frequently watered. Those which are beginning to flower, or have lately been planted, must be often watered in dry weather. It is not generally known that hantboys and Chili strawberries do not, like all other species, produce hermaphrodite flowers, but male and female flowers on separate plants; and persons ignorant of this fact, allege their hantboys are blind; whereas those flowers which turn black in the middle are male plants, and never will produce fruit. To make a plantation properly, let a person skilled in botany examine them when in flower; he will then easily distinguish them by the male stamina above a quarter of an inch high. Most of them should be pulled up, and the male ones marked with

a stick; for they cannot be distinguished when out of flower. The females indeed will produce fruit, but neither so large nor well flavoured, and often ill-shaped; and the seed will not grow, unless impregnated by the male flowers. In making a new plantation, do it in the following manner:

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The male plants may be transplanted when in flower, if covered with a flower-pot for a few days after; three males will do for every fourteen females.

GREENHOUSE. Air must be given freely except on cold nights. American aloes must be often watered, and placed near the windows. Take geraniums towards the end of the month, except those with variegated leaves. Turn myrtles which are small out of the pots, and plant them in a bed of light rich earth. Orange-trees must be fresh-potted, if not done last month; and as soon as the leaves of mulberry-trees are the size of a half-crown, it shews that the weather is settled, and they may safely be set out. Windows may be kept open all day, and, towards the end of the month, all night, to inure the plants by degrees to the open air.

JUNE.

KITCHEN-GARDEN. Plant the first crop of kale, and sow the third. Broccoli, plant the first, prick out the third, and sow the fourth crop. Cabbages, plant the third crop, prick out the fourth and sow the fifth. Red cabbages, plant the second crop, and sow the third. Savoys, plant the first, prick out the second, and sow the third. Cress and mustard intended to stand for seed, should now be hoed for the last time; the cress left at six inches distance, and the mustard at eight. Nail up or stick cucumbers against walls. Sow the sixth crop of lettuces in a cool place, and thin those for seed to a foot distant. Cover melons in frames with mats in the middle of the day, and lay pieces of broken earthen plates or dishes under the fruit. Sow the last marrowfat pease in a cool place. Plant lettuces and melons. Weed pot-herbs and sweet-herbs often, and gather for drying, just before they begin to flower; then tie them up in small bunches, and hang them across lines in a shady room to dry. Prick out broccoli, cabbages, cauliflowers, and celery. Sow turneps and turnep-radishes. Sow radishes, the seventh crop, and turnep-rooted, and black Spanish, in a cool place. Rape and coleseed may now be sown. Seeds of all sorts must be gathered as they ripen, and defended from birds.

FLOWER-GARDEN AND SHRUBBERY. Take up anemones before their leaves are quite withered, and they will be more readily found. Annuals from the hotbeds will require fresh potting, and may be placed in the open air if it be settled and warm, but will want frequent watering. Annuals on the borders should have the earth stirred up with a hoe, and be often watered, and more sown to flower in autumn, as described under last month. Biennials and perennials, transplant from the seedbeds. Hoe and rake borders of the flower-garden and shrubbery frequently. Box may be clipped, but always do it in moist weather. Bulbous-rooted flowers of every sort, whose leaves are nearly withered, should be taken up before the leaves entirely disappear, and put into shallow wooden boxes, as directed for hyacinths, as soon as dry. Carnations require to be examined frequently and tied up to the sticks. Search for earwigs. Evergreens may be clipped in moist weather. Myrtles, and other greenhouse-plants against walls, should be often watered, all fore-right shoots pulled off while small, and the others nailed to the walls with long narrow shreds of fine cloth. Plant out perennials and biennials from the seed-beds in showery weather; and, if the sun should be very hot soon after, cover each plant with a flower-pot, until they have taken root. Pinks may now be increased by making pipings or cuttings, but a glass must be placed over them. Plant out all annuals from the seed-beds and hot-beds: biennials and perennials from the seed-beds. Shrubs ought frequently to be looked over; all straggling branches should be cut off or tied up; and the grounds stirred with a Dutch hoe. Shrubs in pots may be set in pans, and watered often. Sow annuals, as described under last month, to flower in autumn, in any vacancies that may be on the borders of the shrubbery or flower-garden. Tulips should be taken up before their leaves are quite decayed, that they may be found more readily.

FRUIT-GARDEN, AND ORCHARD. Apple-trees in espaliers must be often examined; all fore-right shoots should be taken off while small, and the others regularly trained to their proper distances. Search for caterpillars. If the standard apple-trees be infected with caterpillars, light some damp straw, and with a fork direct the smoke through the tree, and they will soon be suffocated, and instantly drop down. Apricots must be thinned for the third and last time, and the shoots frequently nailed up. Blighted trees must be constantly attended to, as directed last month. Bud apricots, cherries, and peach trees. Nail up fig-trees with very strong shreds. Nail up every week shoots of wall-trees. Vines require constant attendance, in rubbing off improper buds, and nailing up the shoots. Water those trees frequently which are blighted: all newly planted trees in dry weather; and strawberries in flower.

GREENHOUSE. Air may now be given very freely in the greenhouse, and the windows may be kept open all night. Plant cuttings of various sorts, under bell or hand glasses, at the end of the month. Earth all the plants every month at top, if not shifted. It makes them look neater, and grow better. Geranium-seedlings sown in March will now require pricking out, and cuttings planted under glasses. Inarch jessamines, lemons, and oranges. Layer jessamines, oleanders, &c. Plant myrtle-cuttings at the end of the month under glasses, but never take them off till they have grown two inches. Orange-trees, if not taken out at the end of last month, will require it at the beginning of this. Clean well the leaves which are mildewed, or have insects on them, with a sponge and warm water. Inarching may now be performed.

JULY.

KITCHEN-GARDEN. Aromatic herbs, flowers, and shrubs, gathered last month, if hung on lines, will soon be dried. It is then better to strip off the leaves and flowers from the stalks, and put them into paper-bags, which will preserve their flavour better, and keep them free from dust. Continue to gather them before their flowers are too much opened. Asparagus if wished for in autumn, must be attended to at the beginning of this month; the stalks must be cut down, and, if it be dry weather, the beds must be very well watered with the draining from a dunghill. Next day fork them up lightly, and rake them smooth; if the weather continues dry, water them every night for a week, and in about eight or ten days they will be fit to cut. Plant the second crop of kale, prick out the third, and the first of Anjou. Plant out the third crop of broccoli, and prick out the fourth. Plant the fourth crop of cabbages, and prick out the fifth. Prick out the third crop of red cabbages. Plant the second crop of savoys, and prick out the third. Cabbage-turneps, &c. for cattle, prick out the first crop. Sow carrots to draw young, the third crop. Earth up, and often water, capsicums. Plant out the fourth crop of cauliflowers. Plant the second of celery, and prick out the fifth. Finish sowing coleseeds, coleworts, and rape. Prick out the second crop of coleworts. Stick cucumbers on the open ground, with branches of elm, or other sticks. Lay tiles on endive, or tie up the first crop; plant the second, thin the third, and sow the fourth very thin. Take up some eschalots and garlic for present use. Sow finocchio, the fourth crop. Sow kidney-beans, on a south border, the fifth and last crop. Still plant lavender and rosemary cuttings. Plant red cabbages, rosemary, and savoys. Gather pot-herbs and sweet herbs for drying; and, as soon as dried, strip off the leaves, and put them into paper-bags.

FLOWER-GARDEN AND SHRUBBERY. Seeds nearly ripe must be watched and gathered, else many sorts will be lost. Annuals, to flower late in autumn, may still be sown. Auriculas and polyanthus from the seedbed should be transplanted upon a shady border, and, if possible, in rainy weather. Finish cutting box and evergreen shrubs. Bud the curious sorts of jessamines, roses, &c. Mignonette should now be sown to flower in winter, and more put into pots. Myrtles, and other greenhouse-plants against walls, will require frequent nailing and watering. Finish planting perennials and biennials from the seed-beds. Pinks, finish making pipeings or cuttings. Plant auricula and polyanthus seedlings: biennial and perennial seedlings: cuttings of scarlet lychnis and pinks: evergreens, if the weather be rainy: mignonette into pots: offsets of lilies: offsets of autumnal-flowering bulbs: pipeings of carnations and pinks: saffron-crocus. Ranunculuses must be taken up, and laid in the shade to dry; then well cleaned from earth, and

laid in shallow boxes, or put into paper-boxes. Finish layering and budding rose-trees. Seedling-trees, shrubs, and flowers, must be properly shaded and watered. Seeds now begin to ripen very fast; therefore must be constantly attended to, and gathered. Shrubberies will require frequent attention in pruning of hoeing.

GARDEN-FRUIT AND ORCHARD. Destroy ants, flies, and wasps, as soon as they appear, by hanging bottles half filled with sugar, or honey and water. Often look over apricot-trees; pull off all fore-right shoots, and nail those which are to remain. Attend to blighted trees, and water the borders of en. Budding of apricots, cherries, and peaches, finish. Currants intended to be preserved till autumn, should now be covered with mats. Often examine espalier-trees, and train in the shoots. Fig-trees require nailing up as they shoot, with strong nails and long shreds. Fruit should be gathered in the morning, as soon as the sun has dried the dew from it, and before it is heated, and then laid in a cool room. Destroy insects of all sorts. Water strawberries in flower constantly in dry weather, and pull off decayed leaves. Tie up the fruit of the hant-boys and other large sorts to sticks. Cut off all runners after the first, and these should be planted out as soon as some rain falls. Vines must be very often attended to, to nail up the shoots; and pull off all improper buds. Wall-trees require constant attention, to nail up and water in very dry weather.

GREENHOUSE. African aloes, and other succulent greenhouse-plants, may now be set out in the open air. Cuttings of asters, geraniums, grevias, myrtles, &c. should now be planted under bell or hand glasses, which should not be taken off until they have grown an inch. Earth the tops of all the pots, first taking a little out. Plant geranium-cuttings, and prick out the seedlings before they are too thick. Those with variegated leaves do best in alcoves or under a little shelter. Paint and white-wash the greenhouse. In arching and layering various sorts may still be performed. Plant stocks, when four inches high, in separate pots. Pans should be placed under all the pots, as it is better for the plants, and saves much trouble in watering. Shade, water, and prick out, seedling plants. Succulent plants, as aloes, cereuses, ficoides, and Indian figs, torch-thistles, &c. may now be set abroad.

AUGUST.

KITCHEN-GARDEN. Sow alsanders, angelica, and chervil. Sow corn-sallad on beds. Cucumbers for pickling, either large or small, to have them fine, should now be gathered; and they will be free from spots, and save much trouble in greenening. Lettuces, for standing through the winter, and for forcing, must now be sown very thin at three different times in the month: and plant out those last sown on a south border. Melons, in rainy weather, must be defended from wet by putting hand-glasses over them; and sticks placed for the pickling melons to run up. Prepare mushroom-beds, by having dung and spawn ready for the next month. Onions must be frequently turned, that they may be well dried. Sow the second crop of Welsh onions. Gather peppermint for distilling, as soon as it begins to flower. Sow some hotspur-peas, on a south border for the fifth and last crop. Plant celery, endive, leeks, and lettuce. Prick out Anjou, Brussels boorcele, cabbage-turneps, and turnep-rooted cabbages. Sow radishes, the ninth and last crop. Seeds, nearly ripe, must be guarded from birds, particularly radish-seeds. Sow cress, fennel, mustard, and sorrel. Sow the second crop of prickly broad-cast spinach, and then, at spring, hoe it into beds four feet wide, with paths of eighteen inches between the beds.

FLOWER-GARDEN, AND SHRUBBERY. Plant bulbous roots, that flower in autumn, early in the month. Bulbous roots of all sorts should have their offsets planted at the end of the month. Take off carnations' layers, and plant out the pipings from under the glasses. Finish the clipping of evergreen trees and shrubs. Grass-walks and lawns require frequent mowing. Gravel-walks must be weeded and rolled. Take up lilies, if their leaves be decayed; but the offsets must be planted again directly. Plant mignonette in pots to flower in winter, and place them under a south wall. Myrtles and greenhouse-plants against walls must be pruned and nailed, and constantly watered.

FRUIT-GARDEN, AND ORCHARD. Destroy ants, flies, and wasps, by supplying fresh bottles of sugar, or honey and water. Apple-trees on espaliers will require frequent examining. Budding of all trees finish, and pull off buds and shoots from the stocks.

Currants

Currants intended to be preserved, finish covering with mats. Nail up every week the fruit-trees. Nail up nectarines and peaches frequently. Attend to pear and plum-trees, both on walls and against espaliers, constantly. Transplant strawberry-runners, if rooted, in rainy weather, and cut off all the others as they shoot.

GREENHOUSE. Take off the offsets of aloes, both African and American, and plant them in separate pots. Often water the cuttings of myrtles, geraniums, &c. Earth the tops of all the pots. Water geraniums and myrtles constantly, but pour on the water gently. Oranges, still bud till the middle of the month. Prune any which require it, as this is the season of their shooting.

SEPTEMBER.

KITCHEN-GARDEN. Sow cress and mustard every week; and at the end of the month under glasses. Cucumbers for pickling should be finished gathering; which will shew the advantage of sticking them, and pickling early. Plant out a little of the fourth crop of endive to thin it, and give the rest more room. Tie up some to blanch. Eschalots, garlic, and rocambole, should have the offsets and small roots planted. Lettuces must be thinned early in the seed-bed, if sown thick, and pricked out on a south border to about four or five inches asunder. Melons for pickling will now be fit to gather. Make mushroom-beds at the beginning of the month. Gather nasturtiums for pickling. Finish sowing onions, early in the month, the second crop of Welsh. Weed those sown last month before the weeds are high. Plant water-cresses. Pick out cabbages, cauliflowers, and lettuces. Gather seeds constantly as they ripen. Sow cress, mustard, turneps, and water-cresses. Finish sowing spinach for spring use, and hoe that sown last month. Plant tarragon-roots. Hoe and thin turneps, turnep-radishes, and black Spanish radishes. Water in dry weather any crops lately planted out.

FLOWER-GARDEN, AND SHRUBBERY. Plant anemones, single-flowered, at the end of the month to flower early. Annuals in pots must be frequently watered to ripen the seeds. Remove auriculas, that they may have the morning-sun, and finish slipping them. Balsams, cockscombs, egg-plants, or other curious annuals in pots, which are wished to raise seeds from, must be placed under shelter in an alcove, greenhouse, or room, fronting the south, and then the seeds will ripen. Prepare beds for planting bulbous roots, early in the month. Plant box for edgings, at the beginning of the month, or as soon as any rain falls. Plant bulbous roots of all sorts, early in the month; but the offsets and lilies, and crown-imperials first. Plant evergreens at the end of the month, if the ground be moist. Grass walks may now be repaired; or new ones made. Weed and roll gravel-walks often. Plant hyacinths, jonquils, lilies, narcissuses, polyanthus-narcissuses, &c. at the end of the month. Plant laurel-cuttings, in the shade. Layer laurustinuses and other shrubs. Take up lilies which flower late, as soon as their leaves are decayed, but plant the offsets again directly, and all other sorts of lilies. Place mignonette in pots, under shelter. Myrtles and greenhouse-plants against walls must be constantly watered in dry weather. Plant out perennial seedlings, and divide the old roots. Plant box for edgings, evergreens, crown-imperials, and lilies, early in the month; cuttings of laurel, honeysuckles, jessamines, shrubs, and trees, of all sorts; but not until after there has been some rain. Strawberries and thrift for edgings. Gather seeds in the middle of the day.

FRUIT-GARDEN, AND ORCHARD. Destroy ants, flies, wasps, and insects of all sorts, constantly. Sow cherry-kernels on beds. Plant currant and gooseberry cuttings and trees. Nail up fig-trees frequently with strong shreds. Attend to the fruit-room, and pick out the rotten pears, or any other sorts which begin to decay. Put grapes into bags of crape, gauze, or paper. Plant currants, gooseberries, raspberries, strawberries. Strawberries should be planted early in the month, and then they will be well rooted before the frost begins. Dress the beds, and plant some strong roots in pots to force.

GREENHOUSE. Remove aloes into the greenhouse in the beginning of the month, but leave out the American ones to the end. Plant cuttings and seedlings in separate pots, and earth the tops of all the pots. Set in geraniums with variegated leaves, early in the month, and leave off watering the leaves. Take myrtles out of the ground, and pot them. Fresh earth orange-trees, thin the fruit, or most of it will fall off, and take them into the house at the

end of the month. Take in succulent plants of all sorts, early in the month, and give them very little water. Water in the morning, and keep the windows open all night; leave off watering the geraniums over the leaves.

OCTOBER.

KITCHEN-GARDEN. Cut down asparagus-stalks, hoe the weeds, and spread earth from the paths on them, but first a little rotten dung. Prepare hotbeds, for forcing, and plant three-year old plants for the first crop. Beans, the early mazagan, must be planted on a south border, for the first crop. Plant out Anjou boorcole, the second crop, early in the month; and hoe the ground around the others. Plant out broccoli, the rest of the fourth crop. Plant out half the cabbages, sown in August, of the early sorts, in a warm situation. Plant cabbage-turneps, early in the month, and earth up the others. Finish hoeing carrots, sown in July. Attend to cauliflowers, beginning to flower, by breaking down the leaves. Those intended for glasses will want planting out; let there be six to each glass, and the rest in a frame, or under a south wall. Plant out celery, the fifth and last crop, and earth up the second to blanch. Finish planting coleworts. Sow cress, mustard, and radish, under glasses, and on a hotbed at the end of the month. Tie up endive, to blanch, or lay files on it, and plant more. Plant eschalots, garlic, and rocambole. Throw up vacant ground into ridges. Sow peas, the early hotspurs, on a south border near the wall, for a first crop. Plant on hotbeds asparagus for the first crop, and lettuces and mint.

FLOWER-GARDEN, AND SHRUBBERY. Remove auriculas and carnations into shelter, and in wet weather cover them with mats. Balsams, cockscombs, egg-plants, &c. intended to raise seed from, must be constantly attended to, to hasten the ripening of the seed. Turn over beds and composts for bulbous roots, frequently. Finish planting box for edgings, early in the month. Plant bulbous roots for forcing, in pots or boxes, and finish planting all others before the rain sets in. Plant crocuses, aconites, snow-drops, and any bulbous roots which flower early in the spring, at the beginning of the month. Plant evergreens of all sorts, early in the month. Plant bulbous roots early in the month; as aconites, amaryllises, corn-flags, crown-imperials, daffodils, garlic molly, irises, martagons, pancratiums, ranunculuses, snow drops, star of Bethlehem, tulips, &c. Plant also perennials at the beginning of the month: shrubs and trees of all sorts: strawberries and thrift for edgings: place seedlings in pots, under a south wall in the ground; and weed and earth seedlings in beds. Gather seeds in the middle of the day.

FRUIT-GARDEN, AND ORCHARD. Gather apples and pears in the middle of fine dry days. Plant apple-trees at the end of the month. Plant currants, gooseberries, and raspberries. Examine grapes in bags, to see that they are not mouldy or decayed. Gather nectarines and peaches, in the middle of the day. Orchards or fruit-trees intended to be planted, should have the ground prepared, and the holes digged some weeks before-hand; if the soil be very good, some loam and rotten dung should be mixed together, and the trees planted in it. If the orchard be wet, bring a cart-load of earth at least for each tree: form the earth into a little hill, about a foot high, and plant the tree upon it, but dig up the turf first a foot deep in a circle of four or five feet over. Gather peaches in the middle of the day, and, if not ripe, lay them in the sun for a few days in a window; they are much improved by roasting gently like apples, and eating them with sugar and wine. Plant peach-trees, at the end of the month. Plant fruit-trees of all sorts. Prune all sorts of wall-trees, but sweep off all the leaves first with a birch broom. Finish dressing strawberry-beds, and water the alpine frequently under the frames. Vines in pots should be transplanted; make the holes ready, pour water into them, and then gently turn them out of the pot, or place the pot in the hole and break it, and then the roots cannot be disturbed, and you will have fruit the next year. Finish pruning and planting wall-trees, early in the month.

GREENHOUSE. Give air very freely in the day-time, and leave some of the windows open at night until the end of the month. Earth the tops of the pots. Take in geraniums early in this month, if not done the last; water them sparingly, or they will begin to shoot afresh, and pick off constantly all decayed leaves. Clean leaves well before the plants are set in order, and pick off dead ones.

ones. Take in myrtles towards the end of the month. Orange-trees should not remain out this month; examine the leaves before setting them in, for insects, which fasten themselves underneath, and pick them off; if any leaves be mildewed, wash them with warm water and a sponge. Water succulent plants sparingly. Water myrtles, orange-trees, winter-cherries, and all woody plants often. Open the windows every fine day, but keep them shut in foggy weather.

NOVEMBER.

KITCHEN-GARDEN. Finish planting beans for the first crop. Plant beets, cabbages, and carrots, for seed. Take up carrots and lay them in sand. Give some air to cauliflowers under glasses and frames, in the middle of fine days. Earth up celery, when dry, to blanch. Sow cress, mustard, and radishes, on hotbeds. Prepare hotbeds for forcing asparagus and lettuces. Sow early short-topped radishes, and spread wheaten straw over the beds.

FLOWER-GARDEN, AND SHRUBBERY. Bulbous roots, intended for blowing in water early, may now be placed on the glasses, and let all others be finished planting at the beginning of the month. Those in pots or boxes must be frequently watered, and placed as much in the sun and light as possible; for in the shade they will draw up weak. Composts wanted for flowers in spring should now be collected; such as loam, sand, willow-earth, rotten tan, dung, &c. Let them be laid in dry sunny places, and be frequently turned over, but by no means in cold wet places. Plant early in the month all bulbous roots; particularly those for forcing. All sorts of shrubs and trees should be finished planting early in the month; and long litter, straw, or turf, turned downwards, should be laid over the roots to keep out the frost.

FRUIT-GARDEN, AND ORCHARD. Finish any thing ordered last month, that has been omitted, early in this. Place strawberries in pots for forcing, under frames; and attend to the alpine. Finish the pruning and planting of wall-trees.

GREENHOUSE. Earth the tops of any of the pots, when any mould appears on them. Constantly pick off all decayed leaves, as they corrupt the air of the house very much. Succulent plants, as aloes, ficoides, &c. will require but very little water; large aloes the most. Water woody plants often, but give them only little at a time; as dampness is more prejudicial in a greenhouse than cold.

DECEMBER.

KITCHEN-GARDEN. Asparagus must be planted for the third crop, and give it both light and air to colour it. If the beds be not warm enough, line them with fresh dung. Boorcole, broccoli, and cabbages, must be well earthed up, to keep them upright, and all decayed leaves picked off. Cauliflower-plants must have air while the weather is mild, and pick off dead leaves. Earth up celery when dry, for blanching. Sow cress, mustard, and radishes, on hotbeds every week. Weed and turn over dunghills in frosty weather. Tie up endive for blanching. Hotbeds must be attended to, and plenty of hot dung and loam provided for cucumbers and melons. Lettuces under glasses must have air given them in the middle of mild days.

FLOWER-GARDEN, AND SHRUBBERY. Examine auriculas frequently, and pick off all decayed leaves. Carnations in pots should be plunged into the ground; but, if ashes or sand be put between the pots, it will keep them dryer than earth. Shrubs and trees may still be pruned; and long litter, &c. laid over the roots of those lately planted. Trenches and drains should be made wherever the water stands.

FRUIT-GARDEN, AND ORCHARD. Examine apples and pears in the fruit-room; pick out such as appear the soundest of the best sorts, and wrap each in a piece of paper. This will cause them to keep several weeks longer. Repair espaliers; prune the trees; spread some rotten dung on the border, and fork it in. Finish pruning fig-trees. Guard the fruit-room from frost, but give it some air, when the weather is not very damp nor frosty.

GREENHOUSE. Air must be given whenever the weather is mild, and will permit it. Earth the tops of the pots, but first take out a little of the old. Frost must be guarded against, by keeping the doors and windows close, when it begins to freeze. Constantly pick off decayed leaves. Myrtles and other greenhouse-plants against walls will require to have mats placed before them, and, in

the middle of fine days, before the frost is set in, rolled up, but let down again at night. Water those plants which require it very sparingly. Open the windows for three or four hours in the middle of the day.

A TABLE SHEWING THE NUMBER OF CROPS REQUIRED OF EACH SORT OF VEGETABLES, TO HAVE A REGULAR SUCCESSION THROUGH THE YEAR; WITH THE TIME OF SOWING AND PLANTING.

KITCHEN-GARDEN PLANTS, SEEDS, and ROOTS.

	No. of Crops.	Time of Sowing, &c.
Alisander.....	2	Mar. Aug.
Angelica.....	2	Mar. Aug.
Artichoke.....	1	Mar. or Apr.
Asparagus.....	1	Mar. or Apr.
— forced.....	5	Oct. Nov. Dec. Jan. Feb.
— in autumn.....	1	July, if cut down.
Balm.....	1	Mar. or Apr.
Basil.....	1	Mar. or Apr.
Beans, early.....	5	Oct. Jan. Feb. Mar. July.
— late.....	4	April or July.
Beets.....	1	Feb. or Mar.
Boorcole or kale.....	3	Mar. Apr. June.
— Anjou.....	2	May, June.
Borage.....	1	Feb. or Mar.
Broccoli.....	4	Mar. Apr. May, June.
Burnet.....	1	Mar. or Apr.
Cabbages, early.....	1	Aug.
— late.....	4	Feb. Mar. May, June.
— red.....	3	Feb. Mar. June.
— Savoy.....	2	Mar. May, June.
— for cattle.....	3	May, June.
— for seed.....	1	Oct. or Nov.
Cabbage-turneps.....	2	May, June.
Camomile.....	1	Mar. or Apr.
Capsicums.....	1	Mar. or Apr.
Carrots to draw young.....	3	Jan. Apr. July.
— principal crop.....	1	Feb. or Mar.
— for seed.....	1	Feb.
Cauliflowers.....	4	Aug. Feb. Mar. May.
Celery.....	5	Feb. Mar. Apr. May, June.
Chardons.....	1	Mar. or Apr.
Chervil.....	2	Mar. Aug.
Cives.....	1	Mar. or Apr.
Clary.....	1	Mar. or Apr.
Coleseed.....	1	June or July.
Coleworts.....	2	Feb. June or July.
Corn-sallad.....	2	Mar. Aug.
Cress for seed.....	1	Mar. or Apr.
— for sallad.....	1	Mar. to Sept.
— on hotbeds.....	1	Oct. to Mar.
Cucumbers.....	5	Jan. Feb. Mar. Apr. May.
— on hot-beds.....	3	Jan. Feb. Mar.
— for bell-glasses.....	1	Apr.
— on open ground.....	1	May or June.
Dill.....	1	Mar. or Apr.
Endives.....	4	Apr. May, June, July.
Escalions.....	1	Jan. or Feb.
Eschalot.....	2	Feb. Sept.
Fennel.....	2	Feb. Aug.
Finochio.....	4	Apr. May, June, July.
Garlic.....	2	Feb. Sept.
Horse-radish.....	1	Feb. or Mar.
Hyssop.....	1	Mar. or Apr.
Jerusalem artichokes.....	1	Feb. or Mar.
Kidney-beans.....	5	Mar. Apr. May, June, July.
— Runners.....	2	Apr. May.
Lavender.....	1	May or June.
Leeks.....	1	Feb. or Mar.
Lettuces.....	7	Feb. to Aug.
Marjoram.....	2	Mar. Apr.
Marygolds.....	1	Feb. to Apr.
Melons.....	3	Feb. Mar. Apr.
— for autumn.....	1	May.

Mint.....	1	Mar. or Apr.
Mushrooms.....	2	Mar. Sept.
Mustard, for seed.....	1	Mar. or Apr.
— for sallad.....	1	Mar. to Sept.
— on hotbeds.....	1	Oct. to Mar.
Nasturtiums.....	1	Mar. or Apr.
Onions to draw young.....	4	Jan. Apr. May, July.
— principal crop.....	1	Feb. or Mar.
— for seed.....	1	Feb. or Mar.
— Welsh.....	2	July, Aug.
Parsley.....	3	Feb. Mar. July.
— large-rooted.....	2	Feb. Apr.
Parsnips.....	2	Feb. Mar. or Apr.
Peas, hot-spurs.....	5	Oct. Jan. Feb. July, Aug.
— Marrowfats.....	5	Feb. Mar. Apr. May, June.
Pennyroyal.....	1	Mar. or Apr.
Potatoes.....	3	Feb. Mar. Apr.
— on hotbeds.....	1	Jan. or Feb.
Purslane.....	3	Mar. Apr. May.
Radishes.....	9	Jan. to Aug. and Nov.
— on hotbeds.....	2	Jan. Feb.
— for sallad.....	1	Mar. to Sept.
— for seed.....	1	May
Rampion.....	1	Mar. or Apr.
Rape.....	1	June or July
— for sallad.....	1	Mar. to Sept.
Rocambole.....	2	Feb. Sept.
Rosemary.....	1	May or June
Rue.....	1	Mar. or Apr.
Sage.....	1	Mar. or Apr.
Salsafy.....	1	Mar. or Apr.
Savory.....	1	Mar. or Apr.
Savoy cabbage.....	3	Mar. May, June
Scorzonera.....	1	Mar. or Apr.
Scotch kale.....	3	Mar. Apr. June
Sea-kale.....	1	Mar. or Apr.
Skirrets.....	1	Mar. or Apr.
Sorrel.....	2	Mar. Aug.
Spinach.....	6	Feb. to July
— Winter.....	2	July, Aug. or Sept.
Tansey.....	1	Mar. or Sept.
Tarragon.....	1	Mar. or Sept.
Thyme.....	1	Mar. or Apr.
Tomatoes.....	1	Mar. or Apr.
Turneps.....	6	Mar. or Aug.
— for seed.....	1	Feb.
Turnep-cabbage.....	2	May, June
Turnep-radish.....	2	June, July
Water-cress.....	2	Mar. Sept.

CATALOGUE OF FLOWERS, SHRUBS, AND TREES, USUALLY CULTIVATED.

I. TENDER ANNUAL FLOWERS.

To be sown on a strong hotbed the last week in February, or first in March, transplanted afterwards upon another at four inches distance; then planted in small pots in May; afterwards in larger, and at the end of June placed in the open air.

- | | |
|-------------------------|---------------------|
| 1. Amaranths. | 6. Humble plant. |
| 2. Balsams. | 7. Ice-plant. |
| 3. Cockscombs | 8. Sensitive plant. |
| 4. Egg-plants | 9. Stramoniums. |
| 5. Glocester amaranths. | |

II. ANNUAL FLOWERS.

To be sown on a moderate hotbed in March or April, transplanted afterwards before they are too thick, in rich light earth, and covered with mats; and in a month or six weeks into pots, or borders of the flower-garden.

- | | |
|----------------------------|---------------------|
| 1. African marygold. | 7. Chrysanthemum. |
| 2. Browallia, blue. | 8. French marygold. |
| 3. Capsicum. | 9. Marvel of Peru. |
| 4. Cape-marygold | 10. Mignonette. |
| 5. Chinese aster. | 11. Nolana. |
| 6. Chinese or Indian pink. | 12. Palma Christi. |

- | | |
|-----------------------|-------------|
| 13. Stock Julyflower. | 15. Zinnia. |
| 14. Sultan, yellow. | |

In sowing them, fix numbers to them, corresponding with these, to distinguish each sort when they appear.

III. HARDY ANNUAL FLOWERS.

To be sown in March or April on the borders of the flower-garden. Those marked thus †, being very hardy, may be sown in the beginning of February, to flower early. Hollow the earth out in form of a little bason, about a foot over, and two inches deep; draw a circle near the edge half an inch deep, and drop a few seeds in it; thin them soon after they appear, and leave them at six inches distance, but the large sorts wider. In dry weather, they will want frequent watering. Gather the seeds as they ripen, and you may save the expence of buying any in another season.

- | | |
|---------------------------|------------------------------------|
| 1. Adonis flower†. | 23. Mallow. |
| 2. Alkekengi. | 24. Mignonette. |
| 3. Alysson. | 25. Nasturtium†. |
| 4. Amaranth. | 26. Nigella, or devil in a bush†. |
| 5. Amethystea. | 27. Pansey, or hearts-ease. |
| 6. Balm, Moldavian. | 28. Peas, sweet-scented†. |
| 7. Belvidere. | 29. Persicaria.† |
| 8. Candy tuft†. | 30. Poppy†. |
| 9. Catchfly, Lobel's†. | 31. Safflower, or bastard saffron. |
| 10. Caterpillar trefoil. | 32. Snail-trefoil. |
| 11. Clary, red and white. | 33. Snap-dragon. |
| 12. Convolvulus. | 34. Stock July-flower†. |
| 13. Cornbottle†. | 35. Sunflower. |
| 14. Cucumber, spurting. | 36. Sweet sultan. |
| 15. Fumatory, yellow. | 37. Tobacco. |
| 16. Hedgehog trefoil. | 38. Venus's looking-glass†. |
| 17. Hone, wort. | 39. Venus's navelwort. |
| 18. Indian corn. | 40. Xeranthemum. |
| 19. Ketmia. | |
| 20. Larkspur†. | |
| 21. Lavatera. | |
| 22. Lupine. | |

In July, sow again annual stock, candy-tuft, convolvulus minor, cornbottles, Lobel's catchfly, and yellow lupines, and they will flower until the frost kills them.

IV. BIENNIAL FLOWERS.

To be sown in March or April in beds very thin; as soon as the plants touch one another, thin them, and leave them at four or six inches asunder; those drawn out, plant at the same distance. In July transplant them all upon beds, at eight inches asunder; there to remain till the end of September, when they must be planted upon the borders of the flower-garden, and they will produce their flowers the next summer, after which they will perfect their seeds and die.

- | | |
|---------------------------|--------------------------|
| 1. Canterbury bell. | 7. Poppy, yellow-horned. |
| 2. Colutea, Ethiopian. | 8. Rocket. |
| 3. French honeysuckle. | 9. Scabious. |
| 4. Globe-thistle. | 10. Stock July-flower. |
| 5. Honesty, or moon-wort. | 11. Sweet-william. |
| 6. Mallow-tree. | 12. Tree-primrose. |
| | 13. Wall-flower. |

V. PERENNIAL FLOWERS.

Which, if sown in the same manner as the biennials, and transplanted into the borders of the flower garden, will continue for several years.

- | | |
|------------------|-----------------------|
| 1. Alysson. | 11. Ox-eye daisy. |
| 2. Auricula. | 12. Pea, everlasting. |
| 3. Bee-larkspur. | 13. Pinks. |
| 4. Campanula. | 14. Polyanthus. |
| 5. Carnation. | 15. Rhubarb. |
| 6. Columbine | 16. Rose-campion. |
| 7. Flax. | 17. Snap-dragon. |
| 8. Fox-glove. | 18. Valerian. |
| 9. Hawk-weed. | 19. Greek valerian. |
| 10. Hollyhock. | |

VI. PERENNIAL

VI. PERENNIAL FLOWERS.

Which are propagated by dividing their roots in spring, in March or April; or in the autumn in September.

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|------------------------|-------------------------------|
| 1. Adonis flower | 45. Lychnis |
| 2. Anemone | 46. Lychnidea |
| 3. Asphodel | 47. Madwort |
| 4. Asters | 48. Marsh Marygold |
| 5. Bachelors buttons | 49. Meadow-sweet |
| 6. Bean-caper | 50. Milfoil |
| 7. Bears-breech | 51. Milk-vetch |
| 8. Borage | 52. Mint |
| 9. Bugloss | 53. Moth-mullen |
| 10. Campanula | 54. Navelwort |
| 11. Campion | 55. Peony |
| 12. Cardinal-flower | 56. Pilewort |
| 13. Christmas rose | 57. Plantain |
| 14. Cowslip | 58. Primrose |
| 15. Cranesbill | 59. Ragged Robin |
| 16. Crowfoot | 60. Ranunculus |
| 17. Daisies | 61. Reed |
| 18. Dog-tooth violet | 62. Rhubarb |
| 19. Dragons | 63. Saxifrage |
| 20. Dropwort | 64. Skullcap |
| 21. Eternal flower | 65. Sneezewort |
| 22. Fennel-giant | 66. Side-saddle-flower |
| 23. Feverfew | 67. Soapwort |
| 24. Flag | 68. Solomon's seal |
| 25. Fox-glove | 69. Spiderwort |
| 26. Fraxinella | 70. Spurge |
| 27. Fumatory | 71. Stonecrop |
| 28. Garlic | 72. Sunflower |
| 29. Gentianella | 73. Swallow-wort |
| 30. Golden-locks | 74. Thrift |
| 31. Golden rod | 75. Throatwort |
| 32. Greek valerian | 76. Toadflax |
| 33. Hellebore | 77. True love |
| 34. Hepatica | 78. Valerian |
| 35. Herb bennet | 79. Vervain |
| 36. Houseleek | 80. Veronica |
| 37. Ladies mantle | 81. Violet |
| 38. Ladies slipper | 82. Viper's bugloss |
| 39. Ladies smock | 83. Wake-robin |
| 40. Lily of the valley | 84. Willow-herb |
| 41. Lion's tail | 85. Wolfsbane |
| 42. London pride | 86. Wormwood and some others; |
| 43. Loose-strife | but with very little beauty |
| 44. Lupine | to recommend them. |

VII. BULBOUS AND TUBEROUS-ROOTED FLOWERS.

- | | |
|-------------------|--------------------------|
| 1. Aconites | 13. Iris |
| 2. Amaryllis | 14. Lily |
| 3. Anemone | 15. Martagon |
| 4. Bulbocodium | 16. Narcissus |
| 5. Cornflags | 17. Pancratiums |
| 6. Crocuses | 18. Polyanthus Narcissus |
| 7. Crown Imperial | 19. Ranunculus |
| 8. Cyclamen | 20. Sisyrinchium |
| 9. Daffodil | 21. Snowdrop |
| 10. Garlic Moly | 22. Star of Bethlehem |
| 11. Hyacinth | 23. Tuberose |
| 12. Jonquil | 24. Tulips |

To be taken up in April, May, and June, as soon as their leaves are withered, and planted again in September or October, but their offsets in August. The ranunculuses and anemones not to be planted till February. The seed to be sown in February, in boxes.

VIII. BULBOUS-ROOTED FLOWERS.

- | | |
|--------------|---------------------|
| 1. Amaryllis | 5. Daffodil, sea |
| 2. Colchicum | 6. Lily, Belladonna |
| 3. Crocus | 7. — Guernsey |
| 4. Cyclamen | 8. Saffron |

These flower in autumn. They require to be planted in Au-

gust, and to be taken up in April or May, as soon as their leaves are decayed; but their offsets in July.

IX. DECIDUOUS FLOWERING SHRUBS AND ORNAMENTAL TREES.

To be planted in March, April, September, and October.

- | | |
|---------------------------------|-----------------------------------|
| 1. Acacia, rose-flowering. | 37. Jesuits-bark Tree, false. |
| 2. Almond-tree. | 38. Indigo, Bastard. |
| 3. Allspice. | 39. Ironwood Tree. |
| 4. Althæa. | 40. Judas Tree. |
| 5. Ash, mountain. | 41. Kidney-bean Tree. |
| 6. Annona, or papaw. | 42. Laburnum. |
| 7. Azalea. | 43. Lac, or Varnish Tree. |
| 8. Berberry-tree. | 44. Leatherwood. |
| 9. Bigonia or Trumpet-flower. | 45. Lilacs. |
| 10. Bladder-sena. | 46. Mezerion. |
| 11. Bramble. | 47. Nightshade. |
| 12. Buckthorn. | 48. Olive Tree, wild. |
| 13. Caragana. | 49. Passion Flower. |
| 14. Cassioberry-bush. | 50. Peach Trees. |
| 15. Catalpa, or Trumpet-flower. | 51. Periploca, or Virginian Silk. |
| 16. Ceanothus. | 52. Plum Trees. |
| 17. Cephalanthus. | 53. Poison Trees. |
| 18. Cherry Tree. | 54. Pomegranate Tree. |
| 19. Cinquefoil, shrubby. | 55. Privet. |
| 20. Clethra. | 56. Raspberry. |
| 21. Cornel. | 57. Restharrow. |
| 22. Crab Tree. | 58. Rose Tree, 80 varieties. |
| 23. Cytisus. | 59. St. Peter's Wort. |
| 24. Diervilla. | 60. Sassafras. |
| 25. Dogwood. | 61. Service Tree. |
| 26. Fothergilla. | 62. Snowdrop, or Fringe Tree. |
| 27. Gingo, or Maidenhair Tree. | 63. Spindle Tree. |
| 28. Gueldres Rose. | 64. Spiræa. |
| 29. Halesia. | 65. Sumach. |
| 30. Hamamelis. | 66. Syringa. |
| 31. Hawthorn. | 67. Tamarisk. |
| 32. Hickory Nut. | 68. Tea Tree. |
| 33. Honeysuckle. | 69. Toothach Tree. |
| 34. Honeysuckle, upright. | 70. Traveller's Joy. |
| 35. Hypericum. | 71. Tupelo Tree. |
| 36. Jasmin. | 72. Viburnum. |
| | 73. Weeping Willow. |

X. DECIDUOUS FOREST TREES.

To be planted from the middle of February till the beginning of April, and from September till December.

- | | |
|---------------|--------------------|
| 1. Acacia. | 13. Horse-Chesnut. |
| 2. Alder. | 14. Larch. |
| 3. Ash. | 15. Lime. |
| 4. Beech. | 16. Magnolia. |
| 5. Birch. | 17. Maple. |
| 6. Chesnut. | 18. Nettle Tree. |
| 7. Crab Tree. | 19. Oak. |
| 8. Cypress. | 20. Plane. |
| 9. Elder. | 21. Poplar. |
| 10. Elm. | 22. Tulip Tree. |
| 11. Hickory. | 23. Walnut. |
| 12. Hornbeam. | 24. Willow. |

XI. EVERGREEN FLOWERING SHRUBS AND ORNAMENTAL TREES.

To be planted in March, April, September, and October.

- | | |
|------------------------------------|-------------------------------|
| 1. Alaternus. | 10. Cistus, or Rock-rose. |
| 2. Andromeda. | 11. Crab Tree. |
| 3. Arbor Vitæ. | 12. Cytisus, Hairy Evergreen. |
| 4. Arbutus. | 13. Groundsel Tree. |
| 5. Bay. | 14. Holly. |
| 6. Bignonia. | 15. Honeysuckle. |
| 7. Box. | 16. Juniper. |
| 8. Brooms. | 17. Ivy. |
| 9. Cassine, or South Sea Tea Tree. | 18. Kalmia. |
| | 19. Lavender. |

7 B

20 Laurel.

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|--------------------|-------------------|
| 20. Laurel. | 28. Rose Tree. |
| 21. Laurustinus. | 29. Rosemary. |
| 22. Magnolia. | 30. Rue. |
| 23. Phillyrea. | 31. Savin. |
| 24. Privet. | 32. Spindle Tree. |
| 25. Purslane Tree. | 33. Sweet Brier. |
| 26. Pyracantha. | 34. Tea Tree. |
| 27. Rhododendron. | 35. Widow-wail. |

XII. EVERGREEN FOREST TREES.

To be planted from the middle of February till the end of April, and from September till December.

- | | |
|-------------|----------|
| 1. Cedar. | 5. Oak. |
| 2. Cork. | 6. Pine. |
| 3. Cypress. | 7. Yew. |
| 4. Fir. | |

XIII. FRUIT TREES.

To be planted in February, March, October, and November.

- | | |
|-----------------|----------------|
| 1. Almond. | 12. Nectarine. |
| 2. Apple. | 13. Nut Tree. |
| 3. Apricot. | 14. Peach. |
| 4. Berberry. | 15. Pear. |
| 5. Cherry. | 16. Plum. |
| 6. Crab Tree. | 17. Quince. |
| 7. Currant. | 18. Raspberry. |
| 8. Fig. | 19. Service. |
| 9. Filbert. | 20. Vine. |
| 10. Gooseberry. | 21. Walnut. |
| 11. Medlar. | |

XIV. HARDY GREENHOUSE PLANTS.

To be planted against a south wall, in the open ground, the roots covered with tan or long litter. These will not be killed

except in very severe frosts, and then they generally shoot up afresh from their roots. By this method, many curious plants, formerly only kept in greenhouses, will now ornament the walls, where they will appear in greater vigour and beauty, and many may produce both flowers and fruit, which they will not do when confined in pots in a greenhouse.

- | | | |
|-------------------------|------------------|------------------------------|
| 1. Bay Tree. | Blue-berried Ca- | Myrtle. |
| | rolinian. | Portugal. |
| 2. Boxthorn. | | Upright Italian. |
| | African. | |
| 3. Broom. | | |
| | Starry. | Red. |
| | Montpelier. | White. |
| 4. Cedar Tree. | | |
| | Bermudian. | Box-leaved. |
| | Goa. | Provence. |
| 5. Fig, Indian. | | |
| 6. Heath. | Many-flowered. | |
| | Mediterranean. | |
| | Three-flowered. | |
| 7. Jasmin, Catalanian. | | |
| 8. Laurel, Alexandrian. | | Small-leaved Ota- |
| 9. Myrtle. | | heite. |
| | Broad-leaved Ro- | |
| | man. | |
| | Double-flowered. | |
| | | 10. Magnolia, Evergreen. |
| | | 11. Oleander. |
| | | |
| | | 12. Olive Tree. |
| | | |
| | | 13. Pistachia Nut Tree. |
| | | 14. Pomegranate, Dwarf. |
| | | 15. Ragwort, Sea. |
| | | 16. Rose Tree, Chinese. |
| | | 17. Rosemary, Silver-leaved. |
| | | 18. Sophora. |
| | | |
| | | 19. Strawberry Tree. |
| | | 20. Tea Tree, Green. |
| | | 21. Winter Cherry. |

For the particular operations in gardening, see **ESPALIER, FRUIT-TREES, GRAFTING, GREEN-HOUSE, HOTBED, INARCHING, INOCULATING, ORCHARD, PLANTING, PRUNING, TREES, &c. &c.** and the culture of the different plants under their respective generic names.

GARDINER, COLONEL JAMES, a brave and pious officer in the army, the son of Captain Patrick Gardiner, of the family of Torwood-Head, by Mrs. Mary Hodge of Gladsmuir. His father had served in the army under king William III. and queen Anne, and died in Germany, after the battle of Hochstet. His maternal uncle, colonel Hodge, was killed at the battle of Steenkirck, in 1692; and his eldest brother, Robert Gardiner, at the siege of Namur, in 1695. Our hero was born at Carriden, Jan. 10th, 1688. He was educated at Linlithgow, and made a very considerable progress in the languages; but having a kind of hereditary attachment to the military life, he served very early as a cadet; and at fourteen years of age bore an ensign's commission in a Scotch regiment in the Dutch service, wherein he continued till 1702; when he received a similar commission in a British regiment from queen Anne, which he bore in the famous battle of Ramillies. In this memorable action, being sent on a desperate service, with a party of what is called the Forlorn Hope, he very narrowly escaped with his life. While calling to his men, a musket-ball entered his mouth, and without touching his tongue or his teeth, went through his neck, and came out about an inch and a half on the left side of the vertebra. Not feeling the pain at first, he began to suspect he had swallowed the ball, till he felt with loss of blood. After this he passed two nights and all next day in the open air, in extreme cold weather, and had his wound dressed at last by an ignorant barber-surgeon; in spite of all which he recovered. In 1706, he was raised to a lieutenantancy, and soon after was made a cornet in lord Stair's regiment of Scotch greys; and in 1715, a captain-lieutenant of dragoons. When the earl of Stair went ambassador to France, he appointed him his master of horse. In 1715 he was promoted to a captaincy, and in 1717 to a majority. In 1724, he was made major of an older regiment; in 1730 he was advanced to the rank of lieutenant-colonel, and in 1743 to that of colonel of a regiment of dragoons; at the head of which he fell, fighting bravely for his country, at the battle of Preston pans, on the 21st Sept. 1745; in the fifty-eighth year of his age. In his person he

was tall, graceful, strong-built, and well-proportioned. And being endowed with a strong constitution, he in his younger years plunged so deep in every fashionable vice, that his companions styled him the happy rake. But in this vortex of vice and dissipation, he was suddenly arrested in a manner almost, if not entirely, miraculous. Our limits permit us not to quote the full account of this phenomenon given by Dr. Doddridge, in his work entitled Remarkable Passages in the Life of Colonel Gardiner; but the substance of it is as follows: In July, 1719, major Gardiner, having spent the Sabbath-evening with some gay company till eleven, and having an assignation with a married woman at twelve, in order "to kill the tedious hour," took up a book, left by his mother or aunt in his chamber, entitled The Christian Soldier; wherein he expected to find some amusement from the author's spiritualizing the terms of his profession. But while reading it carelessly, he was surprised by a sudden and extraordinary blaze of light; and upon looking up, beheld to his astonishment a visible representation of our Saviour on the cross, suspended in the air, and surrounded with glory; while at the same time he thought he heard a voice, saying, "Oh sinner, did I suffer this for thee, and are these thy returns?" Struck with this amazing phenomenon, he sunk down in his arm-chair, and continued for some time insensible; from which circumstance Dr. Doddridge often suggested to him, that he was perhaps all the time asleep, and dreaming; but he himself considered it not as a dream, but a real waking vision. "Be that as it may, it was without question a message of God unto him, and the consequences were as salutary as if an angel had been sent express from heaven to convert him; and from that time to his death he became as eminently distinguished for piety as he had formerly been for profanity. In July, 1726, he married lady Francis Erskine, daughter of the earl of Buchan, by whom he had thirteen children. From the numerous anecdotes recorded of this great and good man by Dr. Doddridge, we shall only add one more, which may afford an useful example to others in an age wherein duelling is so frequent. He had been so much addicted to this

fashionable folly in his younger years, that he had fought three duels, before he was quite a man; but being challenged to fight a fourth after his conversion, he made this calm reply:—"I fear sinning, though you know I do not fear fighting." Dr. Doddridge has summed up his character in few words, in the quotation from Virgil prefixed as a motto to his work:

"——— Justior alter

Nec pietate fuit, nec bello major & armis."

GARDINER, STEPHEN, bishop of Winchester, and chancellor of England was born at Bury St. Edmunds, in 1483. He was natural son to Richard Woodville, the brother of queen Elizabeth, wife to Edward IV, and was educated at Cambridge. He signed the divorce of Henry VIII. from Katharine of Spain; abjured the pope's supremacy; and wrote "*De vera et falsa Obedientia*," in behalf of the king: yet in Edward VI's reign he opposed the reformation, and was imprisoned; but was liberated by queen Mary. He drew up the articles of marriage between her and Philip II. of Spain. He was violent against the reformers, but on his death-bed often repeated these words, *Erravi cum Petro, sed non flevi cum Petro*; "I have sinned with Peter, but I have not repented like Peter." He died in 1555.

GARET, a town of Barbary, in Fez.

GARFETE, a town of Portugal, in Alentejo.

GARGANO, a town of Naples, seven miles N. of Mount St. Angelo.

GARGANVILLARD, a town of France, in the department of Landes, seven miles N. W. of Riviere Verdun.

GARGARISM, [*γαργαρισμός*], a liquid form of medicine to wash the mouth with.

GARGARISMS, are used when the mouth and throat are inflamed, or ulcerated. A small quantity may be taken into the mouth, and moved briskly about, and then spat out; or if the patient cannot do this, the liquor may be injected by a syringe. When gargles are required, their use should be more frequently repeated than is done in common practice. See **MEDICINE**.

GARGET, a distemper in cattle. It consists in a swelling of the throat and the neighbouring parts; to prevent which bleeding in the spring is recommended.

GARGIL, a distemper in geese, which by stopping the head frequently proves mortal. Three or four cloves of garlic, beaten in a mortar with sweet butter, made into little balls, and given fasting, are the ordinary means of cure.

GARGILESSE, a town of France, in the department of Indre, five miles S. E. of Argenton.

GARGLE, a liquid with which the throat is washed. See **GARGARISM**.

GARGLION, an exsudation of nervous juice from a bruise, or the like, which indurates into a hard immovable tumour.

GARIDELLA, in botany, fennel-flower of Crete, a genus of the trigynia order, and dodecandria class of plants; natural order, Multisiliquæ. Calyx pentaphyllous, with leaves resembling flower-petals; nectaria bifid, five, bilabiate; capsules polyspermous, adhering together; seeds numerous. It has but one species.

GARLAND, in naval affairs, a sort of net extended by a wooden hoop, of sufficient size to admit a bowl or platter, and is used by sailors as a locker or cupboard, to contain their provisions.

GARLAND, [derived by Hicks from *gardel handa*, which in the northern languages signify a nosegay artfully wrought with the hand,] ornaments of flowers, fruits, and leaves, intermixed; anciently much used at the gates of temples, where feasts and solemn rejoicings were held; or at any other place where marks of public joy or gaiety were required, as at triumphal arches, tournaments, &c.

GARLAND, is also used for a chaplet made of feathers, or sometimes of precious stones, worn on the head in the manner of a crown.

GARLIC, in botany. See **ALLIUM**.

GARNET, [*granatus*], in natural history, a very beautiful gem of a red colour, with an admixture of blueish. When pure and free from blemishes, it is little inferior, in appearance, to the oriental ruby, though only of a middle degree of hardness between the sapphire and common crystal. It is found of various sizes, from that of a pin's head to an inch in diameter. Among our lapidaries and jewellers, genuine garnets are known by different names, according to their different degrees of colour. 1. The

garnet, simply so called, is the finest and most valuable kind, being of a very deep blood-red, with a faint admixture of blue. 2. The rock-ruby, a name very improperly given to the garnet, when it is of a very strong but not deep red, and has a fairer cast of the blue; this is a very beautiful gem. 3. The sorane or serain garnet, that of a yet brighter red, approaching to the colour of native cinnabar, with a faint blue tinge. 4. The almandine, a garnet only a little paler than that called the rock-ruby. Garnets are distinguished into the oriental and occidental kinds, as being found in Europe as well as the East Indies. The oriental ones are principally brought from Calicut, Cananor, and Cambay; and the European are common in Italy, Hungary, and Bohemia. It is found in great plenty in many mountains, and is usually crystallized. The primitive form of its crystals is a dodecahedron, whose sides are rhombs with angles of 78° 31' and 120° 28'. The inclination of the rhombs to each other is 120°. This dodecahedron may be considered as a four-sided prism, terminated by four-sided pyramids. It is divisible into four parallelepipeds, whose sides are rhombs; and each of these may be divided into four tetrahedrons, whose sides are isosceles triangles, equal and similar to either of the halves into which the rhomboidal faces of the dodecahedron are divided by their shorter diagonal. The integrant molecules of garnet are similar tetrahedrons. The texture of garnet, as Bergman first shewed, is foliated. Its fracture commonly conchoidal: causes single refraction: specific gravity 3.75 to 4.188. Colour usually red, often green: brittle: often attracted by the magnet: fusible per se by the blow-pipe into a black glass.

Variety 1. Noble garnet. Specific gravity 4 to 4.188: colour deep red inclining to violet: almost always in crystals.

Variety 2. Common garnet. Found in mass and disseminated, sometimes in crystals: fracture uneven, inclining to the conchoidal: specific gravity 3.75 to 4: colour various; shades of green and brown; sometimes hyacinth-red and brown-red; rarely orange-yellow. A specimen of oriental garnet, analysed by Klaproth, contained

35.75 silica
27.25 alumina
36.00 oxide of iron
0.25 oxide of manganese.

99.25

A specimen of red garnet analysed by Vauquelin, contained

52.0 silica
20.0 alumina
17.0 oxide of iron
7.7 lime.

96.7

And a specimen of black garnet,

43 silica
16 alumina
20 lime
16 oxide of iron
4 water and volat. matter.

99.

GARNETS, **COUNTERFEIT**, are made as follows: take prepared crystal, two ounces; red lead, six ounces; manganese, sixteen grains; zaffre, three grains: mix all well, put them into a crucible, cover it well with lute, and set it in a potter's kiln for twenty-four hours. Or take crystal, two ounces; minium, five ounces and a half; manganese, fifteen grains; and zaffre, four grains. Mix and bake them as above.

GARNET, in a ship, is a tackle having a pendant coming down from the mainmast, with a block well seized to the main-stay, just over the hatch-way, to which a guy is fixed to keep it steady; and at the other end is a long tackle-block, in which the fall is reeved, that so by it any goods or casks may be hauled and hoisted into or out of the ship. When this garnet is not used, it is fastened along the stay.

GARNISH, in law-books, signifies to warn; in which sense, to garnish the heir, is mentioned in stat. 27 Eliz. c. 3.

GARNISHEE, is used for the third person or party in whose hands money is attached within the liberties of the city of London, in the sheriff's court there; and he is so called, because he has had garnishment

garnishment or warning not to pay the money, but to appear and answer to the plaintiff creditor's suit.

GARNISHMENT, is a warning given to a person for his appearance, for the better furnishing of the cause and court; as where a person is sued for detaining charters or other writings delivered him by the plaintiff, and another person, upon some certain conditions; and therefore he prays that the other person may be warned to plead with the plaintiff, whether the conditions are or are not performed, which is the praying of garnishment; and interpreted to be either a warning of that other, or a furnishing the court with parties sufficient to determine the cause.

GARONNE, a fine river in the S. of France, which rises in the Pyrenees, and taking a N. W. direction, waters Toulouse and Bourdeaux, below which it is joined by the Dordogne, and thence to its entrance into the bay of Biscay is called the Gironde.

GARONNE, UPPER, a department of France, bounded on the N. by that of Lot. It contains part of the late province of Languedoc. The Garonne runs through it. Toulouse is the capital.

GARRACHICA, a sea-port town of the isle of Teneriffe.

GARRET, or **GARRET DENNIS**, an island in the Pacific ocean, about forty-two miles in circumference, N. of New Ireland. Lon. 151. 25. E. Lat. 2. 30. S.

GARRICK, **DAVID**, a celebrated actor, was descended from a French family, who being Protestants, fled to England on the revocation of the edict of Nantes. His father, Peter Garrick, was a captain in the army, and generally resided at Litchfield; but being on a reconnoitring party at Hereford, David was born there in 1716. He received his education partly at the grammar-school at Litchfield, and partly under Dr. Johnson, with whom he visited London in 1735. He was for some time under Mr. Colson, an eminent mathematician, and afterwards went into partnership with his brother in the wine-trade. This business he soon quitted for the stage. His first attempt was at Ipswich in 1741, under the assumed name of Lyddal: and the applause he met with, induced him to make his appearance at the theatre in Goodman's-fields, in the character of Richard III. The other theatres were quickly deserted, and Goodman's-fields became the resort of people of fashion, till that theatre was shut up. Garrick then formed an engagement with Fleetwood, the patentee of Drury-lane. In the summer of 1743 he played in Dublin, to such full houses, that the heat of the weather and the crowds occasioned a fever, which was called the Garrick fever. In 1747 he became joint-patentee of Drury-lane theatre; and in 1749 he married Mademoiselle Violetti, an Italian stage-dancer. In 1763 he and Mrs. Garrick made a visit to Italy, and at Paris he saw the celebrated Mademoiselle Clairon, whose future eminence he predicted. He returned to England in 1765, and in 1766 he brought out the *Clandestine Marriage*, a comedy, written in conjunction with the elder Colman. In 1769 he celebrated a fete in honour of Shakespeare, called the Jubilee at Stratford-upon-Avon. It was afterwards made an entertainment at Drury-lane, under the same title, and had a prodigious run. In 1776 he gave up his concern in the theatre for 35,000*l*. The last character he performed was Don Felix in the *Wonder*. He died in 1779, and was buried in Westminster Abbey, where a handsome monument has been erected to his memory by private friendship. Mr. Garrick was hospitable and generous, but vain and fond of flattery. He wrote several dramatic pieces, prologues, epilogues, songs, and epigrams; in the last he excelled. (Watkins.)

GARRISON, in the art of war, a body of forces, disposed in a fortress, to defend it against the enemy, or to keep the inhabitants in subjection; or even to be subsisted during the winter-season: hence, garrison and winter-quarters are sometimes used indifferently, for the same thing; and sometimes they denote different things. In the latter case, a garrison is a place wherein forces are maintained to secure it; and where they keep regular guard, as a frontier-town, a citadel, castle, tower, &c. The garrison should always be stronger than the townsmen. Winter-quarters signify a place where a number of forces are laid up in the winter-season, without keeping the regular guard. Du Cange derives the word from the corrupt Latin *garnisio*, which the latter writers use to signify all manner of munition, arms, victuals, &c. necessary for the defence of a place, and sustaining of a siege.

GARRISON, a town of Ireland, in Fermanagh, ten miles S. E. of Ballyshannon.

GARROWS, a county of Asia in India, E. of Bengal.

GARSTANG, a populous town of Lancashire, in the post-road between Preston and Lancaster. It is seated on the Wyre, which, by the late inland navigation, communicates with the Mersey, Dee, Ribble, Ouse, Trent, Darwent, Severn, Humber, Thames, Avon, &c. which navigation, including its windings, extends above 500 miles, in the counties of Lincoln, Nottingham, York, Westmoreland, Chester, Stafford, Warwick, Leicester, Oxford, Worcester, &c. Garstang is ten miles S. of Lancaster. Lon. 2. 53. W. Lat. 55. 56. N.

GARTER, in heraldry, a moiety, or the half of a bend.

GARTER, **ORDER OF THE**, a military order of knighthood, the most noble and ancient of any lay-order in the world, instituted by Edward III. The knights companions are generally princes and peers; and the king of England is the sovereign of the order. The number of knights was originally 26; but six were added in 1786, on account of the increase of the royal family. They are a corporation, having a great and little seal, &c. Their officers are a prelate, chancellor, register, king at arms, and usher of the black rod. They have also a dean, with 12 canons, and petty-canons, vergers, and 26 pensioners or poor knights. The prelate is the head. This office has always been vested in the bishop of Winchester. Next to the prelate is the chancellor; which office is vested in the bishop of Salisbury, who keeps the seals, &c. The next is the register, who by his oath is to enter upon the registry, the scrutinies, elections, penalties, and other acts of the order with all fidelity: The dean of Windsor is always register ex officio. The fourth officer is Garter and King at arms, being two distinct offices united in one person. He is the principal officer within the college of arms, and chief of the heralds. All these officers, except the prelate, have fees and pensions. The college of the order is seated in the castle of Windsor, within the chapel of St. George, and the charter-house, erected by the founder for that purpose. The habit and ensign of the order are a garter, mantle, cape, george, and collar. The three first were assigned the knights companions by the founder; and the george and collar by Henry VIII. The garter challenges pre-eminence over all the other parts of the dress, as from it the order is denominated. It is the first part of the habit presented to foreign princes and absent knights, who, as well as all other knights elect, are therewith first adorned; and it is of so great honour and grandeur, that by the bare investiture with this noble ensign, the knights are esteemed companions of the greatest military order in the world. It is worn on the left leg between the knee and calf, and is enamelled with this motto, *HONI SOIT QUI MAL Y PENSE*. The mantle is the chief of these vestments made use of upon all solemn occasions. The colour of the mantle is by the statutes appointed to be blue. The length of its train only distinguishes the sovereign from the knights companions. To the collar of the mantle is fixed a pair of long strings, anciently woven with blue silk only, but now twisted round, and made of Venice gold and silk, of the colour of the robe; with knobs or buttons and tassels at the end. The left shoulder has from the institution been adorned with a large garter, with the device, *HONI SOIT*, &c. Within this is the cross of the order, which was ordained to be worn at all times by king Charles I. At length the star was introduced, being a sort of cross irradiated with beams of silver. The collar is appointed to be composed of pieces of gold in fashion of garters, the ground enamelled blue, and the motto gold. In 1551, Edward VI. made some alterations in the ritual of this order: that prince composed it in Latin, the original whereof is still extant in his own hand-writing. He there ordained, that the order should no longer be called the order of St. George, but the order of the garter; and, instead of the George, hung at the collar, he substituted a cavalier, bearing a book on the point of his sword, with the word, *protectio* graven on the sword, and *verbum Dei* on the book: with a buckle in the left hand, and the word *fides* thereon. When the knights do not wear their robes, they are to have a silver star on the left side; and they commonly bear the picture of St. George, enamelled on gold, and beset with diamonds, at the end of a blue ribbon, crossing the body from the left shoulder. They are not to appear abroad without the garter, on penalty of 6*s*. 8*d*. paid to the register. The manner of electing a knight companion into this most noble order, and the ceremonies of investiture, are these: When the sovereign designs to elect a companion of the garter, the chancellor of the order draws up the letters, which, passing both under the sovereign's sign manual and signet of the order, are sent to the person by Garter principal king

at arms. The garter, which is of blue velvet bordered with fine gold wire, having the letters of the motto, is, at the time of election, buckled upon the left leg, by two of the senior companions, who receive it from the sovereign, to whom it was previously presented upon a velvet cushion, by Garter king at arms, with the usual reverence, whilst the chancellor reads the following admonition, enjoined by the statutes: "To the honour of God omnipotent, and in memorial of the blessed martyr St. George, tie about thy leg, for thy renown, this noble garter; wear it as the symbol of the most illustrious order, never to be forgotten or laid aside; that thereby thou mayest be admonished to be courageous; and having undertaken a just war, in which thou shalt be engaged, thou mayest stand firm, valiantly fight, and successively conquer." The princely garter being then buckled on, and the word of its signification pronounced, the knight elect is brought before the sovereign, who puts about his neck, kneeling, a dark blue ribbon, whereunto is appendant, wrought in gold within the garter, the image of St. George on horseback, with his sword drawn, encountering with the dragon. In the mean time, the chancellor reads the following admonition: "Wear this ribbon about thy neck, adorned with the image of the blessed martyr and soldier of Christ, St. George, by whose imitation provoked, thou mayest so overpass both prosperous and adverse adventures, that having stoutly vanquished thy enemies both of body and soul, thou mayest not only receive the praise of this transient combat, but be crowned with the palm of eternal victory." Then the knight elected kisses the sovereign's hand; thanks his majesty for the great honour done him; rises up, and salutes all the companions severally, who return their congratulations. Since the institution of this order, there have been 8 emperors and 28 kings, besides numerous sovereign princes, enrolled as companions. The origin of the order is variously related by historians. The common and not improbable account is, that the countess of Salisbury happening at a ball to drop her garter, the king took it up and presented it to her in these words, "Honi soit qui mal y pense; i. e. Evil to him that evil thinks. This accident gave rise to the order and the motto; it being the spirit of the times to mix love and war together. In the original statutes, however, there is not the least hint of allusion to such a circumstance, farther than is conveyed in the motto. Camden, Fern, &c. take the order to have been instituted on occasion of the victory obtained by Edward over the French, at the battle of Cressy. That prince, say some historians, ordered his garter to be displayed, as a signal of battle; in commemoration whereof, he made a garter the principal ornament of the order erected in memory of this signal victory, and a symbol of the indissoluble union of the knights. And they account for the motto, that K. Edward having laid claim to the kingdom of France, denounced shame and defiance upon him that should dare to think amiss of the just enterprise he had undertaken for recovering his lawful right to that crown; and that the bravery of those knights whom he had elected into this order was such as would enable him to maintain the quarrel against those that thought ill of it. This interpretation, however, appears to be rather forced. A still more ancient origin of this order is given in Rastell's Chronicle, lib. vi. quoted by Granger, in the supplement to his Biographical History: viz. that it was devised by Richard I. at the siege of Acres, when he caused 26 knights, who firmly stood by him, to wear thongs of blue leather about their legs; and that it was revived and perfected in the 19th year of Edward III.

GARTH is used in some parts of England for a little back-yard or close. It is an ancient British word. *Gardd*, in that language, signifies garden, and is pronounced *garth*. It is also used for a dam or wear, &c.

GARTH-MAN, in the old English statutes, one who catches fish by means of fish-garths, or wears.

GARTZ, a town of Germany, in Prussian Pomerania. Lon. 14. 18. E. Lat. 53. 13. N.

GAS is a general name for all fluids of the aerial kind, except common air. It is derived from the German *gascht* or *gast*, signifying an irruption of wind, or the ebullition attending the expulsion of elastic fluids from substances in a state of fermentation or effervescence. It was originally given by Van Helmont to the vapour of charcoal, the same with the fluid afterwards called fixed air, now carbonic acid, and also to some other factitious airs. From him the term gas has been employed by modern philosophers,

as a general one for all the elastic fluids which retain their aerial form in the common temperature of the atmosphere. Of all the modern discoveries, those relating to air, or the substances denominated gases, are the most important and interesting.

OXYGEN GAS. This gas was first obtained by the ingenious Dr. Priestley in 1774 on the first day of August. Soon after the same discovery was made by Scheele and Lavoisier. It has been called dephlogisticated air, pure air, vital air, fire-air, empyreal air, and oxygen gas which name it retains. Oxygen is combined in abundance in many metallic substances from which the gas may be obtained by the application of heat. It is most generally procured by adding good sulphuric acid to about the same bulk of the black oxide of manganese. The flame of a taper or lamp is applied, and the gas by means of a brick-tube is received in a glass inverted over water. The properties of this air has been fully examined and are now generally known. It is remarkable for its purity, and for its power of maintaining combustion and respiration. Any combustible substance, previously ignited, being introduced into this gas burns rapidly and vividly. A bit of iron-wire or watch-spring with a small bit of phosphorus and lint lighted at the end, burns brilliantly, emitting sparks. It is insipid, inodorous, highly elastic, and heavier than common air, being to it as 103 to 100. By the application of heat it is expanded; by the abstraction of heat it is contracted, in the same manner as atmospheric air, but in a different ratio. In the first 45° above the freezing point it expands less than atmospheric air; in higher temperatures it expands much more. This gas has been found of use medicinally in cases of debility, serofula, rickets, palsy, nervous affections, &c. It forms about 27 parts in 100 of atmospheric air, constituting that part which supports animal life. It also gives to acids their acid properties, and hence has been called the acidifying principle.

GAS, AZOTIC, or NITROGEN, it is also called mephitic, and is a substance unlike the former, being incapable of supporting animal life. It extinguishes flame, and is only characterised by possessing none of the distinguishing qualities of the other known airs. It is lighter than common air, in the proportion of 985 to 1000. It may be considered indeed as the residue of common air, when vitiated by combustion. It is easily disengaged from animal matters, by a slight increase of temperature; but different parts of animals afford different proportions of it, and the concrescible fibrous matter the most. The portion of it they in general afford is proportioned to their quantity of volatile alkali. Azotic or nitrogen gas, may be procured by mixing equal weights of iron filings and sulphur into a paste with water, and placing the mixture in a proper vessel over water. Then invert over it a jar full of common air, and allow it to stand exposed to the mixture a day or two. The air contained in the jar will gradually diminish, as will appear from the ascent of the water within the jar, till at last only about three-fourths of its original bulk remain. This gas is not absorbed by water: it immediately extinguishes a lighted candle, and other burning substances: it is fatal to animals confined in it: plants, however, live and flourish in it: by it delicate blue colours are slightly reddened; and when mixed with oxygen gas, in the proportion of three or four parts of azotic gas to one of oxygen, it composes a mixture resembling atmospheric air. Its basis is nitrogen, an elementary substance, which is also the basis of nitrous acid or aquafortis. Its combination with oxygen gives it the acid character. In this state it is combined with that substance. In the state of atmospheric air it is only mixed.

GAS, INFLAMMABLE, or HYDROGEN. This air, named also fire-damp, is peculiarly distinguished by its great levity and inflammability. It is the lightest substance whose weight we are able to estimate. When pure, it is thirteen times lighter than atmospheric air, and it immediately explodes on mixture with oxygen and ignition. It is formed by the union of hydrogen and caloric. Its lightness is particularly evinced by its use in balloons. Plants grow in this fluid without impairing its inflammability. Water imbibes about one-thirteenth part of it; and when again expelled, it is as inflammable as ever. Hydrogen gas is thus procured: let sulphuric acid, diluted with five or six times its weight of water, be poured on iron filings or zinc in a glass-bottle or small retort. An effervescence will ensue, and the gas which escapes is inflammable air or hydrogen gas. This effect is procured by the decomposition of the watery parts of the acid; the oxygen is absorbed

by the metal, and with the sulphur forms a solid saline mass (mar-tial vitriol or copperas). The hydrogen which enters into the composition of the water is disengaged in the form of hydrogen gas. According to M. Lavoisier, water is composed of eighty-five parts of oxygen and fifteen parts of hydrogen. This philosopher has instructed us in the following method of obtaining this gas by heat only. Let water pass drop by drop through the barrel of a gun, while it remains red-hot amidst burning coals; let a crooked tube be placed at the end of this iron, and bent, so that it may be passed into a glass-vessel full of water inverted in the pneumatic apparatus. There will then pass into the glass-vessel an aeriform fluid, which is inflammable air or hydrogen gas. In this process the water suffers a decomposition, and while the hydrogen passes into the glass-receiver, the oxygen unites with the substance of the gun-barrel, and oxidates or rusts its internal surface. Metals are very easily revived or reduced from a calx or oxide to the metallic state when heated in a receiver filled with this air. This also arises from its attraction for oxygen, which in this case is expelled from the calx; and, uniting with the hydrogen in the receiver to form water, leaves the metal pure, and in its natural state. In a strong phial mix equal parts of hydrogen gas and common air, and apply to the mouth a lighted candle, and it will produce a sudden and loud explosion. One part of oxygen gas, and two or three, of hydrogen gas, will give a report equal to that of a pistol. Hydrogen gas has an unpleasant smell; it extinguishes burning bodies; and is fatal to animals. From these three simple, or original gases, variously modified, all the rest are produced.

GAS, CARBONIC ACID. This is the first of the elastic fluids that appears to have been distinguished from common air. Dr. Black investigated its nature. From its existing in the inelastic state, in water, Dr. Black called it fixed air. Bewley termed it mephitic air; it has also been termed cretaceous and calcareous acid, but has retained the name carbonic acid, since it appears to have been ascertained, that its radical is carbon. Of this, or rather of charcoal, according to the experiments of Lavoisier, it contains twenty-eight parts by weight, to seventy-two of oxygen. Guyton Morveau considers it as composed of 17.88 pure carbon, and 82.12 of oxygen. Carbonic acid gas exceeds every other in specific gravity, except the sulphurous. Hence the vapour in the Grotto del Cano, rises but a little above the surface; and the choak-damp of miners, which is this gas, lies on the ground. Thus, too, when it is emitted from a fermenting liquor, it first fills the empty portion of the vat, displacing the lighter atmospheric air; and then flows over the sides, almost as water would do. For the same reason, if a bottle filled with it be inverted over the flame of a candle at some distance, it will descend, and extinguish it. According to the experiments of Mr Cavendish, one part of this, mixed with nine of atmospheric air, renders it incapable of supporting combustion.

GAS, CARBONIC OXIDE. This is a mixture of carbonic acid gas, and carbonic oxide; it was first made known by Mr. Cruikshank. This gas freed from carbonic acid by washing with lime-water is somewhat lighter than common air in which it does not explode when fired, but does in oxygen gas. Pure alkalis do not absorb it, but water takes up about a fifth part of its bulk. It is noxious to animals. The purest oxide of carbon is obtained, by passing the carbonic acid gas through red hot charcoal.

GAS, ATMOSPHERIC, or, COMMON AIR. This is a mixture of oxygen and azotic air, with carbonic acid, and this mixture is in the proportion of 27 parts of oxygen air, 72 of azotic, and 1 of carbonic acid gas. The proofs of this composition of atmospheric air were first offered by Mr. Scheele, who found, on its exposure to certain substances, that it suffered a diminution of volume; and that by this diminution it was rendered unfit for the support of life. This abstracted part, therefore, could not fail to be oxygen or vital air; and from this mixture of oxygen and azote, he naturally inferred that atmospheric air came to be formed. This he further confirmed by restoring oxygen to it, in consequence of which it regained all its properties of atmospheric air. On the same subject he was succeeded by Lavoisier, who, in addition to these facts, shewed that the oxygen, or attracted part, was received by the substance producing the change, and could be often recovered again from it. But though the composition of atmospheric air has been thus ascertained, something still remains want-

ing to complete it; and this is the manner of combining by experiment its parts. Hence it is doubted whether its parts exist naturally in a state of chemical combination, or of mechanical mixture; however the latter appears most probable. From this knowledge of the composition of atmospheric air, an attempt has been made to ascertain its purity, or its relative capability of supporting animal life in different situations. This is effected by eudiometry, or measuring the exact quantity of oxygen the air contains. See EUDIOMETER.

GAS, ALKALINE, or AMMONIACAL. This air possesses a strong pungent smell, and is even capable of inflaming the skin of animals. Its lightness is next to that of inflammable air, and its specific gravity is to that of atmospheric air, in the proportion of 600 to 1000. It is capable of supporting animal life, or combustion, though the flame of a candle enlarges before it is extinguished by it. It is a compound of azote and hydrogen, 1000 parts of it containing 807 of azote, and 193 of hydrogen. This air has a strong attraction for water, and is rapidly absorbed by it. When dissolved with water it produces heat; and when dissolved with ice it produces cold. Dr. Priestley first noticed this gas; it is not found in a natural state. To obtain it, put into a retort a certain quantity of liquid ammonia, and heat the bottom of the retort, and having suffered some air to escape from the retort and the tube, the gas may be collected in vessels filled with mercury. This gas, which seems to be nothing but ammonia deprived of water, is perfectly absorbable by water, and the solution forms liquid ammonia (the same which is vulgarly called sal volatile and spirit of hartshorn). It is the lightest of all the saline gases, has a penetrating odour, and gives a strong tint of green to blue vegetable colours. It combines rapidly with carbonic, muriatic, and sulphureous acid gases, and forms neutral salts, throwing out a great deal of heat, which arises from the free state of the calorific that had been combined with these gases. Ammoniacal gas suffocates animals, and extinguishes burning bodies; but it is so far inflammable, that it increases the flame of a taper before it extinguishes it.

GAS, CARBURETTED HYDROGEN. There are several varieties of this gas, the hydrogen holding different proportions of carbon in solution, according to the process by which it is obtained. The gas of stagnant water, which may be procured by stirring the mud at the bottom with a stick, and collecting the gas, as it rises in bubbles, in an inverted bottle, is this compound, as is also the fire-damp of coal-mines. The vapour of water passed through a tube containing ignited charcoal, consists of this gas and carbonic acid, which may be separated by agitating the mixture with lime diffused in water. The vapour of ether, or of alcohol, passed through a red-hot tube of porcelain, coated with clay, affords the same products. If three parts of concentrated sulphuric acid, and one of alcohol, be distilled in a glass-retort with a gentle heat, a carburetted hydrogen comes over. This is distinguished by the name of olefant gas, because when it comes in contact with oxygenated muriatic acid gas, it forms an oil. Several varieties of this gas were examined by Mr. Henry, in order to ascertain their power of affording light. The following results were determined:

GASES.	Oxygen gas required to saturate, 100 measures.		Measures of carbonic acid produced.	
Pure hydrogen.....	50	to 54	.....	0
Gas from moist charcoal.....	60	.....	.....	35
oak	54	.....	.....	33
dried peat.....	68	.....	.....	43
coal.....	170	.....	.....	100
lamp-oil.....	190	.....	.....	124
stagnant water.....	200	.....	.....	100
wax.....	220	.....	.....	137
Pure olefant gas.....	284	.....	.....	179

The light evolved appeared to be in proportion to the oxygen consumed, so that the first four in the list yielded very little; but the last much exceeded all the rest. Of these varieties the olefant

ant gas is the heaviest, and with oxygen detonates more violently than any of the rest.

GAS, SULPHURATED HYDROGEN. This has the properties of an acid; for when absorbed by water, its solution reddens vegetable blues. It combines also with alkalis, earths, and with several metallic oxides. It has an extremely offensive odour, resembling that of putrid eggs. It kills animals, and extinguishes burning bodies. When mixed with oxygen gas, or atmospheric air, it is inflammable. To obtain it, take dry sulphuret of potass, put it into a tubulated retort in a sand-bath; or, supported over a lamp, direct the neck of the retort under the receiver placed in a pneumatic trough; then pour gradually upon the sulphuret diluted sulphuric acid; a violent effervescence will take place, and sulphurated hydrogen gas will be disengaged. When no more gas is produced, apply heat by degrees till it boils, and gas will again be procured abundantly. The water employed for receiving it should be heated to about 80 or 90 degrees: at this temperature it dissolves little of the gas; but if cold water be used, a vast quantity of it is absorbed. Water impregnated with sulphurated hydrogen gas, slightly reddens blue vegetable colours. It is this gas which gives to the mineral-waters of Harrowgate and Aix-la-Chapelle their peculiar smell. Such waters may therefore be artificially imitated, by impregnating common water with this gas, and adding the other constituent parts to it. This gas acts strongly on most metallic oxides. Dip a slip of paper into a solution of lead, and expose it to the action of sulphurated hydrogen gas; and the paper will instantly become blackened. Writing performed with this solution is invisible when dry, but becomes visible when immersed in a bottle filled with this gas.

GAS, PHOSPHORATED HYDROGEN, consists of phosphorus dissolved in hydrogen gas. It is the most combustible substance in nature. It is distinguished from all other gases by the property of taking fire immediately when brought in contact with atmospheric air. When mixed with oxygen gas, or with oxygenated muriatic acid gas, it burns with great violence. When bubbles of it are suffered to pass through water, they take fire in succession as they reach the surface of the fluid. It has an insupportable odour, similar to that of putrid fish. To obtain it, take a small retort, put into it one part of phosphorus and ten of concentrated solution of potass; make the mixture boil, and receive the gas over mercury, or, if it be intended for immediate use, it may be collected over water. In this process a decomposition of the water takes place. Its oxygen unites to part of the phosphorus, forming phosphoric acid, which joins to the potass, and forms phosphate of potass. The hydrogen of the water dissolves another part of the phosphorus, and is converted into phosphorated hydrogen gas. In preparing this gas the body of the retort should be filled as nearly as possible with the mixture, otherwise the first portion of gas which is produced inflames in the retort, a vacuum is formed, and the water is forced up into the retort, which endangers the bursting of it. Phosphorated hydrogen gas is also formed by nature. The air which burns at the surface of certain springs, and forms what is called burning springs, and the ignis fatuus (jack o'lantern), which glides along burying-grounds consist of this gas. If the bubbles of air which come from the retort are suffered to escape into the atmosphere, they will burst with a slight explosion, and produce flashes of fire. A circular dense white smoke rises like a ring, enlarging itself continually in an extremely beautiful manner, if the air be perfectly tranquil. This gas burns with a green light, in nascent oxygenated muriatic acid gas, under the surface of water. Put into a deep glass some phosphoret of lime, broken into pieces of the size of a pea, and add half as much oxygenated muriate of potass. Fill the vessel with water, and bring into contact with the materials at the bottom of the fluid some concentrated sulphuric acid. This may be most conveniently done, by letting the acid fall through a long funnel reaching to the bottom of the vessel. As soon as the decomposition of the water, and that of the oxygenated muriate takes place, flashes of fire dart from the fluid, and illuminate the bottom of the vessel with a beautiful green light. A ribbon, impregnated with solution of gold, may be gilt, by the action of phosphorated hydrogen gas.

GAS, NITROUS. This name is given to an aeriform fluid, consisting of a certain quantity of nitrogen gas and oxygen: first described by Priestley, but in some measure known before to Hales.

It is colourless, having no sensible taste, and is neither acid nor alkaline: it cannot be respired. The greater number of combustible bodies cannot burn in it. It is nevertheless capable of supporting the combustion of some bodies. Phosphorus burns in it, when introduced in a state of inflammation; pyrophorus takes fire in it spontaneously. To obtain it, put into a small retort some pieces of copper, and pour on them nitric acid diluted with water; an effervescence takes place, and nitrous gas will be produced. After having suffered the gas to escape for a few minutes, on account of the common air contained in the retort, collect the gas in the water apparatus as usual. In order to obtain this gas in a pure state, it should be shaken for some time in contact with water. In this process the acid undergoes a partial decomposition; the metal robs the nitric acid of the greatest part of its oxygen, and becomes oxydated. This gas has the property of absorbing the oxygen of the atmosphere; on this property Priestley formed his eudiometers. See EUDIOMETER.

GAS, NITROUS OXIDE. This is sometimes called the gaseous oxide of nitrogen, a compound of nitrogen with a still less proportion of oxygen than the preceding gas. It is a permanent gas. A candle burns in it with a brilliant flame and crackling noise: before its extinction the white inner flame becomes surrounded with a blue one. Phosphorus introduced to it in a state of inflammation burns with increased splendour, as in oxygen gas. Sulphur introduced into it when burning with a feeble blue flame, is extinguished; but when in a state of vivid inflammation it burns with a rose-coloured flame. Lighted charcoal burns in it more brilliantly than in atmospheric air. Iron wire with a small piece of wood affixed to it, and introduced inflamed into a vessel filled with this gas, burns rapidly, and throws out bright scintillating sparks. Nitrous oxide is rapidly absorbed by water which has been boiled; a quantity of gas equal to rather more than half the bulk of the water may be thus made to disappear: the water acquires a sweetish taste, but its other properties do not differ perceptibly from common water. The whole gas may be expelled again by heat. It does not change blue vegetable colours. It has a sweet taste, and a faint but agreeable odour. This gas is produced when substances, having a strong affinity with oxygen, are added to nitric acid, or to nitrous gas. It may therefore be obtained by various methods, in which nitrous gas or nitric acid is decomposed by substances capable of attracting the greater part of their oxygen. The most commodious and expeditious, as well as the cheapest mode of obtaining it, is by decomposing nitrate of ammonia by heat in the following manner: Put into a glass-retort some pure nitrate of ammonia, and apply to it an Argand's lamp; the salt will soon liquefy, and when it begins to boil gas will be evolved. Increase the heat gradually, till the body and neck of the retort become filled with a milky white vapour. In this state the temperature of the fused nitrate is between 340 and 480 degrees. After the decomposition has proceeded for some minutes, so that the gas, when examined, quickly enlarges the flame of a taper, it may be collected over water. Care should be taken during the whole process never to suffer the temperature of the fused nitrate to rise above 500 degrees Fahrenheit, which may be easily judged of from the density of the vapours in the retort, and from the quick ebullition of the fused nitrate; for if the heat is increased beyond this point, the vapours in the retort acquire a reddish and more transparent appearance, and the fused nitrate begins to rise; at 700° or 800° it explodes. After it is obtained it should stand over water several hours to render it fit for respiration, or other experiments. To experience its effects in breathing it, put about a gallon into a large bladder, or oiled silk-bag, having a tube attached to it of three-fourths of an inch in diameter. First, the common air must be expelled from the lungs, before the tube is received into the mouth, and the nostrils must be accurately closed with the hand. It must then be breathed backwards and forwards into the bag for a minute or two; some have gone as far as four or five minutes. It generally produces a pleasant thrilling, particularly in the chest and extremities, frequently with an inclination to laugh, and sometimes an irresistible propensity to gesticulation and muscular exertion. The mind meanwhile is often totally abstracted from all surrounding objects. Sometimes its effects are not entirely dissipated for some hours; and it is remarkable, that, however strong they may have been, no sense of debility or languor is induced after they have subsided. On a few individuals, however,

however, its effects have been unpleasant and depressing; in some it has produced convulsions, and other nervous symptoms; and on some it has had no sensible effect.

GAS, FLUORIC ACID. The radical of fluoric acid gas is unknown. It may be obtained by decomposing fluat of lime (Derbyshire spar), by means of sulphuric acid. For this purpose, put one part of powdered fluat of lime into a leaden retort, and pour over it two or three parts of sulphuric acid. A violent action ensues, and fluoric acid gas is extricated, which must be collected over mercury, either in a leaden or tin vessel, or in a glass-receiver covered within with a coat of varnish or wax. When no more gas is produced, the action of the acid must be assisted by a gentle heat. The most remarkable property of this gas is its power of dissolving silex: it therefore dissolves glass-crystals, and various precious stones. It is heavier than common air. It does not maintain combustion, nor can animals breathe it. It is absorbed by water, and forms with it liquid fluoric acid. It has a penetrating odour. It corrodes animal and vegetable substances. Light has no effect upon it. It emits white fumes, when in contact with moist atmospheric air. It reddens blue vegetable colours. With ammonia, it forms a concrete body. It has no action upon platina, gold, silver, mercury, tin, lead, antimony, cobalt, nickel, or bismuth; but it corrodes iron, arsenic, and manganese. The property of dissolving silex has caused it to be applied to etching on glass, which is done either by means of the fluoric acid gas, or liquid fluoric acid.

GAS, MURIATIC ACID is obtained by exposing to heat fuming muriatic acid, put into a retort, the beak of which is introduced below a bell filled with mercury, and placed on the shelf of a mercurial pneumatic apparatus. You may obtain it also with the same apparatus, if, instead of muriatic acid, you expose to heat a mixture of muriate of soda, or marine salt and sulphuric acid; the sulphuric acid combines with the soda the base of the marine salt, and the muriatic acid remaining free, passes into the state of muriatic acid gas. Muriatic acid gas is perfectly soluble in water, and in a very short time. If you therefore introduce into the bell, in which the gas has been collected, a small quantity of water, the latter, by its relative lightness, will rise to the surface of the mercury; the gas will be immediately absorbed entirely, and dissolved in the water; the mercury will ascend towards the top of the bell; and the liquor found above the mercury will be real muriatic acid, more highly concentrated, according as there is more gas and less water. Muriatic acid gas, therefore, is nothing else than the muriatic acid itself deprived of water; that is to say, as much concentrated as possible, and combined with caloric, which causes it to assume the gaseous form. Muriatic acid gas has a sharp pungent odour. If a little of it be mixed with atmospheric air, it produces, like the muriatic acid, white fumes or vapours, occasioned by the combination of the gas with the moisture of the air. This gas is much heavier than atmospheric air. It gives the same signs of acidity as the muriatic acid itself; and this indeed ought to be the case, as it is the same substance. It reddens blue vegetable colours, but it destroys neither them nor any of the other colours, as the oxygenated muriatic gas does. It combines with all the alkaline bases, and forms with them muriatic salts. If it is mixed with ammoniacal gas, it combines with it, and forms muriate of ammonia. It suffocates animals immersed in it, and extinguishes a lighted taper; but it first enlarges its flame, and makes it appear of a green or bluish colour at the edges.

GAS, OXYGENATED MURIATIC ACID. The dephlogisticated muriatic acid of Scheele, under a gaseous form, is the muriatic acid gas surcharged with oxygen. This gas is obtained by exposing the muriatic acid to heat and evaporation, whilst it is acting on a substance which contains oxygen; such, for example, as the native oxide of manganese: if you therefore put black oxide of manganese and muriatic acid into a glass-retort, and expose them to heat, a strong fermentation will be excited, during which the muriatic acid will be converted into gas, but surcharged with oxygen, which is taken from the oxide of the manganese, because it has a greater affinity for that substance. It may be prepared in the water-apparatus, though it is absorbable by water. This gas destroys vegetable colours entirely. All flowers, and the green leaves of plants, are rendered white by it, and alkali is not capable of restoring their colours. This effect can only be ascribed

to the absorption of oxygen. This gas, which contains oxygen in excess, gives up a part, which vegetable substances absorb with avidity, and by this absorption lose their colour. The oxygenated muriatic acid gas then becomes converted into common muriatic acid gas. This property has given rise to a new method of bleaching, which has proved successful. See BLEACHING. Other gases of less importance will be noticed under their respective bases, and the properties of these further noticed. For the specific gravity of the gases, see SPECIFIC GRAVITY.

GASCOIN, or GASCOIGN, is the hinder thigh of a horse, which begins at the stifle, and reaches to the ply or bending of the ham.

GASCONY, a late province of France, bounded by Guienne on the N. by Languedoc on the E. by the Pyrenees on the S. and by the Bay of Biscay on the W. It had its name from the Gascons, its ancient inhabitants. It now forms along with Armagnac the department of Gers.

GASPEZIA, a tract of country, in Lower Canada, S. of the Lawrence, and N. of Coralein's Bay.

GASSENDI, one of the most celebrated philosophers France has produced, was born at Chanterrier, about three miles from Digne in Provence, in 1592. When a child, he took delight in gazing at the moon and stars in clear unclouded weather. This frequently drew him into bye-places, to feast his eyes undisturbed; by which means his parents had him often to seek, with many anxious fears. They therefore put him to school at Digne; where he soon made such extraordinary progress in learning, that some persons, who had seen specimens of his genius, resolved to have him removed to Aix, to study philosophy under Fesay, a learned minor friar. He was afterwards invited to be professor of rhetoric at Digne, before he was quite sixteen years of age; and he had been engaged in that office but three years, when Fesay dying, he was made professor in his room at Aix. There he composed his "Paradoxical Exercitations;" which, coming to the hands of Nicholas Peirese, that great patron of learning joined with Joseph Walter prior of Valette in promoting him; and he having entered into holy orders, was first made canon of the church of Digne and D. D. and then obtained the rectorship of that church. Gassendi's fondness for astronomy grew up with his years; and his reputation daily increasing, he was, in 1645, appointed royal professor of mathematics at Paris. This institution being chiefly designed for astronomy, he read lectures on that science to crowded audiences. However, he did not hold this place long; for a dangerous cough and inflammation of the lungs, obliged him, in 1647, to return to Digne for the benefit of his native air. Gassendi wrote against the metaphysics of Descartes; and divided with that great man the philosophers of his time, almost all of whom were Cartesians or Gassendians. He joined to his knowledge of philosophy and the mathematics an acquaintance with the languages and a profound erudition. He wrote, 1. Three Volumes on Epicurus's Philosophy; and six others, which contained his own Philosophy. 2. Astronomical Works. 3. The Lives of Nicholas de Peirese, Epicurus, Copernicus, Tycho Brahe, Puerbachius, and Regiomontanus. 4. Epistles, and other Treatises. All his works were collected together, and printed at Lyons, in 1658, in 6 vols. folio. He died at Paris, in 1655, aged 63.

GASSENHOVEN, a town of France, in the department of the Dyle, and late Austrian Netherlands, 3 miles N. E. of Tylemont.

GASTEIN, a town of Bavaria, in the archbishopric of Saltzburg, 36 miles S. of Saltzburg.

GASTEROSTEUS, the STICKLE-BACK, in ichthyology, a genus of fishes of the order thoracici. Body carinate on each side, somewhat lengthened, and covered with bony plates; dorsal fin single, with distinct spines between it and the head; ventral fins behind the pectoral, but above the sternum. There are thirteen species.

G. ACULEATUS, STICKLE-BACK, BANSTICLE, or SHARPLING, is common in many of the British rivers. In the fens of Lincolnshire and some rivers that proceed from them; they are found in prodigious quantities. At Spalding, once in seven or eight years amazing shoals appear in the Welland, and come up the river in form of a vast column. The quantity is so great, that they are used to manure the land, and trials have been made to obtain oil from

from them. It is said that a man being employed by the farmer to take them, has got for a considerable time 4s. a-day by selling them for a halfpenny per bushel.

GASTRIC JUICE, a thin pellucid liquor, which distils from certain glands in the stomach, for the dilution, &c. of the food.

GASTROBRANCHUS, in natural history, a genus of fishes, of the order cartilaginei. Mouth beneath, furnished with pectinal teeth in a double row on each side; body eel-shaped; carinate beneath by a soft fin, two ventral spiracles. *G. cæcus*, or the hag-fish, is about five-inches in length, in the European seas, but, in those of India attains the length of a common eel. Its appearance is very similar to that of the lamprey. It is characterized by the circumstance of exhibiting no traces of the existence of such an organ as the eye.

GASTROMANCY, or **GASTROMANTIA**, [from *gaster*, the belly, and *mantia*, divination,] a kind of divination practised among the ancients, by means of words coming or seeming to come out of the belly. There is another kind of gastromancy, which is performed by means of glasses, or other round transparent vessels, within which certain figures appear by magic art. It is thus called, because the figure appears as in the belly of the vessels.

GATAKER, THOMAS, a learned critic and divine, born at London, in 1574. He studied at St. John's college, Cambridge, and was afterwards chosen preacher at Lincoln's inn; which he quitted in 1611, for the rectory of Rotherhithe. In 1620, he made a tour through the Low Countries; and in 1624, published at London a book, entitled, "Transubstantiation declared by the Confession of the Popish Writers to have no necessary Foundation in God's Word." He wrote also a defence of this discourse. In 1642, he was appointed one of the assembly of divines, and was engaged with them in writing annotations upon the Bible. He died in July 1654, in the 80th year of his age. He published also, 1. A Dissertation upon the Style of the New Testament. 2. De Nomine Tetragrammata. 3. De Diphthongis, sive Bivocalibus. 4. An Edition and Translation of Marcus Antoninus's Meditations. 5. A Collection of Sermons, in folio; and many other works. His piety and charity were very exemplary; and his modesty was so great, that he declined all ecclesiastical dignity. His extensive learning was much admired; his house was a private seminary, and many foreigners resorted to him to receive advice in their studies.

GATE, in architecture, a large door, leading, or giving entrance, into a city, town, castle, palace, or other considerable building: or a place giving passage to persons, horses, coaches, or waggons, &c. See **ARCHITECTURE**.

GATE, or **GAIT**, in the manege, called in French *train*, is used for the going or pace of a horse.

GATES, in a military sense, are made of strong planks, with iron bars, to oppose an enemy. They are generally made in the middle of the curtain, from whence they are seen, and defended by the two flanks of the bastions. They should be covered with a good ravelin, that they may not be seen or enfiladed by the enemy. See **FORTIFICATION**.

GATES OF HELL, an expression used in Scripture figuratively to denote either the grave or the powers of darkness, *i. e.* the devil and his angels. The Mohammedans use it literally, and suppose that hell has seven gates.

GATES, a county of North Carolina, in Edenton district, bounded on the N. by Virginia, and S. by Chowan county.

GATEHOUSE, a town of Scotland, in Kirkcudbrightshire, 13 miles W. of Kirkcudbright.

GATH, or **GETI**, in ancient geography, a city of the Philistines, and one of their five satrapies. It is famous for having given birth to Goliath.

GATINOIS, or **GASTINOIS**, a late province of France, 45 miles long and 30 broad. It now forms part of the departments of the Seine and Marne, Seine and Oise, and Loiret.

GATTA, a level district of Maritime Austria, in Dalmatia, in the province of Poglizza.

GATTEN-TREE. See **CORNUS**.

GATTINARI, a town of Italy, 13 miles N. of Vercelli.

GATTON, a borough of Surrey, 19 miles from London; on the side of a hill on the road to Ryegate.

GAVALS, a town of Russia, 28 miles S. of Viborg.

GAVARDO, **GOVARDO**, or **GUARDO**, a district of the late Cisalpine republic, in the department of Mela, and late province of Bresciano.

GAVARDO, **GOVARDO**, or **GUARDO**, a town of the late Cisalpine republic, in the above district, 10 miles N. E. of Brescia.

GAUDENS, St. a town of France, in the department of Upper Garonne, and late province of Languedoc, 8 miles N. E. of Bertrand.

GAVEL, among builders. See **GABLE**.

GAVEL, in law, tribute, toll, custom, or yearly revenue; of which we had in old time several kinds. See **GABEL**.

GAVELET, in law, an ancient and special cessavit used in Kent, where the custom of gavel-kind continues, by which the tenant, if he withdraw his rent and services due to the lord, forfeits his land and tenements.

GAVELET is also a writ used in the hustings, given to lords of rent in London.

GAVELKIND, a tenure belonging to lands in the county of Kent, and formerly universal in Ireland. The word is said by Lambard to be compounded of three Saxon words, *gaf, eal, kyn*, "*omnibus cognatione proximis data*." Verstegan calls it *gavelkind*, quasi "give all kind," that is, to each child his part: and Taylor, in his history of *gavelkind*, derives it from the British *gavel*, *i. e.* a hold or tenure, and *cenned*, "*generatio aut familia*"; and so *gavel cenned* might signify *tenura generationis*. It is well known what struggles the Kentish men made to preserve their ancient liberties, and with how much success those struggles were attended. And as it is principally here that we meet with the custom of gavel-kind (though it was and is to be found in some other parts of the kingdom), we may conclude, that this was a part of those liberties; agreeable to Mr. Selden's opinion, that gavelkind, before the Norman conquest, was the general custom of the realm. The distinguishing properties of this tenure are principally these: 1. The tenant is of age sufficient to alienate his estate by feoffment, at the age of 15. 2. The estate does not escheat in case of an attainder and execution for felony; their maxim being, "the father to the bough, the son to the plough." 3. In most places he had a power of devising lands by will, before the statute for that purpose was made. 4. The lands descend, not to the eldest, youngest, or any one son only, but to all the sons together; which was indeed anciently the most usual course of descent all over England, though in particular places particular customs prevailed; and it must be allowed, that it is founded on strict justice, however contrary to the present general practice.

GAVELLO, a town of the late Cisalpine republic, in the department of Benaco, on the road to Ferrara.

GAUGAMELA, in ancient geography, a village of Aturia, lying between the rivers Lycus and Tigris; famous for Alexander's victory over Darius.

GAUGE-POINT of a solid measure, the diameter of a circle whose area is equal to the solid content of the same measure.

GAUGER, a king's officer, who is appointed to examine all tuns, pipes, hogsheads, and barrels, of wine, beer, ale, oil, honey, &c. and give them a mark of allowance, before they are sold in any place within the extent of his office.

GAUGING. See **MENSURATION**.

GAUGING-ROD, an instrument used in gauging or measuring the contents of any vessel. That usually employed is the four-foot gauging-rod. It is commonly made of box, and consists of four rules, each a foot long, and about three-eighths of an inch square, joined together by three brass joints; by which means the rod is rendered four feet long, when the four rules are quite opened, and but one foot when they are all folded together. See Plate LXXVIII, fig. 8. On the first face of this rod, marked four, are placed two diagonal-lines; one for beer and the other for wine: by means of which the contents of any common vessel in beer or wine gallons may be readily found by putting the rod in at the bung-hole of the vessel till it meets the intersection of the head of the vessel with the staves opposite to the bung-hole. For distinction of this line, there is written thereon, beer and wine gallons. On the second face, 5, are a line of inches and the gauge-line; which is a line expressing the areas of circles, whose diameters are the correspondent inches in ale gallons. At the beginning is written ale area. On the third face, 6, are three scales of lines; the

first, at the end of which is written hogshead, is for finding how many gallons there are in a hogshead, when it is not full, lying with its axis parallel to the horizon. The second line, at the end of which is written B. L. signifying a butt lying, is for the same use as that for the hogshead. The third line is to find how much liquor is wanting to fill up a butt when it is standing: at the end of it is written B. S. signifying a butt standing. In the half of the fourth face of the gauging-rod, 7, there are three scales of lines, to find the wants in a firkin, kilderkin, and barrel, lying with their areas parallel to the horizon. They are distinguished by the letters, F. K. B. signifying a firkin, kilderkin, and barrel.

GAUGING-ROD, USE OF THE DIAGONAL-LINES ON THE. To find the content of a vessel in beer or wine gallons, put the brazed end of the gauging-rod into the bung-hole of the cask, with the diagonal-lines upwards, and thrust this brazed end to the meeting of the head and staves; then with chalk make a mark at the middle of the bung-hole of the vessel, and also on the diagonal-lines of the rod, right against, over one another, when the brazed end is thrust home to the head and staves; then turn the gauging-rod to the other end of the vessel, and thrust the brazed end home to the end as before. Lastly, see if the mark made on the gauging-rod come even with the mark made on the bung-hole when the rod was thrust to the other end; which if it be, the mark made on the diagonal-lines will, on the same lines, shew the whole content of the cask in beer or wine gallons. If the mark made on the bung-hole be not right against that made on the rod when you put it the other way, then right against the mark made on the bung-hole make another on the diagonal lines; and the division on the diagonal-line between the two chalks will shew the vessel's whole contents in beer or wine gallons. Thus, *e. gr.* if the diagonal-line of a vessel be 28 inches four-tenths, its contents in beer gallons will be near 51, and in wine gallons 62. If a vessel be open, as a half-barrel, tun, or copper, and the measure from the middle on one side to the head and staves be 38 inches, the diagonal-line gives 122 beer gallons: half of which, viz. 61, is the content of the open half-tub. If you have a large vessel, as a tun or copper, and the diagonal-line taken by a long rule proves 70 inches; the content of that vessel may be found thus: every inch at the beginning-end of the diagonal-line call ten inches. Thus ten inches becomes 100 inches; and every tenth of a gallon call 100 gallons; and every whole call 1000 gallons. *Example.* At 44.8 inches on the diagonal beer-line is 200 gallons; so that four inches 48 parts; now called 44 inches eight-tenths, is just two-tenths of a gallon, now called 200 gallons; so also if the diagonal-line be 76 inches and seven-tenths, a close cask of such diagonal will hold 1000 beer gallons; but an open cask but half so much, viz. 500 beer gallons.

GAUGING-ROD, USE OF THE GAUGE-LINE ON THE. To find the content of any cylindrical vessel in ale-gallons; seek the diameter of the vessel in inches, and just against it on the gauge-line is the quantity of ale gallons contained in one inch deep: this multiplied by the length of the cylinder will give its content in ale gallons. *E. Gr.* Suppose the length of the vessel 32.06, and the diameter of its base 25 inches; to find what is the content in ale-gallons. Right against 25 inches on the gauge-line is one gallon and 745 of a gallon: which multiplied by 32.06, the length, gives 55.9447 gallons for the content of the vessel. The bung-diameter of a hogshead being 25 inches, the head-diameter 22 inches, and the length 32.06 inches; to find the quantity of ale-gallons contained in it.—Seek 25, the bung-diameter, on the line of inches; and right against it on the gauge-line you will find 1.745: take one-third of it, which is .580, and set it down twice: seek 22 inches in the head-diameter, and against it you will find on the gauge-line 1.356; one-third of which added to twice .580, gives 1.6096; which multiplied by the length 32.06, the product will be 51.603776, the content in ale gallons. Note, this operation supposes, that the aforesaid hogshead is in the figure of the middle frustum of a spheroid. The use of the lines on the two other faces of the rod is very easy; you need only put it down-right into the bung-hole (if the vessel you desire to know the quantity of ale-gallons contained therein lie lying) to the opposite staves; and then where the surface of the liquor cuts any one of the lines appropriated to that vessel, will be the number of gallons contained in that vessel.

GAUL, the English translation of Gallia, the ancient name given by the Romans to the country now called France. The

original inhabitants were descending from the Celtes or Gomerians, by whom the greatest part of Europe was peopled; the name of Galli, or Gauls, being probably given them long after their settlement in that country. See GALLIA.

GAULTHERIA, in botany, a genus of the monogynia order, and decandria class of plants: natural order, Bicornes. Exterior calyx diphyllous, interior quinquefid; corolla ovate; nectarium consists of ten subulated points; capsule quinquelocular, covered with the interior calyx formed in the shape of a berry. There are two species.

GAUNERSDORFF, a town of Austria, 16 miles N. N. E. of Vienna.

GAUNT-BELLIED, in the manege, a term applied to a horse whose belly shrinks up towards his flanks.

GAVOT, GAVOTTA, or GAVOTTE, a kind of dance, the air of which has two brisk and lively strains in common time, each of which is twice played over.

GAUR, a country of Asia, between Balk and Candahar. Also the name of the capital.

GAURA, in botany, VIRGINIAN LOOSE-STRIPE, a genus of the monogynia order, and octandria class of plants; natural order, Calycanthaceae. Calyx quadrifid, tubular; corolla pentapetalous, the petals rising upwards; nut inferior, monospermous, quadrangular. It has but one species.

GAUTS or INDIAN APPENINES, a stupendous wall of mountains, extending from Cape Comorin, the S. extremity of the peninsula of Hindostan, to the Tapy, or Surat river, at unequal distances from the coast; seldom more than 60 miles, commonly about 40, and in one part it approaches within six miles.

GAUZE, GAUSE, or GAWSE, in commerce, a very slight, thin, open kind of stuff, made of silk, and sometimes of thread; there are also figured gauzes, and some with gold or silver flowers on a silk ground.

GAY, JOHN, a celebrated English poet, descended from an ancient family in Devonshire. He was born at Exeter, and educated at the free school of Barnstaple, under Mr. Rayner. In 1712, he became secretary to the duchess of Monmouth. In 1714, he accompanied the earl of Clarendon to Hanover. On Queen Anne's death, he returned to England, where he lived in the highest estimation and friendship with many persons of the first distinction. He was particularly noticed by Queen Caroline, to whom he read in MS. his tragedy of the Captives; and in 1726 dedicated his Fables, by permission to the duke of Cumberland. From this countenance shewn to him, and numberless promises of preferment, it was supposed, that he would have been genteelly provided for in some office suitable to his inclination and abilities. But instead of this, in 1727, he was offered the place of gentleman-usher to one of the youngest princesses. Considering this as rather an indignity to a man of his talents, he thought proper to refuse it; and some pretty warm remonstrances were made on the occasion by his sincere friends and patrons the duke and duchess of Queensberry, who withdrew from court in disgust. Mr. Gay's dependencies on the delusive promises of the great, he has figuratively and humourously described in his fable of the Hare with many friends. The profits of his poems he lost in 1720 in the South-Sea scheme. But the very extraordinary encouragement he met with from the public soon made ample amends for those private disappointments. For, in 1727-8, appeared his Beggar's Opera; the vast success of which was not only unprecedented, but almost incredible. The satire of this piece was so striking; and so perfectly adapted to the taste of all ranks that it overthrew the Italian opera, that Dagon of the nobility and gentry, which they had so long idolized, and which Dennis and many other writers had in vain, by the force of reason alone, endeavoured to drive from the throne of public taste. The profits were so very great, both to the author and Mr. Rich the manager, that it gave rise to a popular pun, viz. *That it had made Rich gay, and GAY rich.* He wrote several other dramatic pieces, and many valuable ones in verse. Among the latter, his Trivia; or the Art of walking the Streets of London, though his first poetical attempt, recommended him to the esteem and friendship of Mr. Pope: but as, among his dramatic works, his Beggar's Opera will perhaps ever stand as an unrivalled masterpiece; so, among his poetical works, his Fables hold the same rank of estimation. Mr. Gay's disposition was sweet and affable, his temper generous, and his conversation agreeable. He died in Dec. 1732.

GAZA, THEODORE, a famous Greek in the 15th century, born in Thessalonica, in 1398. His country being invaded by the Turks, he retired into Italy; where he at first supported himself by transcribing ancient authors. His uncommon parts and learning soon recommended him to public notice. In 1450, he was invited to Rome by Pope Nicholas V.; and on his death, in 1456, to Naples, by king Alphonso: who dying in 1458, he returned to Rome, where cardinal Bessarion procured him a benefice in Calabria. He was one of those to whom the revival of learning in Italy was principally owing. He translated from the Greek into Latin, Aristotle's History of Animals; Theophrastus on plants; and Hippocrates's Aphorisms; and put into Greek, Scipio's Dream, and Cicero's Treatise on Old Age. He wrote a Grammar and several other works in Greek and Latin; and died at Rome in 1478, aged 80.

GAZA, in ancient geography, a principal city and one of the five satrapies of the Philistines. It was situated about 100 stadia from the Mediterranean, on an artificial mount, and strongly wall-ed round.

GAZE-HOUND, or **GAST-HOUND**, one that makes more use of his sight than of his nose. Such dogs are much used in the north of England: they are fitter in an open champaign country, than in bushy and woody places.

GAZETTE, [*gazetta*, is a Venetian halfpenny, the price of a newspaper, of which the first was published at Venice,] a paper of public intelligence. With us it is confined to that paper of news published by authority. The first English gazette was published at Oxford, the court being there, in a folio half-sheet, Nov. 7, 1665. On the removal of the court to London, the title was changed to the London Gazette. The Oxford Gazette was published on Tuesdays, the London on Saturdays: and these have continued to be the days of publication ever since.

GAZETTEER, in literature, a title for Geographical Dictionaries, giving a brief account of the various countries, kingdoms, cities, towns, republics, &c. in the world, in alphabetical order.

GAZNA, a city of Asia, once much celebrated, and the capital of a very extensive empire; but which is now either entirely ruined, or become of so little consideration, that it is hardly taken notice of by geographers. This city was anciently an emporium and fortress of Zablestan, near the confines of India.

GAZONS, in fortification, pieces of fresh earth, covered with grass, cut in the form of a wedge about a foot long and half a foot thick, to line parapets and the traverses of galleries.

GDOV, a town of Russia, in the government of Petersburg, 90 miles S. S. W. of Petersburg.

GECCO, in natural history, a name given by the Indians to their terrible poison, the smallest quantity of which kills when mixed with the blood. They say that it is a venomous froth or humour vomited out of the mouths of their most poisonous serpents; which they procure in this fatal strength, by hanging up the creatures by the tails, and whipping them to enrage them; they collect this in proper vessels as it falls; and when they would use it, they either poison a weapon with it, or wounding any part of the flesh introduce the smallest quantity imaginable into it; which is said to cause immediate death.

GEDERN, a town of Germany, 24 miles E. N. E. of Frankfurt on the Maine.

GEEONG, a town in the island of Borneo.

GEFLE, a river of Sweden, in the province of Gestricia which runs into the Gulf of Bothnia.

GEFLE, or **GEWLE**, an ancient and populous town of Sweden, in Gestricia, 60 miles N. of Upsal.

GEHENNA, or **GEHINNON**, [*gevva*, Gr. of *גיהנום*, Heb. the valley of Hinnom,] a scripture-term which has given some trouble to the critics. It occurs in St. Matthew, v. 22, 29, 30. x. 28. xviii. 9, xxiii. 15, 33. Mark, ix. 43, 45, 47, Luke, xii. 5. James, iii. 6. The authors of the Louvain and Geneva versions retain the word *gehenna* as it stands in the Greek; the like does M. Simon: the English translators render it by hell and hell-fire, and so do the translators of Mons and Father Bohours. In the valley of Hinnom, near Jerusalem, there was a place named Tophet, where the idolatrous Jews sacrificed their children to Moloch, by fire. K. Josias, to render this place for ever abominable, made a common sewer of it, where all the filth and carcasses of the city were cast; and where a continual fire was kept up, to burn those carcasses; for which reason, as the Jews had no proper term in their

language to signify hell, they made use of *gehenna* or *gehinnon*, to denote a fire unextinguishable.

GEISINGEN, town of Germany, in Suabia, in the principality of Furstenberg, 29 miles N. W. of Constance.

GEISLINGEN, an imperial town of Suabia, on the Cocher, 12 miles W. of Ulm.

GEISMAR, a town of Hesse-Cassel, 22 miles W. of Gottin-gen.

GELA, in ancient geography, a city of great extent on the S. of Sicily, so named from the Gelas. It is now called *Terra Nuova*.

GELATINE, in chemistry, a semitransparent and colourless jelly, obtained from animal substances. If a piece of the skin of an animal be well cleaned, and repeatedly soaked and washed in cold water, till the water ceases to be coloured, and the skin be then boiled for some time in pure water, some of it will be dissolved, and on evaporation will yield gelatine. It is the same with glue only that the glue is not quite free from impurities, or extraneous matter. On being exposed to dry air it obtains its hardness, and breaks with a glassy fracture. Gelatine has neither taste nor smell; it is soluble in hot acids and alkalies; but there is no action between any of the earths and this substance. Some of the metallic oxides and salts form precipitates with gelatine in its solution in water, and the compound thus formed is insoluble. Gelatine forms a copious white precipitate with tan, which is brittle and insoluble in water, and is not changed by exposure to the air. It is composed of carbon, hydrogen, azote, and oxygen, with small portions of phosphate of lime and of soda. It is a principal part both of the solid and fluid parts of animals, and is employed in the state of glue, size, and isinglass.

GELD, in the English old customs, a Saxon word signifying money, or tribute. It also denoted a compensation for some crime committed: hence *wergeld*, in their ancient laws, was used for the value of a man slain; and *orfeld*, of a beast.

GELDERS. See **GUELDERS**.

GELDING, the operation of castrating any animal, particularly horses. A colt may be gelded at nine or fifteen days old, if the testicles have come down; as the sooner he is gelded the better it will be for his growth, shape, and courage; though the operation may be performed at any age, if proper care be taken in the management. The manner of doing it is usually this: The beast being cast down on some soft place, the operator takes the testicles between his foremost and his great finger, and, slitting the scrotum, presses the stones forth; then taking a pair of nippers made very smooth, either of steel, box, or Brazil wood, he claps the chord to the testicles between them, a very little above where the stones are set on, and presses them so hard that the course of the blood through the artery is interrupted; then with a thin, drawing, cauterising iron, he sears away the testicle. This done, he takes a hard plaster, made of rosin, wax, and turpentine, well dissolved together, and melts it on the seared part, till he has laid a good thickness of it upon the cauterized edge. When this is done to one testicle, the nippers are loosened, and the like is done to the other; and the two incised edges of the scrotum are brought close together, and kept in that situation by pieces of sticking plaister. If the part inflames violently, the horse should be bled, and a poultice of rye-meal, linseed-meal, and water, should be applied. A considerable improvement, however, on this operation, would be to perform it either by applying a strong ligature round the chord of the testicle, or by taking up the blood-vessels separately; for the method commonly used is sometimes fatal to the horse, owing to the violent inflammation brought on by the actual cautery. The manner of gelding a hog is as follows:—The operator, after having made two cross-slits or incisions on the midst of the stones, presses them out, and takes off the stone. But another general method, yet somewhat more difficult, is, first, to cut on the side of one stone, and after having drawn and cut it off, the operator puts in his fingers at the same slit, and with a lancet cuts the skin between the two stones, and by that slit presses out the other stone; and thus there is but one incision made in the cord. Boar-pigs ought to be gelded about six months old; yet they are commonly gelded about three or four weeks old.

GELENHAUSEN, a small town of Germany, in Wetteravia. Lon. 8. 13. E. Lat. 50. 20. N.

GELENIUS, **SEISMUND**, a learned and excellent man, born of a good family at Prague, about 1498. Erasmus, conceiving an esteem

esteem for him at Basil, recommended him to John Frobenius as a corrector for his printing-house; which laborious charge he accepted, and had a great number of Hebrew, Greek, and Latin books to correct: he also translated many works himself from the Greek into Latin; and published a dictionary in four languages, Greek, Latin, German, and Sclavonian. Profitable and honourable employments were offered him in other places, but nothing could tempt him to quit his peaceful situation at Basil. He died in 1555. All his translations are highly esteemed.

GELHEIM, a town of Germany, lately in the principality of Nassau Weilburg, now included in the department of Mont Tonnerre, 13 miles W. of Worms.

GELLIBRAND, HENRY, a laborious astronomer of the 17th century, born at London, in 1597. He became so enamoured with mathematical studies, that on the death of his father, he entered a student at Oxford, and devoted himself solely to them. On the death of Mr. Gunter, he recommended Mr. Briggs to the trustees of Gresham college, for astronomical professorship there; to which he was elected in 1617. His friend Mr. Briggs dying in 1630, before he had finished his *Trigonometria Britannica*, it was finished by Gellibrand at his request. He wrote several other works, chiefly tending to the improvement of navigation; and died in 1636.

GELLIUS, AULUS, a celebrated grammarian, who lived in the second century under Marcus Aurelius and some succeeding emperors. He wrote a collection of observations on authors, for the use of his children; and called it *Noctes Atticæ*, because composed in the nights of a winter he spent at Athens. The chief value of it is for preserving many facts and monuments of antiquity not to be found elsewhere. Critics and grammarians have bestowed much pains on this writer.

GELNHAUSEN, a town of Germany, 12 miles E. of Hanau.

GEM, a general name applied to all precious stones, which are divided into two classes; 1. The pellucid, or such as are clear, elegant and beautiful fossils, extremely hard, and of uncommon lustre; 2. The semi-pellucid gems, which are found in small detached pieces, and are composed of crystalline matter debased by earth: they are, nevertheless, of great beauty and brightness, and somewhat transparent. The value of gems depends principally on their hardness and colour. With respect to the former, the diamond is allowed to be the firmest, and can only be polished, or cut, by its own powder: next to it, the ruby, sapphire, jacinth, emerald, amethyst, garnet, onyx, jasper, agate, porphyry, and marble, are classed in the order we have enumerated. See these articles. The same classification prevails in point of colour: the diamond is universally esteemed on account of its brilliancy; the ruby for its purple; the sapphire for its blue; the emerald for its green; the jacinth for its orange; the amethyst for its carnation; the onyx for its tawny; the jasper, agate, &c. for their vermilion, green, and variegated colours; and the garnet for its transparent red.

GEMARA, or **GHEMARA**, the second part of the Talmud. The Hebrew word גמרא, gemara, is commonly supposed to denote a supplement; but in strictness it rather signifies complement, or perfection: being formed of the Chaldee גמר, gemar or gremar, "to finish, perfect, or complete, any thing." The rabbins called the Pentateuch simply the law: the first part of the Talmud, which is only an explication of that law, or an application thereof to particular cases, with the decisions of the ancient rabbins thereon, they call the *Mischna*, i. e. "second law;" and the second part, which is a more extensive explication of the same law, and a collection of decisions of the rabbins posterior to the *Mischna*, they call *Gemara*, q. d. "perfection, completion, finishing;" because they esteem it the finishing of the law, or an explication beyond which there is nothing farther to be desired.

GEMBLOURS, or **GIBLOU**, a town of France in the department of Dyle, and late province of Austrian Brabant, seated on the Orne. It is 22 miles S. E. of Brussels.

GEMINGEN, a town of Germany in the late palatinate of the Rhine, six miles N. W. of Heilbronn.

GEMINI, in astronomy, the twins; a constellation or sign of the zodiac, the third in order, representing Castor and Pollux; and marked thus, ♊. See **ASTRONOMY**.

GEMMA, or **BUD**, in botany. See **BOTANY**. Buds, as well as bulbs, which are a species of buds, constitute that part of the herb called by Linnaeus *Hybernaculum*, or the winter-quarters of the future vegetable: a very proper appellation, as it is during that severe season that the tender rudiments are protected. Plants,

considered in analogy to animals, may be reckoned viviparous and oviparous. Seeds are vegetable eggs; buds, living fetuses, or infant plants, which renew the species as certainly as the seed. Buds are placed at the extremity of the young shoots, and along the branches, being fixed by a short footstalk upon a kind of brackets, the remainder of the leaves, in the wings or angles of which the buds in question were formed the preceding year. They are sometimes placed single; sometimes two by two, either opposite or alternate; sometimes collected in greater numbers in whorls or rings. With respect to their construction, buds are composed of several parts artificially arranged. Externally, we find a number of scales that are pretty hard, frequently armed with hairs, hollowed like a spoon, and placed over each other like tiles. These scales are fixed into the inner plates of the bark, of which they appear to be a prolongation. Their use is to defend the internal parts of the bud; which, being unfolded, will produce, some, flowers, leaves, and stipulae; others, footstalks and scales. All these parts, while they remain in the bud, are tender, delicate, folded over each other, and covered with a thick clammy juice, which is sometimes resinous and odiferous, as in the *tacahamac* tree. This juice serves not only to defend the more tender parts of the embryo-plant from cold, the assaults of insects, and other external injuries; but likewise from excessive perspiration, which, in its young and infant state, would be very destructive. It is conspicuous in the buds of horse-chestnut, poplar, and willow-trees. In general, we may distinguish three kinds of buds; viz. 1. *Florifera*, that containing the flower; 2. *Folifera*, that containing the leaves; and 3. *Foliferoflorifera*, that containing both leaves and flowers.

1. **GEMMA FLORIFERA**, termed by the French *bouton fleur*, or à fruit, contains the rudiments of one or several flowers, folded over each other, and surrounded with scales. In several trees, this kind of bud is commonly found at the extremity of certain small branches, which are shorter, rougher, and less garnished with leaves than the rest. The external scales of this species are harder than the internal; both are furnished with hairs, and in general more swelled than those of the second sort. This species too is commonly thicker, shorter, almost square, less uniform, and less pointed; being generally terminated obtusely. It is called by Pliny *oculus gemmae*; and is employed in that species of grafting called inoculation, or budding.

2. **GEMMA FLORIFERA**, termed by the French *bouton à feuilles*, or à bois, contains the rudiments of several leaves, which are variously folded over each other, and outwardly surrounded by scales, from which the small stipulae, seated at the foot of the young branches, are chiefly produced. These buds are commonly more pointed than the former sort. In the hazel-nut, however, they are perfectly round; and in horse-chestnut, very thick.

3. **GEMMA FOLIFERA ET FLORIFERA**, or **GEMMA FOLIFERO-FLORIFERA**. The third sort of bud is smaller than either of the preceding; and produces both flowers and leaves, though not always in the same manner. Sometimes the flowers and leaves are unfolded at the same time. This mode of the flower and leaf-bud is termed by Linnaeus *gemma folifera et florifera*. Sometimes the leaves proceed or emerge out of this kind of bud upon a small branch, which afterwards produces flowers. This mode of the flower and leaf-bud is termed by Linnaeus *gemma folifero-florifera*, and is the most common bud of any. Such buds as produce branches adorned only with leaves, are called barren; such as contain both leaves and flowers, fertile. From the bulk of the bud we may often with ease foretell whether it contains leaves only, or leaves and flowers together, as in cherry and pear-trees. Neither the buds produced on or near the root, called by some authors *turiones*; nor those produced on the trunk, and from the angles or wings of the leaves, contain, in strict propriety, an entire delineation of the plant; since the roots are wanting; and in various buds, shoots are contained with leaves only, and not with flowers; but as a branch may be considered as a part similar to the whole plant, and, if planted, would in process of revegetation exhibit or produce roots and flowers, we may in general allow, that the bud contains the whole plant, or the principles of the whole plant, which may be unfolded ad libitum; and thus resembles the seed in containing a delineation of the future plant in embryo: for although the bud wants a radicle, or plumula, of which the seed is possessed, yet it would undoubtedly form one, if planted in the earth. But as the medullary part adhering to the bud is too tender, and by the abundance of juice flowing into it from the earth would be disposed

disposed to putrefaction, the buds are not planted in the soil, but generally inserted within the bark of another tree; yet placed so that the production of the marrow or pith, adhering to them, may be inserted into the pith of the branch in which the fissure or cleft is made; by which means there is a large communication of juice. This propagation by gems or buds, called inoculation, is commonly practised with the first sort of buds above described. From the obvious uses of the buds, we may collect the reason why the Author of nature has granted this sort of protection to most of the trees that are natives of cold climates: and, on the other hand, denied it to such as, enjoying a warm benign atmosphere, have not the tender parts of their embryo-shoots exposed to injuries and depredations from the severities of the weather.

GEMONLÆ SCALE, or **GEMONII GRADUS**, in Roman antiquity, was much the same as gallows or gibbet in Britain. Some say they were thus denominated from the person who raised them; others, from the first criminal that suffered on them; and others, from the verb *gemo*, "I sigh, or groan."

GEMUND, or **GEMUNDEN**, a town in Franconia, 37 miles E. of Franfort.

GEMUND, or **GEMUNDE**, late a town in the duchy of Juliers, now included in the department of the Roer. It is seated on the Roer, 24 miles S. W. of Cologne.

GEMUND, or **GMUND**, in Suabia, on the Reims, 24 miles E. of Stutgard, and 30 N. by W. of Ulm.

GENAP, or **GENEPPE**, a town of France in the department of the Dyle, 15 miles S. E. of Brussels.

GENDARMES, or **GENS D'ARMES**, in the French armies, a denomination given to a select body of horse, on account of their succeeding the ancient gendarmes, who were thus called from their being completely clothed in armour.

GENDARMES, **GRAND**, were a troop composed of 250 gentlemen; the king himself was their captain, and one of the first peers their captain-lieutenant, who has under him two lieutenants, three ensigns, three guidons, and other officers.

GENDER, or **GENUS**, among grammarians, a division of nouns, or names, to distinguish the two sexes. Nouns denoting the male are called masculine, and those denoting females, feminine. This was the original intention of gender: but afterwards other words, which had no proper relation either to the one sex or the other, had genders assigned them, rather out of caprice than reason; which is at length established by custom. Hence genders vary according to the languages, or even according to the words introduced from one language into another. Thus, *arbor*, a tree, in Latin is feminine; but *arbre* in French is masculine; and *dens*, a tooth, in Latin is masculine; but *dent* in French is feminine, though the meaning is the same. The oriental languages frequently neglect the use of genders, and the Prussian has none at all. The Latins, Greeks, &c. generally content themselves to express the different genders by different terminations, as *bonus equus*, a good horse; *bona equa*, a good mare, &c. But in English we frequently go further, and express the difference of sex by different words: as boar, sow; boy, girl; buck, doe; bull, cow; dog, bitch, &c. We have also some feminines distinguished from the masculines by the variation of the termination of the male, as abbot, abbess; prince, princess; executor, executrix, &c. which is all that our language knows of any thing like genders. The Greek and Latin, besides the masculine and feminine, have the neuter, common, and the doubtful gender; and likewise the epicene, or promiscuous, which under one single gender and termination includes both the kinds. See **GRAMMAR**.

GENEALOGICA ARBOR, or **TREE OF CONSANGUINITY**, signifies a genealogy or lineage drawn out under the figure of a tree, with its root, stock, branches, &c. The genealogical degrees are usually represented in circles, ranged over, under, and aside, each other. This the Greeks called *stemma*, a word signifying crown, garland, or the like. See **CONSANGUINITY** and **DESCENT**, and the plate there referred to.

GENEALOGY, [*γενεα* and *λογος*,] history of the succession of families; enumeration of descent or order of succession.

GENEALOGY, comprehends a summary account of the relations and alliances of a person or family, both in the direct and collateral line. In divers military orders, it is required that the candidates produce their genealogy, to shew that they are noble by so many descents.

GENEP, or **GENNEP**, a strong town of Germany, in Westphalia, now included in the department of Roer. It is 5 miles S. W. of Cleves.

GENERAL, an appellation given to whatever belongs to a whole genus. See **genus**. Thus we say general-geography, diet, council, averment, issue, &c. See the articles **GEOGRAPHY**, **DIET**, &c.

GENERAL OFFICERS, in the army. See **OFFICER**.

GENERAL TERMS, among logicians, those which are made the signs of general ideas. See **LOGIC**.

GENERAL OF AN ARMY, in the art of war, he who commands in chief. See **army**. A general ought to be a man of great courage and conduct, to have great experience, and to be of good quality. His conduct appears in establishing his magazines in convenient places; in examining the country, that he may not engage his troops too far, while he is ignorant of the means of bringing them off; in subsisting them, and in knowing how to take the most advantageous posts, either for fighting or shunning a battle. His experience inspires his army with confidence, and an assurance of victory; and his quality, by creating respect, augments his authority. By his liberality he gets intelligence of the strength and designs of the enemy, and by this means is enabled to take the most successful measures. A general ought likewise to be fond of glory, to have an aversion to flattery, to render himself beloved, and to keep a strict discipline. The office of a general is to regulate the march and encampment of the army; in the day of battle to choose out the most advantageous ground; to make the disposition of the army; to post the artillery; and, where there is occasion, to send his orders by his aides-de-camp. At a siege, he is to cause the place to be invested; to order the approaches and attacks; to visit the works, and to send out detachments to secure his convoys.

GENERAL OF HORSE, and **GENERAL OF FOOT**, are posts under the general of the army, and these have upon all occasions an absolute authority over all the horse and foot in the army.

GENERAL is also used for a particular march, or beat of drum; being the first which gives notice, commonly in the morning early, for the infantry to be in readiness to march.

GENERAL is also used for the chief of an order of monks; or of all the houses and congregations established under the same rule. Thus we say, the general of the Franciscans, Cistercians, &c.

GENERALISSIMO, [*generalissimo*, Fr. from general,] the supreme commander. It is often rather a title of honour than office. Generalissimo is called also captain-general, and simply general. He commands all the military powers of a nation; gives orders to all the other general officers; and receives no orders himself but from the king. M. Balzac observes, that cardinal Richelieu first coined the word, of his own absolute authority, upon his going to command the French army in Italy.

GENERATE, in music, is used to signify the operation of that mechanical power in nature, which every sound has in producing one or more different sounds. Thus any given sound, however simple, produces along with itself, its octave, and two other sounds extremely sharp, viz. its twelfth above, that is to say, the octave of its fifth; and the other the seventh above, or, in other words, the double octave of its third major. Whether we suppose this procreation of sounds to result from an aptitude in the texture and magnitude of certain particles in the air, for conveying to our ears vibrations that bear those proportions one to another, as being determined at once by the partial and total oscillations of any musical string; or from whatever æconomy of nature we choose to trace it, the power of one sound thus to produce another, when in action, is said to generate. The same word is applied by Signior Tartini and his followers, to any two sounds which, simultaneously heard, produce a third.

GENERATED, or **GENITED**, is used, by some mathematical writers, for whatever is produced, either in arithmetic, by the multiplication, division, or extraction of roots; or in geometry, by the invention of the contents, areas, and sides; or of extreme and mean proportionals, without arithmetical addition and subtraction.

GENERATING LINE, or **FIGURE**, in geometry, is that which by its motion produces any plane or solid figure. Thus a right line moved any way parallel to itself, generates a parallelogram; round a point in the same plane, with one end fastened

ened in that point, it generates a circle. One entire revolution of a circle, in the same plane, generates the cycloid; and the revolution of a semi-circle round its diameter, generates a sphere. See GENESIS.

GENERATION, in physiology, implies the propagation of the species, whether in plants, insects, fishes, or other animals. See PHYSIOLOGY.

GENERATION, in mathematics, is used for the formation or production of any geometrical figure; as of equations, curves, solids, &c.

GENERATOR, in music, signifies the principal sound or sounds by which others are produced. Thus the lowest C for the treble of the harpsichord, besides its octave, will strike an attentive ear with its twelfth above, or G in alt, and with its seventeenth above, or E in alt. The C, therefore, is called their generator, the G and E its products or harmonics.

GENERICAL, or **GENERIC**, **NAME**, in natural history, the word used to signify all the species of natural bodies, which agree in certain essential and peculiar characters, and therefore comprehending all of the same genus, family, or kind; so that the word used as the generical name equally expresses every one of the genus, and other words expressive of the peculiar qualities or figures of each species are added, in order to denote them distinctly, and make up what is called the specific name. See BOTANY and ZOOLOGY.

GENESIS, [*γενεσις*; *genesis*, French,] **GENERATION**, the first book of Moses, which treats of the production of the world. It contains the history of the creation, and the lives of the first patriarchs. This book stands at the head of Pentateuch. Its author is held to be Moses: it contains the relation of 2369 years, viz. from the beginning of the world to the death of Joseph. The Hebrews called it *ברשית*, *Bereschith*, because it begins with that word, which in their language signifies "in the beginning." The Greeks gave it the name *Γενεσις*, *g. d.* production or generation, because it begins with the history of the production or generation of all beings. This book, besides the history of the creation, contains an account of the original innocence and fall of man; the propagation of mankind; the rise of religion; the general defection and corruption of the world; the deluge; the restoration of the world; the division and peopling of the earth; and the history of the first patriarchs to the death of Joseph. It was easy for Moses to be satisfied of the truth of what he relates in this book, because it came down to him through few hands: for from Adam to Noah there was one man, viz. Methuselah, who lived so long as to see them both: in like manner Shem conversed with Noah and Abraham; Isaac with Abraham and Joseph, from whom the facts recorded in this book might easily be conveyed to Moses by Amram, who was contemporary with Joseph.

GENESIS, in geometry, denotes the formation of a line, plane, or solid, by the motion or flux of a point, line, or surface. See FLUXIONS. The genesis or formation, *e. gr.* of a globe or sphere, is conceived by supposing a semicircle to revolve upon a right line drawn from one extreme thereof to the other, called its axis, or axis of circumvolution: the motion or revolution of that semicircle is the genesis of the sphere, &c. In the genesis of figures, &c. the line or surface that moves is called the describent; and the line round which, or, according to which, the revolution or motion is made, the dirigent.

GENESSEE, a large tract of land in New York, bounded on the N.W. and N. by lake Ontario.

GENESSEE, a river of New York, which runs into lake Ontario.

GENET, **GENNET**, or **JENNET**, in the manege. To ride *a-la-genette*, is to ride after the Spanish fashion, so short that the spurs bear upon the horse's flank.

GENETHLIA, in antiquity, a solemnity kept in memory of some person deceased.

GENETHLIACAL, [*γενεθλιακός*,] pertaining to nativities, as calculated by astronomers, to shew the configurations of the stars at any birth.

GENETHLIACI, in astrology, [from *γενεθλιον*, origin, generation, or nativity,] persons who erect horoscopes, and pretend to foretell what shall befall a man by means of the stars which presided at his nativity. The ancients called them Chaldaei, and Mathematici. Hence the several civil and canon laws, made against mathematicians, only respect the genethliaci or astrologers.

GENEVA, a late republic of Europe, on the confines of France, Savoy, and Switzerland, long in alliance with the Swiss cantons, but annexed to France in 1798. It now forms the department of Lac Lemman.

GENEVA, a city of Switzerland, on the confines of old France, and the late duchy of Savoy, now the capital of the department of Lac Lemman. It is seated on the banks of the Rhone, just at its efflux from the lake of Geneva; and part of it is built on an island in the river. It is handsome, well fortified, and pretty large; the streets in general are clean and well paved, but the principal one is encumbered with a row of shops on each side between the carriage and foot-paths. This city lies forty miles N. E. of Chamberv. Lon. 5. 55. E. Lat. 46. 11. N.

GENEVA, LAKE OF. This lake, which was anciently called Lemanus, (whence the present name of the department, Lac Lemman,) is in the shape of a crescent; Switzerland forms the concave, and the department of Mont Blanc, (Savoy,) the convex part; the greatest breadth being about twelve miles. The greatest depth of this lake, found by M. de Luc, is 160 fathoms. The Rhone runs through its whole extent from its E. to its S. W. extremity; after which it passes through the city and divides it into two unequal parts.

GENEVA, a lake of Upper Canada, which forms the W. extremity of Lake Ontario, to which it is joined by a short and narrow strait.

GENEVA, a post-town of New York, in Onondago county.

GENEVA, or **GIN**, is an ordinary malt spirit, distilled a second time, with the addition of some juniper-berries. Originally, the berries were added to the malt in the grinding; so that the spirit thus obtained was flavoured with the berries from the first, and exceeded all that could be made by any other method. At present, they leave out the berries entirely, and give their spirits a flavour by distilling them with a proper quantity of oil of turpentine; which, though it nearly resembles the flavour of juniper-berries, has none of their valuable virtues.

GENEVIEVE, ST. FATHERS, OR RELIGIOUS OF, a congregation of regular canons, established in France, in the seventeenth century. It was a reform of the Augustine canons, begun by St. Charles Faure, in the abbey of St. Vincent de Senlis, in 1618. In 1634, the abbey was made elective; and a general chapter, composed of the superiors of fifteen houses, who had received the reform, chose F. Faure coadjutor of the abbey of St. Genevieve, and general of the congregation.

GENEVOIS, or the **DUCHY OF GENEVA**, a late province of France, bounded on the N. by Switzerland. It is now included in the department of Mont Blanc.

GENGENBACH, an imperial town of Germany, in Suabia, on the Kinzig; fifteen miles S. E. of Strasburg.

GENGOUX, *Sr. late Le Royal*, a town of France, in the department of Saone and Loire, and late province of Burgundy, seventeen miles S. W. of Chalons.

GENIAL GODS, in the Pagan mythology, deities who were supposed to preside over generation. The genial gods, says Festus, were earth, air, fire, and water. The twelve signs, together with the sun and moon, were sometimes also ranked in the number.

GENIEZ, *Sr.* a town of France, in the department of Aveyron, and late province of Rouergue. It is twenty-four miles N. E. of Rhodéz.

GENII, in the Mohammedan theology, a sort of intermediate beings, supposed to exist between men and angels. They are of a grosser fabric than the latter, but much more active and powerful than the former. Some of them are good, others bad, and they are capable of future salvation or damnation like men. The Orientals suppose several ranks and degrees or different species among this kind of beings; some being peculiarly called Jin, or genii; some Peri, or fairies; some Div, or giants; and others Tacwins, or fates, of whom they relate many romantic stories.

GENIOGLOSSI, and **GENIO-HYOIDEUS**, in anatomy. See ANATOMY.

GENIOSTOMA, in botany, a genus of the monogynia order, and pentandria class of plants. Calyx turbinate, quinquefid; corolla monopetalous, tubular; anther oblong; seeds very numerous, subangulate, placed on a filiform receptacle.

GENIS, or **ST. GENIS**, a town of France, in the department of

of Mont Blanc, and the late duchy of Savoy; 12 miles W. of Chambery.

GENISTA, **BROOM**, or **DYER'S-WEED**, a genus of the decandria order, and diadelphia class of plants; natural order, Papilionaceæ. Calyx bilabiate; upper lip bidentate, under one tridentate; vexillum oblong, reflexed. There are seventeen species.

G. TINCTORIA, is a native of Britain. It rises with shrubby stalks three feet high, garnished with spear-shaped leaves placed alternate, and terminated by several spikes of yellow flowers, succeeded by pods. The branches are used by dyers for giving a yellow colour; from whence it is called dyer's-broom, greenwood, wood-waxen, or dyer's-weed. A drachm and a half of the powdered seeds operate as a mild purgative. A decoction of the plant is diuretic; and, like the former, has proved serviceable in dropsical cases. Horses, cows, goats, and sheep, eat it.

GENITES, among the Hebrews, those descended from Abraham, without any mixture of foreign blood.

GENITIVE, the second case of the declension of nouns. The relation of one thing considered as belonging in some manner to another, occasioned in the Greek and Latin, a peculiar termination of nouns called the genitive case.

GENIUS, a good or evil spirit, or dæmon, whom the ancients supposed set over each person, to direct his birth, accompany him in life, and to be his guard. See **DÆMON**. Among the Romans, Festus observes, the name genius was given to the god who had the power of doing all things, deum qui vim obtineret rerum omnium gerendarum; which Vossius, de Idol. rather chooses to read genendarum, who has the power of producing all things; by reason Censorinus frequently uses genere for gignere. The ancients had their genii of nations, of cities, of provinces, &c. The following was a very common inscription on their medals, **GENIUS POPULI ROM.** "The genius of the Roman people;" or **GENIO POP. ROM.** "to the genius of the Roman people." In this sense genius and lar were the same thing; as Censorinus and Apulius affirm they were. See **LAES**, and **PENATES**.

GENIUS, that aptitude which a man has received from nature, to perform well and easily that which others can do but indifferently, and with a great deal of pains. To know the bent of nature is the most important concern. Men come into the world with a genius determined not only to a certain art, but to certain parts of that art, in which alone they are capable of success. If they quit their sphere, they fall even below mediocrity in their profession. Art and industry add much to natural endowments, but cannot supply them where they are wanting. Every thing depends on genius. A painter often pleases without observing rules; whilst another displeases though he observes them, because he has not the happiness of being born with a genius for painting. A man born with a genius for commanding an army, and capable of becoming a great general by the help of experience, is one whose organical conformation is such, that his valour is no obstruction to his presence of mind, and his presence of mind makes no abatement of his valour. Such a disposition of mind cannot be acquired by art: it can be possessed only by a person who has brought it with him into the world. What has been said of these two arts may be equally applied to all other professions. The administration of great concerns, the art of putting people to those employments for which they are naturally formed, the study of physic, and even gaming itself, all require a genius. The Deity has thought fit to allot peculiar talents to different individuals in order to render all men necessary to one another; the wants of men being the very first link of society. He has therefore given to some particular persons, an aptitude to perform rightly some things which he has rendered difficult or impossible to others; and the latter have a greater facility granted them for other things, which facility has been refused to the former. He seems indeed to have made an unequal distribution of talents among his creatures; yet he has disinherited none; and (cases of natural lunacy excepted) a man divested of all kinds of abilities is as great a phenomenon as an universal genius. From this diversity of genius arises that difference of inclination in men, who are led to those employments for which Providence designs them, with more or less impetuosity in proportion to the greater or less number of obstacles they have to surmount, to render themselves capable of answering this vocation. Thus the inclinations of men are so very different, because they follow the same mover, that is, the impulse of their ge-

nus. This, (as with the painter,) is what renders one poet pleasing, even when he trespasses against rules; whilst others are disagreeable, notwithstanding their strict regularity. Aristotle mentions a poet who never wrote so well as when his poetic fury hurried him into a kind of frenzy. The admirable pictures in Tasso of Armida and Clorinda are alleged by some to have been drawn at the expence of a disposition he had to real madness, into which he fell before he died. "Do you imagine, (says Cicero,) that Pacuvius wrote in cold blood? No, it was impossible. He must have been inspired with a kind of fury, to be able to write such admirable verses."

GENNESARETH, in ancient geography, a lake of Lower Galilee, called also Cinnereth, 140 stadia in length, and forty in breadth; abounding in fish. St. Matthew calls it the Sea of Galilee, and St. John the Sea of Tiberias.

GENOA, the **GENOISE REPUBLIC**, or the **LIGURIAN REPUBLIC**, a late small democratic state of Italy, which extended along that part of the Mediterranean, which from it is called the Gulf of Genoa, for about 152 miles, but varied in its breadth from eight to twenty miles. It was bounded on the N. from W. to E. by Piedmont, Monterrat, the late Cisalpine republic, Placentia, Parma, a small territory belonging to Tuscany, and the late republic of Lucca. This country was a part of the ancient Liguria, whence its modern name of the Ligurian republic. It now forms a part of the kingdom of Italy, and lies between 7. 27. and 9. 25. Lon. E. and between 43. 40. and 45. 0. Lat. N.

GENOA, the capital of the late Ligurian republic, is seated on the coast of the Mediterranean sea, at the bottom of the gulph. It is 62 miles S. E. of Turin, and 63 S. of Milan. Lon. 8. 41. E. Lat. 44. 25. N.

GENTIANA, or **GENTIAN**, in botany, a genus of the digynia order, and pentandria class of plants; natural order, Rotaceæ. Corolla monopetalous; capsule superior, two-valved, one-celled, with two longitudinal receptacles. There are fifty-three species.

G. CENTAUREUM, the **LESSER CENTAURY**, of the shops, is a native of many parts of Britain. It grows on dry pastures; and its height is commonly proportioned to the goodness of the soil, as in rich soils it grows to the height of a foot, but in poor ones not above three or four inches. The plant cannot be cultivated in gardens. The tops are an useful aperient bitter, in which view they are often used in the present practice of medicine.

G. LUTEA, the **COMMON GENTIAN** of the shops. It is a native of the mountainous parts of Germany; whence the roots, the only part used in medicine, are brought to this country. These have a yellowish brown colour, and a very bitter taste. The roots of this plant are often used in medicine as stomachic bitters. In taste they are less exceptionable than most of the substances of this class. Infusions of gentian-root flavoured with orange-peel, are sufficiently grateful. Some years ago a poisonous root was discovered among the gentian brought to London; the use of which occasioned violent disorders, and in some cases death. This root is easily distinguished from the gentian, by its being internally of a white colour, and void of bitterness.

GENTILE, means a Pagan, or worshipper of false gods. The Jews called all those who were not of their race גוים *gojim*, i. e. *gentes*, which in the Greek translations of the Old Testament is rendered *ἔθνη*; in which sense it often occurs in the New Testament; as in Matth. vi. 32. "All these things do the Gentiles (or nations) seek." Whence the Latin church also used *gentes* in the same sense as our *Gentiles*, especially in the New Testament. But the word *gentes* soon got another signification, and no longer meant all who were not Jews; but those only who were neither Jews nor Christians, but followed the superstitions of the Greeks and Romans, &c. In this sense it continued among the Christian writers, till their manner of speech, together with their religion, was publicly and by authority received in the empire; when *gentiles*, from *gentes*, came into use: and then both words had two significations, viz. in treatises or laws concerning religion, they signified Pagans, neither Jews nor Christians; and in civil affairs, they were used for all such as were not Romans.

GENTILE, in the Roman law and history, sometimes expresses what the Romans otherwise called barbarians, whether they were allies of Rome or not: but this word was used in a more particular sense for all strangers not subject to the Roman empire.

GENTLEMAN, originally comprehended all above the rank

of yeomen; whereby even noblemen were truly called gentlemen. See COMMONALTY. A gentleman is usually defined among heralds, to be one, who, without any title, bears a coat of arms, or whose ancestors have been freemen: and by the coat that a gentleman giveth, he is known to be, or not to be, descended from those of his name who flourished many hundred years before. The word is formed of the French *gentil*, "fine, fashionable, or becoming;" and the Saxon *man*.

GENTLEMEN OF THE CHAPEL, officers whose duty and attendance is in the royal chapel, being in number thirty-two. Twelve of them are priests; the other twenty, commonly called clerks of the chapel, assist in the performance of divine service.

GENTOOS, in modern history, according to the common acceptance of the term, denote the professors of the religion of the bramins or brachmans, who inhabit the country called Hindoostan, or Indostan, in the East Indies, from the word *stan*, a region, and *hind* or *hindoo*: which Ferishteh, as we learn from colonel Dow's translation of his history, supposes to have been a son of Ham, the son of Noah.

GENUS, in metaphysics and logic, denotes a number of beings which agree in certain general properties common to them all; so that a genus is nothing else but an abstract idea, expressed by some general name or term. See LOGIC and METAPHYSICS.

Genus, in music, by the ancients called *genus melodia*, is a certain manner of dividing and subdividing the principles of melody, *i. e.* the consonant and dissonant intervals, into their concinnous parts. See MUSIC.

GENUS, in natural history, a subdivision of any class or order of natural beings, whether of the animal, vegetable, or mineral kingdoms, all agreeing in certain common characters. See BOTANY and ZOOLOGY.

GENUS, in rhetoric. Authors distinguish the art of rhetoric, as well as orations or discourses produced thereby, into three genera, demonstrative, deliberative, and judiciary. To the demonstrative kind belong panegyrics, genethliacons, epithalamiums, funeral-harangues, &c. To the deliberative, persuasions, dissuasions, commendations, &c. To the judiciary, accusations and defences.

GEOCENTRIC, [*γῆ* and *κέντρον*, *geocentrique*, Fr.] applied to a planet or orb considering the earth as its centre.

GEOCENTRIC LATITUDE OF A PLANET, is its distance from the ecliptic as it is seen from the earth, which even though the planet be in the same point of her orbit, is not constantly the same, but alters according to the position of the earth in respect to the planet.

GEOCENTRIC PLACE OF A PLANET, the place wherein it appears to us from the earth, supposing the eye there fixed: or it is a point in the ecliptic to which a planet seen from the earth is referred.

GEODÆSIA, [*γεωδαισία*, *geodesie*, Fr.] that part of geometry which contains the doctrine or art of measuring surfaces, and finding the contents of plain figures. See MENSURATION.

GEOFFREY OF MONMOUTH, bishop of St. Asaph, called by our ancient biographers Gallofridus Monumentensis. Leland conjectures that he was educated in a Benedictine convent at Monmouth, where he was born; and that he became a monk of that order. Bale, and after him Pits, call him archdeacon of Monmouth; and it is generally asserted, that he was made bishop of St. Asaph, in 1151 or 1152, in the reign of King Stephen. His history was probably finished after 1138. It contains a fabulous account of British kings, from Brutus the grandson of Æneas the Trojan to Cadwallader, in 690. But Geoffrey, though we may blame his credulity, was not the inventor of the legendary history. It is a translation from a MS. written in the British language, and brought to England from Armorica by his friend Gualter, archdeacon of Oxford. But the achievements of King Arthur, Merlin's prophecies, and many speeches and letters, were chiefly his own additions. In excuse for this historian, Mr. Wharton judiciously observes, that fabulous histories were then the fashion, and popular traditions a recommendation to his book.

GEOFFRÆA, or **GEOFFROYA**, in botany, a genus of the decandria order, and diadelphia class of plants; natural order, Papilionaceæ. Calyx quinquefid; fruit an oval plum; kernel compressed. There are two species. See Plate LXV.

GEOGRAPHY.

GEOGRAPHY, [from *γῆ* or *γη*, the earth, and *γραφειν*, to describe,] signifies simply a description of the earth. Geography as a science, denotes that science which describes and explains the nature and properties of the earth, as to its figure, place, magnitude, motions, celestial appearances, &c. with the various lines, real or imaginary, on its surface. Geography is distinguished from Cosmography, as a part from the whole; this latter considering the whole visible world, both heaven and earth. And from Topography and Chorography it is distinguished, as the whole from a part.

"Golnitz considers geography as either exterior or interior: but Varenius more justly divides it into general and special, or universal and particular.

"General or Universal Geography is that which considers the earth in general without any regard to particular countries; or the affections common to the whole globe, as its figure, magnitude, motion, land, sea, &c.

"Special or Particular Geography is that which contemplates the constitution of the several particular regions, or countries, their bounds, figure, climate, seasons, weather, inhabitants, arts, customs, language, &c."

From this it appears that the earth is the proper object of geography: but as it is also the object of other sciences, it is to be considered in what sense it is the object of geography. About this there is great dissension among authors; some including the consideration of its animals, others of its atmosphere, elements, &c. but because they are the province of other sciences, the object of geography is more justly restrained to the exterior parts of the earth. Hence we consider it not as an element, but chiefly as a large spherical surface, variously diversified. General geography is now to be considered; the particular geography of the various

countries, kingdoms, cities, towns, &c. being to be found in their order, under their respective names throughout this work.

HISTORY.

It is generally agreed that geography was first studied as a science by the Egyptians and Babylonians, but by which of these nations it was first cultivated is not so well determined. Herodotus tells us, that the Greeks first learned the poles, the gnomon, and the twelve divisions of the day, from the Babylonians. Pliny, and Diogenes Laertius, however, tell us, that Thales of Miletus first found out the passage of the sun from tropic to tropic; which he could not have done without the assistance of a gnomon. He is said to have been the author of two books, the one on the tropic, and the other on the equinox: both of which he probably determined by the gnomon; and thus he was led to discover the four seasons of the year, which are determined by the solstices and equinoxes. Thales also divided the year into 365 days; which was undoubtedly a method discovered by the Egyptians, and communicated by them to him. The Babylonians began to apply to this science in the time of Belus, whenever that was; or about the time they first made astronomical observations. But it may be questioned whether they brought it to any tolerable perfection till the Nabonassarean Era, 747 years before Christ. However, it may be presumed, that the Greeks were beholden to them for the astronomical rudiments of it, as well as astronomy itself, and other sciences, which the Babylonians cultivated till the destruction of their monarchy by the Persians; although it does not appear that the Greeks had any observations of the latitude or longitude from them, relating to their dominions or other parts. The Egyptians are acknowledged to have cultivated geography, and had tables or maps, as early as the time of Sesostris; but whether

A
General
MAP OF THE WORLD,
from the most
MODERN AUTHORITIES.



whether they had astronomical geography, or to what degree they improved it, we know not, since the Greeks either suppressed or attributed to themselves the learning of other nations: and it is likely, that they gave over the pursuit of the sciences from the time they became subject to foreign yokes; as at present we find them involved in the grossest ignorance under the power of the Turks. Geography began to be cultivated among the Jews under Moses and Joshua, of which, the books written by those leaders, as is commonly believed, is a proof. Geography, without doubt, was cultivated by the Persians, during their several empires. They had it probably from the Babylonians: indeed, how far they improved it, or whether they made any astronomical observations, does not appear: but we find that they and the Parthians kept registers of the public roads through their dominions, for the service of the state, which looks as if they had surveyed, or at least measured them. They had also maps, as appears by that of the world, or at least of the Persian empire, which Aristagoras brought from thence, and another of Manes the founder of the Manichean sect. Of those monuments, however, none remain at present; having been destroyed in some of the revolutions that befel their empire, probably in that remarkable one made by the Arabs, who destroyed all their records, and perhaps their libraries, as they did the remains of the famous Alexandrian in Egypt. The Greeks began to lay the foundation of geography about the time of Homer, who is reckoned the first geographer among them: or rather to the time of Anaximander, 550 years before the Christian æra. They after that improved it much by applying astronomy to it, with great success, as to the theory; discovered the ways of finding the latitude and longitude of places by observations of the stars and eclipses; invented accurate methods for projecting globes and maps, which were very common among them. The first Grecian map on record is that of Anaximander, mentioned by Strabo, lib. i. p. 7. It has been conjectured, that this was a general map of the known world, and it is supposed to be the one referred to by Hipparchus under the name of the ancient map. However it was Hipparchus, the Bythinian, who first taught a regular method of making maps; he flourished about 160 years before Christ. That prince of ancient astronomers taught more expressly, that geography could not be put upon a tolerable footing, nor the situation of places determined without astronomical observations. He invented the planisphere, whereby he laid his foundation of a true projection for maps, which hath since been much improved by optics: and it is highly probable, he first introduced the terrestrial globe, inscribed with meridians, parallels, and other celestial circles, according to which places were to be ranged thereon. The honour, therefore, of reducing geography to its present form, seems to be due to Hipparchus; for though Ptolemy has been thought by some of the ancients, as well as most of the moderns, to have given the astronomical form to geography; yet that mistake has been corrected by Agathemeris, an ancient geographer near his time, who informs us, Ptolemy invented nothing of his own, but in what he did followed the opinion of the ancients. It even appears from Ptolemy himself, that Marinus Tyrius, before him, regulated his maps by meridians and parallels; and adjusted the bounds of the earth by astronomical observations. However, Ptolemy, by his collections and elucidations greatly advanced the science of geography, and seems to have fixed its ne plus ultra among them. For afterwards it appears to have been at a stand for some ages: and, during the distractions of the empire from civil wars, and foreign invasions, declined daily till the utter destruction thereof by the Turks; since when the sciences have been the least of their care. The Romans borrowed their geography from the Greeks. It does not appear that they made any observations of the latitude or longitude, or added any thing to the theory. However, in the geometrical part, they improved it greatly, by measuring or surveying the whole empire, in the time of Julius Cæsar and Augustus; and making roads throughout the same, a thing which the Greeks never thought of. They had also globes, but especially maps in great plenty, which were much improved by their itineraries. The Arabs, who, at their first setting out to conquer, after Mohammed's death, despised learning, or at least any but their own, became smitten about 823, with that of their neighbours, especially the Greeks; whose geography, (with the rest of the sciences,) they cultivated, and much improved in the

practical part, by means of observations, (chiefly of the latitude taken as well with the quadrant as gnomon,) and itineraries. They also invented new instruments, particularly the quadrant, and some think the mariner's compass, which was in use with them at least very early. But their knowledge of the earth extended very little beyond the bounds of their own empire; which at length being broken to pieces, and confined to its original limits, Arabia, they neglected the sciences by degrees, so that at present geography is little minded by them. The Turks, so long as they continued in Turkestan, their original seat, seem to have been strangers to all learning; but as soon as those of the race of Seljuk had made themselves masters of Persia, under Toghrul Beigh, about 1037, they took the sciences, which then flourished in that country, under their protection, and continued the improvement of them so long as the three dynasties of Fars, or proper Persia, Kerman, and Rum, or Anatolia, held the sovereignty. But we are as yet ignorant in what degree they advanced geography. The Moguls and Tartars having over-run the southern parts of Asia in the beginning of the thirteenth century, cherished learning wherever they found it. Kublay Kaan in China, Hulaku Khan in Persia, and afterwards Vluh Beigh in Great Bukharia, or Transoxana. Geography, in particular, received considerable improvement from their observations of the latitude of places: but civil distractions and foreign war, which ensued, left them no leisure to think of the sciences, their care for which abated as their power declined. At length being driven out of all which they possessed in the lower Asia, they returned to their ancient ignorance, wherein they, for the most part, still continue, excepting the Manchew Tartars, at present lords of China. To discover the magnitude of the earth is a problem which has probably engaged the attention of astronomers and geographers ever since the globular figure of it was known. Anaximander is said to have been the first among the Greeks who wrote upon this subject. Archytas of Tarentum, a Pythagorean, famous for his skill in mathematics and mechanics, also made some attempts in this way; and Dr. Long conjectures, that these are the authors of the most ancient opinion, that the circumference of the earth is 400,000 stadia. Aristarchus of Samos is thought to have considered the magnitude of the earth, as well as of the sun and moon. Archimedes mentions, that the ancients held the circumference of the earth to be 30,000 stadia; but it does not appear what methods were made use of by these ancient geographers to solve the problem. Perhaps they attempted it by observations of stars in the zenith or in the horizon, and actual mensuration from some part of the circumference of the earth. Aristotle, in his treatise *De Cælo*, affords a proof of this. In that work he says, that different stars pass through our zenith, according as our situation is more or less northerly; and that in the southern parts of the earth stars come above our horizon, which, if we go northward, are no longer visible. Hence it appears, that there are two ways of measuring the circumference of the earth; one by observing stars which pass through the zenith of one place, and do not pass through that of another; the other by observing some stars which come above the horizon of one place, and are observed at the same time to be in the horizon of another. Eratosthenes, made use of the former method, which is the best, at Alexandria in Egypt, B. C. 250. He knew, that at the summer-solstice the sun was vertical to the inhabitants of Syene, a town on the confines of Ethiopia, under the tropic of Cancer, where they had a well built for that purpose, on the bottom of which the rays of the sun fell perpendicularly on the day of the summer-solstice. He observed by the shadow of a wire set perpendicularly in an hemispherical bason, how much the sun was on that day at noon distant from the zenith of Alexandria; and found that distance to be the 50th part of a great circle in the heavens. Then supposing Syene and Alexandria to be under the same meridian, he concluded the distance between them to be the 50th part of a great circle upon the earth; and this distance being by measure 5000 stadia, he concluded the circumference of the earth to be 250,000 stadia; but as this number divided by 360 would give 694 $\frac{2}{3}$ stadia to a degree, either Eratosthenes himself or some of his followers assigned the round number 700 stadia to a degree; which multiplied by 360, makes the circumference of the earth 252,000 stadia; whence both these measures are given by different authors as that of Eratosthenes. In the time of Pompey the Great, Posidonius made an attempt to

measure the circumference of the earth by Aristotle's second method, viz. horizontal observations, made the measure of the earth to be 180,000 stadia, at the rate of 500 stadia to a degree. The reason of this difference is thought to be, that Eratosthenes measured the distance between Rhodes and Alexandria, and found it only 3,750 stadia. Taking this for a 48th part of the earth's circumference, which is the measure of Ptolemy's, the whole circumference will be 180,000 stadia. This measure was received by Marinus of Tyre, and is usually ascribed to Ptolemy. Ptolemy's method, however, is found to be exceedingly erroneous, on account of the great refraction in the stars near the horizon, the difficulty of measuring the distance at sea between Rhodes and Alexandria, and from his supposing these places under the same meridian, when they are really very different. Several geographers, after the time of Eratosthenes and Ptolemy, made use of the different heights of the pole in distant places under the same meridian, to find the dimensions of the earth. About A. D. 800, the khalif. Almamun had the distance measured of two places two degrees asunder, and under the same meridian; in the plains of Sinjar near the Red Sea. The result was, that the mathematicians found the degree at one time to consist of 56 miles, and at another of 56½, or 56¾. Snellius, an eminent Dutch mathematician, by taking the heights of the pole at Alcaer and at Bergen op Zoom, found the difference to be 1° 11' 30". He next measured the distance betwixt the parallels of these two places, by taking several stations and forming triangles; by means of which he found the degree to consist of 341,676 Leyden feet. Hence he assigned the round number 342,000 Leyden feet to a degree: which, according to Picard, amounts to 55,021 French toises. In 1635, Mr. Norwood, an Englishman, took the elevations of the pole at London and at York; and having measured the distance betwixt the two parallels, assigned 69½ miles and two poles to a degree; each pole being reckoned 16½ feet. After 1654, Ricciolus made use of several methods to determine the circumference of the earth; from all which he concluded, that one degree contained 64,363 Bologna paces, which are equivalent to 61,650 French toises. The most remarkable attempt, however, was that of the French mathematicians, who employed telescopic sights for the purpose, which had never been done before. These are much the best; as by them the view may be directed to an object at a greater distance, and towards any point with more certainty; whence the triangles for measuring distances may be formed with greater accuracy than otherwise can be done. In consequence of this improvement, the fundamental base of their operations was much longer than that made use of by Snellius or Ricciolus. The distance measured was between the parallels of Sourdun and Malvoisine; between which the difference of the polar altitude is somewhat more than one degree. The result of the whole, as related by Picard, was, that one degree contained 57,060 French toises. As this problem can be the more accurately determined in proportion to the length of the meridian-line measured, the members of the Royal Academy prolonged theirs quite across the kingdom of France, measuring it trigonometrically all the way. This work was begun in 1683, and finished in 1718. They used Picard's fundamental base, as being measured with sufficient accuracy; and an account of the whole was published by Cassini in 1720. In this work some mistakes were detected in the calculations of Snellius; and it was likewise shewn, that there are errors in those of Ricciolus owing principally to the latter having taken too short a fundamental base, and not having paid sufficient attention to the effects of refraction. Professor Muschenbroek was induced to make new calculations and form triangles upon the fundamental base of Snellius, which he did in 1700; and from these he assigns 57,033 toises to a degree, which is only 27 less than had been done by the academicians. In consequence of various opinions being entertained concerning the true figure of the earth, and the magnitude of a degree upon its surface, Messrs. Maupertuis, Clairaut, Camus, and Outheir, of France, were sent by Lewis XV. to measure an arch of the meridian in the northern regions of the earth. They began their operations, assisted by M. Celsus, an eminent astronomer of Sweden, in Swedish Lapland, in July 1736; and finished them by the end of May following. They obtained the measure of that degree whose middle-point was in lat. 66° 20' N. and found it to be 57,439 toises when reduced to the level of the sea. About the same time another company of philosophers were sent to South America, viz. Messrs. Godin, Bouguer, and Condamine, of France;

to whom were joined Don Jorge Juan, and Don Antonio de Ulloa, of Spain. They left Europe in 1735, and began their operations in the province of Quito in Peru, in October 1736, and finished them after many interruptions in about eight years. The Spanish gentlemen published a separate account, and assigned for a measure of a degree of the meridian, at the equator, 56,768 toises. M. Bouguer makes it 56,753 toises, when reduced to the level of the sea; and M. Condamine states it at 56,749 toises. M. La Caille, being at the Cape of Good Hope in 1752, found the length of a degree of the meridian in lat. 33° 18' 30" S. to be 57,037 toises. In 1755, Father Boscovich found the length of a degree in lat. 43° to be 56,972 toises, as measured between Rome and Rimini in Italy. In 1740, Messrs. Cassini again examined the former measures in France; and, after making all the necessary corrections, found the measure of a degree whose middle-point is in lat. 49° 22' N. to be 57,074 toises; and in the lat. of 45° it was 57,050 toises. In 1764, F. Beccaria, having measured a portion of the meridian near Turin, found the length of a degree whose middle-point was 44° 44' N. to be 57,024 toises. At Vienna three degrees of the meridian were measured, from which it may be concluded that a degree in lat. 47° 40' N. may be reckoned to be 57,091 Paris toises. In 1766, Messrs. Mason and Dixon measured a part of the meridian in Maryland and Pennsylvania, and found that the length of a degree whose middle-point is 39° 12' N. was 363,763 English feet, or 56,904½ toises. The improvements in geography, which have taken place in the more modern times, were owing to the great progress made in astronomy by Copernicus, Galileo, Newton, and other eminent men who lived within these three last centuries. More correct methods and instruments for observing the latitude were found out; and the discovery of Jupiter's satellites afforded a much easier method of finding the longitudes than was formerly known. The voyages also made by celebrated navigators of different nations, which were now become much more frequent than formerly, brought to the knowledge of the Europeans a vast number of countries totally unknown to them before. The late voyages of Captain Cook, made by order of his Britannic Majesty, have contributed more to the improvement of geography, than any thing that has been done during the 18th century. To these may be added the voyage made by Vancouver to explore the N. W. coasts of America; and that of the unfortunate La Perouse in the South Sea: as well as the late important additions made to geographical knowledge by the discoveries made by Mr. Mungo Park, in his Travels in the interior Parts of Africa. On the whole the geography of the utmost extremities of the globe is now in a fair way of being much better known to the moderns, than that of the most adjacent countries was to the ancients: at least with regard to the sea-coasts of these countries; for, as to their internal geography, it is less known now than before, except in a very few places. Still however, it must be owned, that geography is a science even yet far from perfection. The maps of America and the eastern parts of Asia are, perhaps, more unfinished than any of the rest. Even the maps of Great Britain and Ireland till very lately were imperfect; and the great numbers of them, that are varied and republished, without any real improvement, confirm an observation made by Lord Bacon, that an opinion of plenty is one of the causes of want. The late Dr. Bradley was of opinion, that there were but two places in England whose longitude might be depended upon as accurately taken; and that these were the observatory at Greenwich, and Serburn castle, the seat of the earl of Macclesfield in Oxfordshire; and that their distance was one degree in space, or four minutes in time. Even this was found to be inaccurate, the distance in time being observed by the late transit of Venus to be only three minutes and 47 seconds. Before the late Trigonometrical Survey of Great Britain, the result of which is published in the Philosophical Transactions, hardly any two geographers agreed in the longitude of the Lizard; some making it 4° 40' from London; others 5°, and others 5° 14': while some enlarged it to 6°. Our best maps of foreign countries are therefore still to be considered as imperfect, where there will always be many things to be added and corrected, as future geographers may find time and opportunity. The chief works on geography among the moderns are Johannes de Sacrobosco, (or John Hallifax,) *De Sphæra*; Sebastian Munster's *Cosmographia Universalis*; Clavius, on the *Sphere of Sacrobosco*; Riccioli's *Geographia et Hydrographia Reformata*; Weigelius's *Speculum Terræ*; De Chales's *Geography*, in his *Mundus Mathematicus*;

Mathematicus; Cellarius's Geography; Cluverii Introductio in Universam Geographiam; Leibnecht's Elementa Geographiae Generalis; Stevenius's Compendium Geographicum; Wolfii Geographia, in his Elementa Matheseos; Busching's New System of Geography; Gordon's, Salmon's, and Guthrie's Grammars; Pinkerton's Geography; and, above all, Varenus's Geographia Generalis, with Jurin's additions, the most scientific and systematical of any geographical work.

GENERAL GEOGRAPHY.

The proper object of geography as above stated is the surface of the terraqueous globe, being a superficies nearly spherical, divided into a variety of parts denominated places, which are distinguished by characteristic properties. Geography then is the science by which places and their properties are ascertained. By places we understand the parts large and small, of which the surface of the earth consists, or into which it is divisible; from the largest continent, or ocean, kingdom, or state, to the smallest hill, house, or individual point, or spot of ground. The properties of places, or accidents, by which they are affected, are either terrestrial or celestial. The terrestrial properties are figure, dimensions, and situation. The figure or form of places is various. The dimensions threefold; circumference, length, and breadth. The situation of places is likewise threefold. The first sort regards the province and country to which it belongs, and the particular mountain, plain, river, or lake, whereon it stands: and this we call the historical situation, a knowledge of which may be obtained barely from history or report. The second kind is that which places have, considered in respect of one another, whence it is called the relative or mutual situation. The third sort regards the particular spot of the earth where any place stands independent of other places, whence it may be called the absolute situation. Of these two sorts of situations, the absolute is most excellent, because that being obtained you have the relative also: whereas, the knowledge of the relative situation does not make known the absolute. The absolute is known from the latitude and longitude. The whole of geography, in effect, turns upon the situation of places; for what is a representation or description of the earth, but a combination of situations, exhibited to view? What are the figure and dimensions of countries, but the result of particular situations? The celestial properties or affections are, the rising or setting of the stars, vicissitudes of light and darkness, lengths of days and nights, variety of shadows, cold and heat, seasons of the year, and other phenomena. Geography may be divided into Mathematical, Historical, and Technical.

1. **MATHEMATICAL GEOGRAPHY**, comprises that part of geography which it borrows from mathematics. The mathematical part is derived from Geometry and Astronomy, by the help of which places and their properties, especially the absolute and relative situations, are determined. Hence mathematical geography may be subdivided into Geometrical, by which distances and places are measured and their relative situations are fixed; and Astronomical, by which the absolute situations, and celestial properties, are determined.

2. **HISTORICAL GEOGRAPHY** comprizes the particulars which geography takes from history, or those accounts of places, which furnish a notitia of them, in whole or in part, as travels, voyages, chorographical and topographical descriptions, astronomical observations, geometrical admeasurements, &c. This part of geography serves to exhibit the divisions of the earth, and hence is divided into Natural, which considers the natural divisions, as continents, oceans, peninsulas, seas, islands, &c. and Political, which considers the different countries, and their divisions, whether civil or ecclesiastical.

3. **TECHNICAL GEOGRAPHY**, is that part which regards the form or manner of the description, and is subdivided into Representative, when places are represented on maps, or globes, &c. Synoptical when the description is alphabetically arranged by way of geographical tables, and Explanatory, when the description is given in regular treatises for that purpose.

1. MATHEMATICAL GEOGRAPHY.

This, as already observed, is either geometrical, or astronomical. Geometrical geography, is chiefly employed in ascertaining the dimensions, distances, and relative situations, of places, and is

of excellent use in delineating roads, and the windings, and course of rivers, measuring the magnitudes of mountains, taking surveys and plans of particular parts of countries, and determining a variety of similar matters, which cannot be done by astronomical methods, and thus it includes surveying, and the measuring of heights and distances. See **MENSURATION**. This part of Geography is also employed in the construction of maps and globes, of which we shall treat in this article. For the different measures employed, See **MEASURE**.

ASTRONOMICAL GEOGRAPHY, is an important branch of this science, since by it the absolute situations of places are fixed, the form and magnitude of the earth determined, and the celestial properties of places exhibited: we shall therefore consider this part under separate heads as follows:

OF THE FIGURE AND MAGNITUDE OF THE EARTH.

The Earth is one of the great bodies which compose the planetary system. It moves round the sun in an orbit nearly circular, and completes its revolution in the course of a year, while at the same time it revolves continually upon its own axis, which is inclined to the plane of its orbit at an angle of $66\frac{1}{2}$ degrees; the time of a revolution being 23 hours and $56\frac{1}{2}$ minutes. The revolution of the earth round the sun is called its annual motion, and the rotation it performs on its own axis is called its diurnal motion. While the earth revolves round the sun in the course of its annual motion, its axis, round which the diurnal motion is constantly performed, moves always parallel to itself. It is by the parallelism of the axis, and the annual motion of the earth, that the changes of the seasons are produced. See **ASTRONOMY**, where this subject is treated at large, and the figure of the earth shewn to be that of an oblate spheroid excepting a few inequalities which are inconsiderable in comparison of the bulk of the earth. We shall only add, therefore, on this head the following Table of the dimensions of the earth which is given by Dr. Hutton:

The diameter	7,957 $\frac{1}{2}$ English miles.
The circumference	25,000 English miles.
A degree contains	69 $\frac{1}{2}$ English miles.
The superficies	193,944,206 square miles.
The solidity	263,930,000,000 cubic miles.

OF THE CIRCLES SUPPOSED TO BE DESCRIBED ON THE EARTH'S SURFACE.

In geography the circles, which the sun apparently describes in the heavens, are supposed to be extended as far as the earth, and marked on its surface. In like manner we may imagine as many circles as we please to be described on the earth, and their planes to be extended to the celestial sphere, till they mark concentric ones on the heavens. The most remarkable of those supposed by geographers to be described in this manner are the following:

The **AXIS** of the earth is that imaginarily line passing through the earth's centre, round which it continually revolves, from west to east.

The **POLES** of the earth are the points at which the axis meets the earth's surface. One of these is called the north pole, and the other the south pole. These correspond to the poles of the heavens, or the points where the earth's axis, when produced, meets the starry sphere.

The **EQUATOR** is a great circle on the earth's surface, equally distant from both poles, and corresponds to the equinoctial circle in the heavens. It divides the earth's surface into two equal portions called the northern and southern hemispheres. The equator is also sometimes called the Line, or Equinoctial Line.

The distance of any place, northward or southward from the equator, is called its **LATITUDE**, and is reckoned in degrees and minutes, &c. The distance between the poles and equator, which is a quadrant of a great circle passing through the poles, has by all geographers hitherto been supposed to be divided into 90 degrees; and each of these again subdivided into 60 minutes, &c. But some French astronomers, and in particular La Place, in his Exposition du Systeme du Monde, as well as in his *Traité de Mécanique Celeste*, has adopted the decimal division of the meridian. They have supposed the distance between the equator and the poles to be divided into 100 degrees, and each degree to be subdivided into 100 minutes, each minute into 100 seconds, and so on. All places lying on the north side of the equator are said to have

have north latitude: on the contrary, all places on the south side of the equator are said to have south latitude.

PARALLELS OF LATITUDE are less circles upon the earth's surface parallel to the equator. They may be considered as indefinite in number; all places that lie directly east or west from each other, are said to lie in the same parallel of latitude.

The **TROPICS** are two less circles on the earth, parallel to the equator, and $23\frac{1}{2}$ degrees distant from it. That which lies on the north side of the equator is called the Tropic of Cancer; and that which lies on the south side is called the Tropic of Capricorn. These circles correspond to the circles of the same name, which limit the sun's north and south declination from the equinoctial in the heavens.

The **POLAR CIRCLES** are two less circles upon the earth's surface, parallel to the equator. They are as far distant from the poles, which they surround, as the tropics are from the equator. That which lies toward the north pole is called the Arctic Circle, and that which lies next to the south pole is called the Antarctic Circle. To these there are corresponding circles, bearing the same names, in the heavens.

Great circles passing through the poles of the earth, and therefore perpendicular to the equator, are called **MERIDIANS**. The meridian passing through any particular place, lies in the plane of the celestial meridian of that place. It also divides the surface of the earth into two equal portions, called the eastern and western hemispheres, in respect of that place. The meridians may be considered as indefinite in number; and all places lying directly north and south from each other, are upon the same meridian. Sometimes by the meridian of a place is understood the half of a great circle, passing through that place, and extending from the one pole to the other; and the other half of the circle is called the opposite meridian. If we suppose 12 great circles, one of which is the meridian of a given place, to intersect each other at the poles of the earth, and divide the equator into 24 equal parts, these are the Hour or Horary circles of that place. These are by the poles divided into 24 semicircles, corresponding to the 24 hours of the day and night. The distance between each two of these semicircles is 15° , being the 24th part of 360.

The **LONGITUDE** of any place on the earth is an arc of the equator intercepted between the meridian passing through that place and some other meridian previously agreed upon, which is called the first meridian. The longitude is reckoned eastward and westward from the first meridian, by which means all places lying in the hemisphere to the eastward of that place, through which the first meridian passes, will have east longitude; and all places lying in the hemisphere to the westward of that place, will have west longitude. Geographers at different periods, and in different countries, have fixed upon different places for the first meridian. The rule among the ancients was to make it pass through the place farthest to the west that was known. But the moderns, knowing that no place on the earth can be considered the most westerly, have laid aside that method of reckoning the longitude. Ptolemy assumed the meridian that passes through the farthest of the Canary Islands, as his first meridian. After him, as more countries were discovered in that quarter, the first meridian was removed farther off. The Arabian geographers fixed the first meridian upon the utmost shore of the western ocean. Some fixed it to the island of St. Nicholas, near Cape Verd; Hondius to the isle of St. James; others to the isle Del Corvo, one of the Azores, because there the magnetic needle pointed due north at that time, and it was not then known, that the deviation of the needle from the true north is itself subject to variation. The latest geographers, particularly the Dutch, have pitched upon the Peak of Teneriffe; others on the Isle of Palm, one of the Canaries; and lastly the French, by order of the king, on the island of Ferro, another of the Canaries. But without regarding any of these rules, geographers and map-makers often assume the meridian of the place where they live, or the capital of their own country, or its chief observatory, for a first meridian. Hence in Great-Britain, we reckon the longitudes of places eastward and westward from the meridian of London, and sometimes those of places in Scotland from that of Edinburgh.

The **HORIZON** of a place is either sensible or rational. The **SENSIBLE HORIZON** of any place is a circle of the sphere, the plane of which touches the spherical surface of the earth at that place.

The **RATIONAL HORIZON** is a great circle of the sphere, the plane of which passes through the centre of the earth, and is parallel to the plane of the sensible horizon. Although the sensible and rational horizons have been defined as two distinct circles of the sphere, yet seeing that their planes, when produced to the sphere of the fixed stars, are only distant from each other by the earth's semidiameter, it is evident that these circles of the sphere may be supposed, as to sense, to coincide; for not only the earth's semidiameter, but even the orbit it describes round the sun, subtends no sensible angle at the distance of the nearest of the fixed stars. The horizon divides the celestial sphere into two equal portions or hemispheres; one of these is visible, but the other, by reason of the interposed body of the earth, is invisible.

By the **SENSIBLE HORIZON** of a place is also sometimes understood a circle, which determines the segment of the surface of the earth, which is visible to the eye; called also the **VISIBLE HORIZON**. It is evident that this circle will be most accurately defined at sea, and equally distant every where from the eye of an observer, but below the level of his eye. It will also be so much the more extensive, as the eye is raised above the earth's surface.

The **ZENITH** of a place is the point of the heavens directly over the head of an observer; and the **NADIR** is the point in the opposite hemisphere, directly under his feet; or the zenith and nadir are the poles of the horizon.

Great circles of the sphere passing through the zenith and nadir are called **VERTICAL CIRCLES**, or **AZIMUTHS**. They are also sometimes called **Secondaries** of the horizon; and in general any great circle passing through the poles of another is called its **secondary**. That vertical circle, which has its plane perpendicular to the plane of the meridian, is called the **PRIME VERTICAL**. The meridian and prime vertical, by their intersections with the horizon divide it into four equal parts. The points of their intersection are called the **CARDINAL POINTS**. The meridian cuts the horizon at right angles in the north and south points, and the prime vertical cuts it at right angles in the east and west points.

Less circles of the sphere parallel to the horizon are called **PARALLELS OF ALTITUDE** or **ALMACANTERS**. These parallels, as well as the vertical circles, may be considered as indefinite in number.

The circles in the heavens, which correspond with these are particularly described under the article **ASTRONOMY**, by a reference to a figure. See **ASTRONOMY**, Index.

OF THE METHODS OF FINDING THE LATITUDE AND LONGITUDE OF PLACES.

The figure and magnitude of the earth being known, it next becomes a problem of the utmost importance in geography, to determine the position of any assigned place upon its surface. This is done by finding its latitude and longitude: for by the first of these is determined the position of the parallel of latitude, which passes through that place; and by the second the position of its meridian; and thus the position of the place itself becomes known. Let PZEQ, Plate LXXXI. fig. 1, represent the celestial meridian, P the pole of the heavens, EQ the equinoctial, and HO the horizon; let pLe represent the terrestrial meridian, p the pole, and eq the equator: let L be any place on the earth, the latitude of which is to be found, and Z its zenith: the arch eL , which is the latitude of the place, evidently contains the same number of degrees as the arch EZ , which is the distance of the equinoctial from the zenith. Now ZO and PE are both quadrants; wherefore the arches, PO and ZE , are equal; but the arch PO is the elevation of the pole above the horizon. Thus it appears, that the latitude of a place is equal to the elevation of the pole above the horizon of that place. And hence by observing the altitude of the pole, the latitude of the place is ascertained from the observation. There is no star exactly in the pole of the world; but the elevation of the pole may be found by the pole-star, which is very near the pole, or by any other circumpolar star in this manner: let the altitude of the star be taken when it is on the meridian, both above and below the pole, by means of a quadrant or other proper instrument, making the proper corrections for the refraction of the atmosphere: then, half the sum of these altitudes, reckoned from the north, will be the elevation of the pole, or the latitude of the place at which the observation is made: for let S be the place of the star when above the pole, and s its place below the pole, then since $PS = Ps$, it is evident that PO is equal to half the sum of OS

OS and Os. Another method is by means of the declination of the sun, or a star, and one meridian-altitude of the same; thus: having, by means of a quadrant or other instrument, found the zenith-distance, Zd , of the luminary, or else its altitude, Hd , and taken its complement, Zd ; then, to this distance add the declination dE , as found by astronomical tables, when the luminary and place are on the same side of the equator, or subtract it when they are on different sides, and the sum or difference will be the latitude EZ sought. By either of these methods, and by many others that could be mentioned, the latitude may be found very accurately. While the earth revolves on its axis from W. to E. the different terrestrial meridians, which are considered as fixed to its surface, are turned in succession towards the sun; and it is noon-day at any place when the plane of the meridian of that place passes through his centre; at which time the sun, as seen from that place, appears to be due S. or N. according as the place happens to be situated to the N. or S. of the parallel of declination, which he describes that day in the heavens. Hence it appears, that all places situated on the same meridian will have their noon at the same instant of time; and that it will be forenoon to all places situated to the W. of that meridian, seeing that the meridians of these places have not yet passed the sun's centre; while on the contrary, it will be afternoon to all places situated to the E. of the meridian passing through the sun, seeing that the meridians of these places have already passed his centre. Since the planes of all the terrestrial meridians pass, one after another, through the sun in 24 hours, it follows: that in one hour the meridians of two places, whose difference of longitude is one-24th of 360° , or 15° , will have arrived at the sun's centre; and therefore, when it is noon at any place it will want one hour from noon at all places upon the meridian 15° to the W. of the meridian of that place, and two hours at all places 30° to the W. and so on till we come to the opposite meridian; where the difference of longitude is 180° , at which place it will then be midnight. The contrary happens with respect to places situated to the eastward of the given meridian; for at these places it is past noon, by the same part of 24 hours that the difference between their longitudes, and that of the meridian where it is then noon, is of 360° . The difference between the times of noon, and therefore of all the other hours of the day, at different places of the earth, is the foundation of the methods by which the longitude of any place is found. Suppose that some remarkable phenomenon were to be seen in the heavens, at the same instant of time, throughout all places in that hemisphere of the earth from which the phenomenon was then visible; it is evident from what has been said, that the time of its appearance would be different at different places, according as these meridians happened to be situated in respect of that phenomenon; and that if we knew the longitude of any place, as reckoned from some given meridian where the phenomenon was visible, we should be able to tell the difference between the time of its appearance, as reckoned at that place, and upon the given meridian. Suppose, for example, that the phenomenon was visible at 10 P. M. at some place upon the given meridian, and that another place was 30° of longitude W. from that meridian; then the phenomenon would be seen at 8 P. M. as reckoned at that place. Hence it follows on the contrary, that if we know the times of the appearance of the phenomenon, as reckoned at both these places, we shall also know how many degrees of longitude the one place is eastward or westward from the other. If, for example, it is seen at 9 P. M. at any one place, and at midnight at another place, we may be assured, that the latter place is 45° of longitude E. from the former. In this way may the longitudes of all places upon the earth's surface be found. The celestial phenomena to be observed at these places are eclipses of the sun and moon; eclipses of Jupiter's satellites, and particularly of his first satellite; occultations of the fixed stars by the moon and the planets; and lastly, the angular distance of the moon from the sun, and from the fixed stars.

The eclipses of JUPITER'S SATELLITES, which frequently happen, and which may be observed on shore, would afford to the navigator an easy method of finding his longitude, if it were also possible to observe them at sea; but the attempts that have been made to overcome the difficulties attendant on such observations, by reason of the motions of the vessel, have been hitherto unsuccessful. Navigation and geography have however received great

advantages from these eclipses; more especially from the eclipses of the first satellite, the commencement and the end of which can be observed with precision. It is indeed necessary to know also the hour at which any observed eclipse may be seen under a known meridian; seeing that it is by the difference of these hours that the longitude is found: but the tables of the first satellite are now brought to such a degree of perfection, as to give the times of these eclipses with a precision almost equal to that of the observations themselves. The great difficulty of observing these eclipses at sea has rendered it necessary to recur to other celestial phenomena; and of these the motions of the moon are the only ones that can be generally useful for the determination of the longitude. The position of the moon, as it would appear if seen from the centre of the earth, may easily be found at any time, by taking its angular distances from the sun or stars by a proper instrument. These being found, the tables of her motion give the hour as reckoned at the first meridian, when she ought to have had that position: by a comparison of this time, with the time as reckoned on board of the vessel when the observation was made, the navigator is enabled to determine his longitude. By such observations the longitudes and latitudes of a great number of places have been determined, and the position and extent of many countries accurately defined, concerning which the most erroneous opinions formerly were entertained. Much, however, yet remains to be done: the interior parts of Africa and America are yet in a great measure entirely unknown, and even many places frequently visited by navigators may have their positions more accurately determined than has been hitherto done. Besides the methods of finding the longitude already treated of, there is yet another much used by navigators; to whom an exact knowledge of their position, when at sea, and without any other guide than the stars and compass, is of the utmost importance. It has been already observed, that in order to know the longitude of any place, it is only necessary to know the difference between the time of noon, or of any other hour, at that place, and the time of noon, or of the same hour, at any place upon the first meridian; for from this difference of time the longitude may be found, by allowing 15° of longitude for every hour of time, and so in proportion for any period less than an hour. Hence it appears, that if a traveller, or navigator, set out from the first meridian, and carry with him a watch, or time-keeper, so regulated as to shew exactly the hours as reckoned at the first meridian; by comparing the time shewn by his watch with the time as reckoned at any place he may visit, or as found by means of proper astronomical observations at that place, it is evident he may immediately find its longitude. If instead of departing from the first meridian, he had departed from any other meridian whose longitude from the first meridian was known, still it is obvious, that the longitude is to be found by the same method of observation. This method of finding the longitude would be the most simple of any, were it not a matter of great difficulty to construct time-keepers that shall go with perfect regularity; more especially on board of a ship, where they are continually exposed to changes of temperature as well as continual agitation. The difficulties that occur have however been overcome by perseverance and ingenuity; and watches have been constructed that have gone with great uniformity for many months. See LONGITUDE.

OF THE DIFFERENT POSITIONS OF THE SPHERE.

If we could suppose an inhabitant of the earth capable of living at either of the poles, he would have always one of the celestial poles in his zenith and the other in his nadir, the equator coinciding with the horizon. Hence all the celestial parallels are also parallel to the horizon; and hence a person, or people, are said to live in a parallel sphere, or to have a parallel horizon. Those who live under the equator have both poles in the horizon, all the celestial parallels cutting the horizon at right angles; whence they are said to live in a right sphere, or to have a right horizon. Those who live between either of the poles and the equator are said to live in an oblique sphere, or to have an oblique horizon; because the celestial equator cuts their horizon obliquely, and all the parallels in the celestial sphere have their planes oblique to that of the horizon. In this sphere some of the parallels intersect the horizon at oblique angles, some are entirely above it, and some entirely below it; all of them, however, so situated, that they would if extended obliquely intersect the plane of the horizon. The largest parallel,

parallel, which appears entire above the horizon of any place in N. latitude, is called by the ancient astronomers, the Arctic circle of that place. Within this circle, *i. e.* between it and the arctic pole, are comprehended all the stars which never set in that place, but are carried perpetually round the horizon, in circles parallel to the equator. The largest parallel, which is hid entirely below the horizon of any place in N. latitude, was called the Antarctic circle of that place by the ancients. This circle comprehends all the stars which never rise in that place, but are carried perpetually round below the horizon, in circles parallel to the equator. In a parallel sphere, however, the equator may be considered as both arctic and antarctic circles; for being coincident with the horizon, all the parallels on one side are entirely above it, and those on the other entirely below it. In an oblique sphere, the nearer any place is to either of the poles the larger are the arctic and antarctic circles, as being nearer to the celestial equator, which is a great circle. In a right sphere, the arctic and antarctic circles have no place; because no parallel appears either entirely above or below it. By the ancients the arctic circle was called *maximus semper apparentium*, and *circulus perpetuæ apparitionis*; the antarctic circle on the other hand, being named *maximus semper occultorum*, and *circulus perpetuæ occultationis*. By the arctic and antarctic circles, however, modern geographers in general understand two fixed circles, at the distance of 23½ degrees from the poles. These mark out the space all round the globe where the sun appears to touch the horizon at midnight in mid-summer, and to be entirely sunk below it in winter. According to the different positions of the globe with regard to the sun, the celestial bodies exhibit different phenomena to the inhabitants. Thus, in a parallel sphere, they appear to move in circles round the horizon; in a right sphere, they appear to rise and set as at present, but always in circles cutting the horizon at right angles; but in an oblique sphere, the angle varies according to the degree of obliquity, and the position of the axis of the sphere with regard to the sun. The phenomena thence arising will be sufficiently understood from what is said under the article ASTRONOMY. From thence we may easily perceive the reason of the sun's continual change of place in the heavens: but though it is certain that this change takes place every moment; it is imperceptible for some time, unless by very nice astronomical observations. Hence we may generally suppose the place of the sun to be the same for a day or two together, though in a considerable number of days it becomes exceedingly obvious to every body. When he appears in the celestial equator, his motion seems for some time to be in the plane of that circle, though it is certain that his place there is only for a single moment; and in like manner, when he comes to any other point of the heavens, his apparent diurnal motion is in a parallel drawn throughout. Twice a year he is in the equator, and then the days and nights are nearly equal all over the earth. This happens in March and September: after which, the sun proceeding either northward or south, according to the season of the year, and the position of the observer, the days become longer or shorter than the nights, and summer or winter comes on, as is fully explained under the article ASTRONOMY. The recession of the sun from the equator either northward or southward is called his Declination, and is either north or south according to the season of the year; and when this declination is at its greatest height, he is then said to be in the tropic. The space between the two tropics, called the Torrid Zone, extends in breadth 47 degrees of latitude all round the globe; and throughout the whole of that space the sun is vertical to some of the inhabitants twice a year, but to those who live directly under the tropics only once. Throughout the whole torrid zone also there is little difference between the length of the days and nights. The ancient geographers found themselves considerably embarrassed in their attempts to fix the northern tropic; for though they took a very proper method, namely, to observe the most northerly place where objects had no shadow on a certain day, yet they found that on the same day no shadow was cast for a space of no less than 300 stadia. The reason of this was, the apparent diameter of the sun; which being about half a degree, seemed to extend himself over as much of the surface of the earth, and to be vertical every where within that space. When the sun is in or near the equator, he seems to change his place in the heavens most rapidly; so that about the equinoxes one may very easily perceive the difference in a day or two: but as he approaches the tropics this apparent change becomes gradually

slower; so that for a number of days he scarce seems to move at all. The reason of this may easily be understood from a globe or any map on which the ecliptic is delineated: for by drawing lines through every degree of it parallel to the equator, we shall perceive them gradually approach nearer, and nearer each other, until at last, when we approach the point of contact betwixt the ecliptic and tropic, they can for several degrees scarce be distinguished.

METHOD OF FINDING THE LENGTH OF THE DAY, AND THE BEGINNING AND ENDING OF THE TWILIGHT.

As it is of considerable importance in geography to know the length of the day at any assigned place upon the earth, it will therefore be proper to shew the manner of finding the time of the rising and setting of the sun, or any other of the celestial bodies. Let PZES, Plate LXXXI. fig. 2, represent the celestial meridian of any place, P and S being the poles of the sphere; let EQ be the equator, and HOR the horizon, stereographically projected upon the plane of the meridian; let PCS represent the six o'clock hour-circle, and *mOn* the parallel of declination described by the sun or a star at any given day of the year; the point O being that in which it cuts the horizon; then *nO* represents half the arch described by the sun when above the horizon, and *Om* the half of the arch described when below the horizon. Let POS represent an hour-circle passing through the sun or star when in the horizon, and meeting the equator EQ in A; the arch EA of the equator intercepted between the meridian and hour-circle, being found, and converted into time (allowing 15° to an hour), will evidently give half the time that the sun or star remains above the horizon, as the arch AQ will give half the time it remains below the horizon. As the arch EC contains 90° and corresponds to six hours, it is only necessary to find the arch CA, which is called the sun's ascensional difference, it being the difference between his right ascension and his oblique ascension; and having converted it into time to add it to, or subtract it from six hours, according as the latitude of the place and of the sun's declination are of the same or of contrary names, that is, both N. or both S.; or the one N. and the other S. and the sum or difference shall be half the length of the day, as required. In the spherical triangle CAO, right-angled at A, we have AO, the complement of the sun's declination, to be found from astronomical tables, and the angle ACO the complement of the latitude of the place, in order to find AC, the right ascension. Hence from the principles of spherics we have the following proportion: As radius to the tangent of the latitude, so is the tangent of the sun's declination to the sine of the sun's ascensional difference required. When the sun is in the same hemisphere with any place, and his declination is equal to the complement of its latitude, which can only happen to places within the polar circles, then *mn* the parallel of declination will not cut the horizon, and consequently the sun will not set in those places during the time his declination exceeds the co-latitude; but when the sun and place are in opposite hemispheres, then he will never rise at that place so long as his declination exceeds the co-latitude, and hence it is easy to see how to find the time when the sun begins to shine constantly upon any given place within the polar circle; and also the time when that place begins to be wholly in the dark for a considerable time together. It has been observed in astronomy, that the twilight commences in the morning and ends in the evening, when the sun is 18° below the horizon. The time of its commencement, or ending, may be found by spherical trigonometry as follows: let Z be the zenith, P the pole of the sphere, and T the place of the sun, 18° below the horizon HR. In the spherical triangle PZT, we have PZ the distance of the pole from the zenith, which is equal to the co-latitude of the place, and PT the complement of the sun's declination; also ZT, the distance of the sun from the zenith, which, in this case, is always 90° + 18° or 108°. From these we are to find the hour-angle, ZPT, which may be had by the following proportion: Let $V = \frac{1}{2}$ perimeter of the triangle. Then as sine ZP × sine PT is to radius square, so is sine (V - ZP) × sine (V - PT) to the square of the sine of $\frac{1}{2}$ ZPT. The angle ZPT being turned into time will give the time from noon of the beginning or ending of the twilight.

OF THE DIVISION OF THE EARTH'S SURFACE INTO CLIMATES AND ZONES; AND THE DIRECTION OF THE SHADOWS OF BODIES.

From observing the diversity in the length of the days and night,

nights, the rising and setting of the sun, with the other phenomena already mentioned, the ancient geographers divided the surface of the earth into certain districts, which they called climates; and instead of the method of describing the situation of places by their latitude and longitude as we do now, they contented themselves with mentioning the climate in which they were situated. When more accuracy was required, they mentioned also the beginning, middle, and ending, of the climates. This distinction, however, was certainly very vague and inaccurate: for the only method they had for determining the difference was by the length of the day; and a climate, according to them, was such a space as had the day in its most northerly part half an hour longer than in the most southerly. For the beginning of their first climate, they took that parallel under which the day is twelve hours and three quarters long; those parts of the world which lie nearer the equator not being supposed to be in any climate; either because in a loose sense they may be considered as in a right sphere, or because they were unknown, or thought to be uninhabitable by reason of the heat. The northern climates were generally supposed to be seven; which must have an equal number of southern climates corresponding with them. The northern climates, according to the ancients, were as follows: 1. *Meroc*. 2. *Syene* in Egypt. 3. *Alexandria* in Egypt. 4. *Rhodes*. 5. *Rome*; or, according to others, a parallel drawn through the *Hellespont*. 6. The parallel passing through the mouth of the river *Boristhenes*. 7. The *Riphean* mountains. Each of these places was supposed to be in the middle of the climate; and as the southern parts of the globe were then very little known, the climates to the S. of the equator were supposed to be as far distant from that circle as the northern ones; in consequence of which they took their names from the latter. A parallel was said to pass through the middle of a climate, when the day under that parallel is a quarter of an hour longer than that which passes through the most southerly part. Hence it does not divide the space into two equal parts, but that part next the equator will always be the larger of the two; because the farther we recede from that circle, the less increase of latitude will be sufficient to lengthen the day a quarter of an hour. Thus, in every climate there are three parallels; one marking the beginning, the second the middle, and the third the ending, of the climate; the ending of one being always the beginning of another. Some of the ancients divided the earth by these parallels; others by a parallel did not mean a mere line, but a space of some breadth; and hence the parallel may be understood as the same with half a climate. This method of dividing the surface of the earth into climates, though now very much disused, has been adopted by several modern geographers. Some of these begin their climates at the equator, reckoning them by the increase of half an hour in the length of the day northward. Thus they go on till they come to the polar circles, where the longest day is twenty-four hours: betwixt these and the poles they count the climates by the increase of a natural day in the length of time that the sun continues above the horizon, until they come to one where the longest day is fifteen of ours, or half a month; and from this to the pole they count by the increase of half months or whole months, the climates ending at the poles where the days are six months long. The climates betwixt the equator and the polar circles are called *hour-climates*, and those between the polar circles and the poles *month-climates*. But in common language, we use the word *climate* in a very different sense; so that, when two different countries are said to be in different climates, we understand only that the temperature of the air, seasons, &c. are different. The division of the earth into zones has arisen from the various appearances of the sun, and the effects of his light and heat upon different parts of it. These are five in number: 1. The *torrid zone*, lying between the two tropics for a space of $46^{\circ} \frac{1}{2}$ of latitude, or $23^{\circ} \frac{1}{2}$ on each side of the equator, it being divided into two equal parts by the equator; and the inhabitants have the sun vertical to them twice a-year, excepting those who dwell under the tropics, to whom he is vertical only once. 2. The two *temperate zones* lie between the polar circles and the tropics, containing a space of $43^{\circ} 4'$ of latitude. And, 3. The two *frigid zones* lie between the polar circles and the poles. In these last the longest day is never below twenty-four hours; in the temperate zones it is never quite so much, and in the torrid zone it is never above 14. The zones are named from the degree of heat they were supposed to be subjected to. The torrid zone was supposed by the ancients to be uninhabitable by reason

of its heat; but this is now found to be a mistake, and many parts of the temperate zones are more intolerable in this respect than the torrid zone itself. Towards the polar circles, also, these zones are intolerably cold during winter. Only a small part of the northern frigid zone, and none of the southern, is inhabited. Some geographers reckoned six zones, dividing the torrid zone into two by the equator. When any parts of the heaven or earth are said to be on the right or left, we are to understand the expression differently according to the profession of the person who makes use of it: because according to that, his face is supposed to be turned towards a certain quarter. A geographer is supposed to stand with his face to the north, because the northern part of the world is best known. An astronomer looks towards the south, to observe the celestial bodies as they come to the meridian. The ancient augurs, in observing the flight of birds, looked towards the east; while the poets look towards the *Fortunate Isles*. In books of geography, therefore, by the right hand we must understand the east: in those of astronomy, the west; in such as relate to augury, the south; and in the writings of poets, the north; according to the following verses:

Ad Boream Terræ, sed Cœli mensor ad Austrum:
Præco Dei Exortum videt, Occasumque Poeta.

From the difference in the length and positions of the shadows of terrestrial objects, ancient geographers have given different names to the inhabitants of certain places of the earth; the reason of which will be easily understood from the following considerations. 1. As the sun in his apparent annual revolution never removes farther from the equator than twenty-three degrees and a half, none of those who live without that space, or beyond the tropics, can have that luminary vertical to them at any season of the year. 2. All who live between the tropics have the sun vertical twice a year, though not all at the same time. Thus to those who live directly under the equator, he is directly vertical in March and Sept. at the equinox. If a place is in 10° N. lat. the sun is vertical when he has 10° north declination; and so of every other place. 3. All who live between the tropics, have the sun at noon sometimes N. and sometimes S. of them. Thus, they who live in a place situated in 20° N. lat. have the sun at noon to the northward when he has more than 20° N. declination, and to the southward when he has less. 4. Such of the inhabitants of the earth as live without the tropics, if in the northern hemisphere, have the sun at noon to the S. of them, but to the N. if in the southern hemisphere. 5. When the sun is in the zenith of any place, the shadow of a man, or any upright object, falls directly upon the place where they stand, and consequently is invisible; whence the inhabitants of such places were called *Æscii*, or without shadows: those who live between the tropics, and have the sun sometimes to the N. and sometimes to the S. of them, have of consequence their shadows projecting N. at some seasons of the year, and S. at others; whence they were called *Amphiscii*, or having two kinds of shadows. They who live without the tropics have their noon-shadows always the same way; and are therefore called *Heteroscii*, that is, having only one kind of shadow. If they are in N. lat. the shadows are always turned towards the N. and if in the southern hemisphere, towards the S. When a place is so far distant from the equator that the days are twenty-four hours long or longer, the inhabitants were called *Periscii*, because their shadows turn round them. Names have likewise been given the inhabitants of different parts of the earth, from the parallels of latitude under which they live, and their situation with regard to one another. Thus, when two places are so near each other, that the inhabitants have only one horizon, or at least that there is no perceptible difference between them, the inhabitants were called *Synæci*, that is, near neighbours; the seasons, days, nights, &c. in both places being perfectly alike. Those who lived at distant places, but under the same parallel, were called *Periæci*, that is, living in the same circle. Those who are on the same side of the equator have the seasons of the year at the same time; but if on different sides, the summer-season of the one is the winter of the other; as explained under astronomy. Some writers, however, by the name of *Periæci*, distinguish those who live under opposite points of the same parallel, where the noon of the one is the midnight of the other. When two places lie under parallels equally distant from the equator, but in opposite hemispheres, the inhabitants were called *Antæci*. These have a similar increase of days and nights, and similar seasons, but in opposite months. According

According to some, the Antœci were such as lived under the same geographical meridian, and had day and night at the same time. If two places are in parallels equally distant from the equator, and in opposite meridians, the inhabitants were called Antichthones, with respect to one another, that is, living on opposite sides of the earth; or Antipodes, having their feet opposite to one another. When two persons are Antipodes, the zenith of the one is the nadir of the other. They have a like elevation of the pole, but it is of different poles: they have also days and nights alike, and similar seasons of the year; but they have opposite hours of the day and night, as well as seasons of the year. Thus, when it is mid-day with us, it is midnight with our Antipodes; when it is summer with us, it is winter with them, &c.

II. HISTORICAL GEOGRAPHY.

Since the divisions of the surface of the earth, concerning which this part of geography is principally employed, are either natural or political, this branch divides itself into two parts, natural and political; the first regarding those divisions formed by nature, that is, to speak properly, by the hand of the eternal Creator and Preserver of all things; the second regarding those divisions made by the inhabitants for the sake of government and order among the different communities of men.

NATURAL GEOGRAPHY.

The natural division of the surface of the globe is into sea and land; about three-fourths of the whole being occupied by water, although probably no where to a depth comparatively very considerable, at most of a few miles on an average. The remaining fourth consists of lands, elevated more or less above the level of the sea, interspersed in some parts with smaller collections of water, at various heights, and in a few instances somewhat lower than the general surface of the main ocean. Thus the Caspian Sea is said to be about three hundred feet lower than the ocean. The sea and land is each of them again variously divided into parts: the names and definitions now follow:

A **CONTINENT** is a large portion of the earth, which comprehends several countries that are not separated by any sea; such are Europe, Asia, Africa, and America.

An **ISLAND** is a part of the earth which is entirely surrounded by water; as Great Britain.

A **PENINSULA** is a tract of land almost surrounded with water, and is joined to a continent only by a narrow slip or neck; such is the Morea in Greece.

An **ISTHMUS**, or **NECK OF LAND**, is that part by which a peninsula is joined to a continent, or two continents together; as the isthmus of Suez, which joins Africa to Asia.

A **PROMONTORY**, or **CAPE**, is a high part of land which stretches into the sea; thus the Cape of Good Hope is a promontory.

An **OCEAN** is a vast collection of waters surrounding a considerable part of the continent; as the Atlantic.

A **SEA** is a smaller collection of waters; as the Black Sea.

A **GULF** is a part of the sea which is nearly surrounded by land; as the Gulf of Venice.

A **BAY** has a wider entrance than a gulf; as the Bay of Biscay.

A **STRAIT** is a narrow passage that joins two seas; as the Strait of Gibraltar, which joins the Mediterranean to the Atlantic.

A **LAKE** is a large collection of water entirely surrounded by land, having no visible communication with the sea; as the Caspian Lake in Asia.

A **RIVER** is a stream of water that has its source from a spring, which keeps constantly running till it falls into some other river, or into the sea.

There are two continents, the old and new, divided into four grand parts, or quarters. The old continent, or that known to the ancients, comprehends Europe, Asia, and Africa; and the new continent, or that lately discovered, is denominated America, which is divided into North and South America. Of these grand divisions of the earth we find Europe, Asia, North America, part of Africa and South America, in the northern hemisphere, the seas occupying almost all the southern. Some place Australasia, or New Holland, among the grand divisions, and very properly, as its great extent demands this distinction. If the whole earth be

conceived to be divided into one hundred parts, Europe contains two; Asia, seven; Africa, six; America, six; and Australasia, two; the remaining seventy-seven being sea; although some authors assign seventy-two parts only out of one hundred to the sea, and twenty-eight to the land. These proportions may be ascertained with tolerable accuracy, by weighing the paper made for covering a globe, first entire, and then cut out according to the terminations of the different countries; or, if still greater precision were required, the greater part of the continents might be divided into known portions of the whole spherical surface, and the remaining irregular portions only weighed. Or, in square miles, the whole earth contains nearly two hundred millions, the seas and parts imperfectly known contain about one hundred and fifty-four millions; Europe, four millions; Asia, fourteen millions; Africa, twelve millions; America, twelve millions; and Australasia, four millions. These several divisions of the earth, and their principal parts, dependent islands, &c. will be found treated of in alphabetical order in the course of this work. The waters are divided into five oceans, namely, the Northern, the Atlantic or Western, the Pacific or Eastern, the Indian, and the Southern. The Northern Ocean stretches to the northward of Europe, Asia, and America, towards the north pole. The Atlantic Ocean lies between the continents of Europe and Africa on the east, and America on the west, and is usually divided into two parts, one called the North Atlantic Ocean, and the other the South Atlantic or Ethiopic Ocean, and is three thousand miles wide. The Pacific Ocean, or, as it is sometimes called, the Great South Sea, is bounded by the western and north-west shores of America, and by the eastern and north-east shores of Asia, and is ten thousand miles wide. The Indian Ocean washes the shores of the eastern coasts of Africa, and those of the south of Asia, and is about three thousand miles wide. The Southern Ocean extends to the southward of Asia and America towards the South pole. Captain Cook penetrated farther towards this pole than any other circumnavigator of the globe. The general inclinations and levels of the continents are discovered by the course of their rivers. Of these the principal are the following, with the length of each, according to major Rennel's calculation, taking the length of the Thames for unity; the Amazon is fifteen and three-quarters; the Kian Kew, in China, fifteen and a half; the Hoango, thirteen and a half; the Nile, twelve and a half; the Lena, eleven and a half; the Amur, eleven; the Oby, ten and a half; the Jenisei, ten; the Ganges, its companion the Burrampooter, the river Ava, and the Volga, each nine and a half; the Euphrates, eight and a half; the Mississippi, eight; the Danube, seven; the Indus, five and a half; and the Rhine, five and a quarter. The principal chain of mountains in the eastern continent first constitutes the Pyrenees, and divides Spain from France, then passes through Vivarais and Auvergne, to join the Alps, and through the south of Germany to Dalmatia, Albania, and Macedonia; it is found again beyond the Euxine, under the names of Taurus, Caucasus, and Imaus, and goes on to Tartary and to Kamschatka. The peninsula of India is divided from north to south by the mountains of Gate, extending from the extremity of Caucasus to Cape Comorin. In Africa, Mount Atlas stretches from Pez to Egypt, and the mountains of the moon run nearly in the same direction: there is also a considerable elevation between the Nile and the Red Sea. In the new world, the neighbourhood of the western coast is in general the most elevated; in North America the Blue Mountains, or Stony Mountains, are the most considerable; and the mountains of Mexico join the Andes or Cordeliers, which are continued along the whole west coast of South America. There are several points in both hemispheres, from which we may observe rivers separating to run to different seas; such as Switzerland, Bjelosero, Tartary, Little Tibet, Nigritia or Guinea, and Quito. The highest mountains, are Chimboragoa, and some others of the Cordeliers in Peru; or perhaps Descabesado in Chili, Mont Blanc, and the Peak of Teneriffe. Chimboragoa is about seven thousand yards, or nearly four miles, above the level of the sea; Mont Blanc, five thousand, or nearly three miles; the Peak of Teneriffe about four thousand, or two miles and a quarter; Ophir, in Sumatra, is said to be five or six hundred feet higher. It has, however, been asserted, that some of the snowy mountains to the north of Bengal, are higher than any of those of South America. On the tops of some of the mountains of Quito, in Peru, the barometer stands at the height of fifteen inches only, and the air is reduced to half its usual density,

But none of these heights is equal to a thousandth part of the earth's semidiameter, and are no more than so many specks in respect of the whole. For an account of the situations, and other particulars relating to these general heads, we refer to the articles themselves.

POLITICAL GEOGRAPHY.

The artificial divisions of the earth, or those made for the regulation of society, are subject to continual changes on account of the revolutions, new regulations, &c. which are almost always going on in some parts of the earth. The natural divisions, it is true, are also continually changing from various causes, but these changes are slow, preserving a sort of regularity, and proceeding by almost imperceptible degrees. But with regard to political divisions, the case is quite otherwise, so that we frequently hear of the boundaries of an empire or kingdom being extended, or contracted, or of its being destroyed altogether, and some other erected in its stead. The political divisions are either civil or ecclesiastical. The civil divisions are primary, as monarchies, which are either empires or kingdoms; and common-wealths, or republics, which are either aristocracies or democracies. These different divisions are so denominated from the kind of government exercised in the country, or from that form which predominates; for the several kinds are frequently mixed: 2. Secondary, as electorates, principalities, dukedoms, counties, markgraviates, or marquises, palatinates, landgraviates, baronies, free-cities, archbishoprics, bishoprics, abbeys, &c. The ecclesiastical governments have the common name of hierarchies, that is, holy principalities; but as this kind of jurisdiction extends only over the consciences, not the bodies or properties, of people, they cannot properly be called dominions, except such as have temporalities annexed to them; they are denominated patriarchates, primacies, archbishoprics, bishoprics, deaneries, &c. An explanation of the several terms pertaining to civil and ecclesiastical geography will be found in their regular alphabetical order. We shall here only add a general review of the grand divisions of this class, which are treated of, and their subdivisions noticed in this work.

EUROPE.

Nations.	Chief Cities.	Population in Millions.	Religion.	Revenue in Millions.	Government.
Sweden.....	Stockholm ...	3	Lutheran.	1 $\frac{1}{2}$	Monarchy.
Russia.....	Petersburgh ..	36	Greek church	10	Despotism.
Denmark....	Copenhagen...	3	Lutheran	1 $\frac{1}{2}$	Monarchy.
Prussia.....	Berlin	6	Protestant and Roman Cath.	3	Monarchy.
Austria.....	Vienna	23	Roman Cath.	10	Monarchy.
Turkey in Europe...	Constantinople.....	8	Mohammedanism	7	Despotism.
France.....	Paris.....	40	Roman Cath.	30	Milit. Desp.
Switzerland	Berne	2	Protestant and Roman Cath.	1	Aristocracy.
Italy.....	Milan	7	Roman Cath.	2	Monarchy.
Naples.....	Naples.....	2	Roman Cath.	2	Monarchy.
Portugal....	Lisbon.....	4	Roman Cath.	2	Monarchy.
Spain.....	Madrid	11	Roman Cath.	5 $\frac{1}{2}$	Monarchy.
Great Brit. and Ireland	London	15	Protestant	33	Limited Monarchy.

ASIA.

Turkey	Aleppo	10	Mohammed.	.....	Despotism.
Russia.....	Astracan	5	Greek church	.....	Despotism.
China	Pekin and Nankin	60	Shamanism.	9	Monarchy.
Japan.....	Jeddo	30	Polytheism.	28	Despotism.
Birman Empire....	Ava	17	Brahmins.	.....	Despotism.
Siam.....	Siam	5	Brahmins.	.....	Despotism.
Hindustan...	Calcutta	60	Brahmins.	160	Various.
Persia.....	Ispahan	10	Mohammed.	5	Despotism.
Tartary	Samarcand....	10	Mohammed.	.....	.....
Arabia.....	Mecca and Medina.....	10	Mohammed.	.....	Hierarchy.

AFRICA.

Nations.	Chief Cities.	Population in Millions.	Religion.	Revenue in Millions.	Government.
Abyssinia....	Gondar	2	Christian.	.....	Monarchy.
Egypt.....	Cairo.....	2 $\frac{1}{2}$	Mohammed.	1	Aristocracy.
Morocco....	Morocco.....	2	Mohammed.	.....	Despotism.
Algiers.....	Algiers.....	0 $\frac{1}{2}$	Mohammed.	.....	Despotism.
Tunis.....	Tunis.....	0 $\frac{1}{2}$	Mohammed.	.....	Despotism.
Tripoli.....	Tripoli.....	0 $\frac{1}{2}$	Mohammed.	.....	Despotism.

AMERICA.

<i>N. America</i>					
United Stat.	Washington...	6	Protestant.	3	Republic.
Spanish Dominions...	Salvador	4	Roman Cath.	3	Spanish Viceroy.
British Possessions...	Quebec.....	4 $\frac{1}{2}$	Roman Cath.	.....	British Constitution.
<i>S. America.</i>					
Spanish Dominions...	Lima.....	9	Roman Cath.	1	Spanish Viceroy.
Portuguese Dominions.	Rio Janeiro...	4	Roman Cath.	.....	Portuguese Viceroy.

III. TECHNICAL GEOGRAPHY.

This part of the science relates to the method of exhibiting geographical descriptions, which is, 1. By means of geographical tables, giving an analytical view of the whole earth, or of some part of it. 2. By treatises giving a systematical account of the science, or describing places in alphabetical order. 3. By delineations of the earth, or of some part of it on plane or curve surfaces; these graphical representations are of considerable importance, and are called maps and globes, of which we shall now treat.

OF THE CONSTRUCTION AND USE OF MAPS.

A MAP is a plane figure representing the surface of the earth, or some part of it; being a projection of its globular surface, exhibiting countries, seas, rivers, mountains, cities, &c. in their due positions, or nearly so. Maps are either universal or particular.

UNIVERSAL, or GENERAL MAPS, are such as exhibit the whole surface of the earth, or the two hemispheres.

PARTICULAR, or PARTIAL MAPS, are such as exhibit some particular part or region of the earth.

Both kinds are usually called GEOGRAPHICAL or LAND-MAPS, as distinguished from HYDROGRAPHICAL, or SEA-MAPS; which represent only the seas and sea-coasts, and are properly called charts.

Maps are constructed by making a projection of the globe, or a part of it, either on the plane of some particular circle, or by the eye placed in some particular point, according to the rules of perspective, &c. of which there are several methods.

I. CONSTRUCTION OF GENERAL MAPS. A map of the world must represent two hemispheres; and both must be drawn upon the plane of that circle which divides the hemispheres.

i. The first method is to project each hemisphere upon the plane of some particular circle, by the rules of orthographic projection; (see PROJECTION of the SPHERE) forming two hemispheres on one common base or circle. When the plane of projection is that of a meridian, the maps will be the E. and W. hemispheres; the other meridians will be ellipses; and the parallel circles will be right lines. Upon the plane of the equinoctial, the meridians will be right lines, crossing in the centre, which will represent the pole; the parallels of latitude will be circles having that common centre; and the maps will be the northern and southern hemispheres. Fig. 1, Plate LXXX, is an orthographic projection of one of the hemispheres upon the plane of the meridian: and fig. 2, an orthographic projection of the northern hemisphere upon the plane of the equator. The fault of this way of

drawing maps is, that towards the outside the circles are too near each other; and therefore equal spaces upon the earth are represented by very unequal spaces in the map.

ii. Another method is to project the same hemispheres by the rules of stereographic projection: in which way all the parallels will be represented by circles, and the meridians by circles or right lines. (For the nature and properties of these projections, see PROJECTION OF THE SPHERE.) But here the contrary fault occurs; viz. the circles towards the outsides are too far asunder, and about the middle they are too near together. Fig. 3, is a stereographic projection of one of the hemispheres on the plane of the meridian: and fig. 4, of one on the plane of the equator.

iii. A third method is therefore adopted to remedy the faults of both the former methods: viz. 1. For the E. and W. hemispheres, describe the circle PENQ, fig. 5, Plate LXXX, for the meridian, or plane of projection; through the centre of which draw the equinoctial EQ, and axis PN perpendicular to it, making P and N the north and south poles. Divide the quadrant PE, EN, NQ, and QP, into nine equal parts, each representing ten degrees, beginning at the equinoctial EQ. Divide also CP and CN into nine equal parts, beginning at EQ; and through the corresponding points draw the parallels of latitude. Again divide CE and CQ into nine equal parts; and through the points of division, and the two poles P and N, draw circles, or rather ellipses, for the meridians. Thus the map will be prepared to receive the names of the principal countries, kingdoms, cities, &c. in the world. For the N. or S. hemisphere, draw A Q B E, fig. 6, for the equinoctial, dividing it into the four quadrants EA, AQ, QB, and BE; and each quadrant into nine equal parts; and through these points, from the centre C, draw lines for meridians, and the parallels of latitude; equidistant as in the figure. In this last method, equal spaces on the earth are represented by equal spaces on the map, as near as any projection will bear; for a spherical surface can no way be represented exactly upon a plane. Then the several countries, kingdoms, cities, seas, islands, sea-coasts, towns, &c. are to be marked in the map, according to their latitudes and longitudes. In filling up the map, all places representing land are filled with such cities, towns, rivers, hills, &c. as the countries contain; but the seas are left white; the shores adjoining to them being shaded. Large rivers are marked by strong or double lines, drawn winding in the form of those they represent; and small rivers are expressed by small lines. Different countries are best distinguished by different colours; at least the borders of them should be so distinguished. Forests are represented by small trees; and mountains are shaded to make them appear. Sands are denoted by numerous small points; and rocks under water by small crosses. The mariner's compass, with the thirty-two points representing the winds, is drawn in any void space.

II. CONSTRUCTION OF PARTICULAR MAPS.

To draw a map of any particular country, its extent must be known as to latitude and longitude: as, suppose Spain, lying between the N. latitude 36° and 44° , and extending from 10° to 23° of longitude; so that its extent from N. to S. is 8° and from E. to W. 13° . 1. Draw the line AB, fig. 7, for a meridian passing through the middle of the country; on this, set off 8° from B to A, taken from any convenient scale; A being the north and B the south point. Through A and B draw the perpendiculars CD, EF, for the extreme parallels of latitude. Divide AB into eight parts or degrees, through which draw the other parallels of latitude, parallel to the former. For the meridians, divide any degree in AB into 60 equal parts, or geographical miles. Then, because the length of a degree in each parallel decreases towards the pole, (as appears from the annexed Table,) take the number of miles answering to the latitude of B, which is $48\frac{1}{2}$ nearly, and set it from B, seven times to E, and six times to F; so is EF divided into degrees. Again, from the same table take the number of miles of a degree in the latitude A, viz. $43\frac{1}{2}$ nearly; which set off, from A, seven times to C, and six times to D. Then from the points of division in the line CD, to the corresponding points in the line EF, draw so many right lines for the meridians. Number the degrees of latitude up both sides of the map, and the degrees of longitude on the top and bottom. Also in some vacant place make a scale of miles; or of degrees, if the map represent a large part of the earth; to serve for finding the distances of places upon the map.

Then make the proper divisions and subdivisions of the country and having the latitudes and longitudes of the principal places, it will be easy to set them down in the map; for any town, &c. must be placed, where the circles of its latitude and longitude intersect. For instance, Gibraltar, whose latitude is $36^{\circ} 4' 44''$ and lon. $12^{\circ} 27'$ will be at G; and Madrid, whose lat. is $40^{\circ} 25' 18''$ and lon. $14^{\circ} 44'$ will be at M. In like manner, the mouth of a river must be set down; but to describe the whole river, the lat. and lon. of every turning must be marked down, and the towns and bridges by and under which it runs. And so for woods, forests, mountains, lakes, forts, &c. The boundaries will be described by setting down the most remarkable places on the sea-coast, and drawing a continued dotted line through them all. This method is very proper for small countries.

A TABLE,

Shewing how many minutes or geographical miles of the equator make a degree of longitude, at every degree of latitude.

D. L.	MILES.	D. L.	MILES.	D. L.	MILES.	D. L.	MILES.	D. L.	MILES.
1	59,99	19	56,73	37	47,92	55	34,41	73	17,54
2	59,97	20	56,33	38	47,28	56	33,55	74	16,53
3	59,92	21	56,01	39	46,62	57	32,67	75	15,52
4	59,86	22	55,63	40	45,95	58	31,79	76	14,51
5	59,77	23	55,23	41	45,28	59	30,90	77	13,50
6	59,67	24	54,81	42	44,75	60	30,00	78	12,48
7	59,56	25	54,38	43	43,88	61	29,09	79	11,45
8	59,42	26	53,93	44	43,16	62	28,17	80	10,42
9	59,26	27	53,46	45	42,43	63	27,24	81	9,38
10	59,08	28	52,97	46	41,68	64	26,30	82	8,35
11	58,89	29	52,47	47	40,92	65	25,36	83	7,32
12	58,68	30	51,96	48	40,15	66	24,41	84	6,28
13	58,46	31	51,43	49	39,36	67	23,45	85	5,23
14	58,22	32	50,88	50	38,57	68	22,48	86	4,18
15	57,95	33	50,32	51	37,76	69	21,50	87	3,14
16	57,67	34	49,74	52	36,94	70	20,52	88	2,09
17	57,37	35	49,15	53	36,11	71	19,54	89	1,05
18	57,06	36	48,54	54	35,26	72	18,55	90	0,00

As this table is calculated only to whole degrees, therefore, when the length of a degree of longitude is required on a parallel of latitude, consisting of degrees and minutes, we must use the following proportion, viz. As one degree = 60 minutes is to the difference between the minutes answering to a degree, in the next greater, and next less tabular latitude; so is the excess of the proposed latitude above the next less tabular latitude to a proportional part; which being subtracted from the miles answering to a degree of latitude, in the next greater tabular latitude, will give the minutes answering to a degree of longitude on the proposed parallel.

Examp. How many minutes of the equator make a degree of longitude in the latitude of the Royal Observatory at Greenwich, the latitude being $51^{\circ} 28' 40''$ N.—Solution $60 : 82 : 28' 40'' : 3917$, which subtracted from 37,76, gives 37,3683 for the answer required. *N.B.* If 37,3683 be multiplied by 69½, and the product divided by 60, the quotient will be the number of English miles contained in a degree of longitude in the latitude of Greenwich.

$37,3683 \times 69,5$
Thus $\frac{37,3683 \times 69,5}{60} = 43,2849$ English miles, or which is the

same thing, 43 miles, 61 yards, one foot, and 5,7 inches. Therefore a place situated 43 miles, 61 yards, one foot, and 5,7 inches, to the east or west of the Royal Observatory at Greenwich will be exactly one degree of longitude to the east or west of the said Observatory. 2. Maps of particular places, being portions of the globe, may be drawn after the same manner as the whole; i. e. either by the orthographic or stereographic projection of the sphere. But in partial maps, an easier method may be taken; thus: having drawn the meridian AB, fig. 7, and divided it into equal parts, as in the last method, draw lines through all the points of division perpendicular to AB, for the parallels of latitude; CD, EF, being the extreme parallels. Then, to divide these, set off the degrees in each parallel, diminished as directed for the two extreme parallels CD, EF, in the last method; and through all the correspond-

ing points draw the meridians, which will be curve lines; and which were right lines in the last method; because only the extreme parallels were divided by the table. This method is proper for a large tract, as Europe, &c. in which case the parallels and meridians need only be drawn to every five or 10 degrees. This method is much used in drawing maps; as all the parts are nearly of their due magnitude, but a little distorted towards the outside, from the oblique intersection of the meridians and parallels. 3. A third method may be adopted thus: Draw PB, Plate LXXXI, fig. 4, of a convenient length for a meridian: divide it into nine equal parts, and through the points of division, describe as many circles for the parallels of latitude, from the centre P, which represents the pole. Suppose AB, fig. 4, the height of the map; then CD will be the parallel passing through the greatest latitude, and EF will represent the equator. Divide the equator EF into equal parts, of the same size as those in AB, both ways, beginning at B. Divide also all the parallels into the same number of equal parts, but less, in proportion to the numbers for the several latitudes, as directed in the last method for the rectilinear parallels. Then through all the corresponding divisions, draw curve-lines, which will represent the meridians, the extreme ones being EC and FD. Lastly number the degrees of lat. and lon. and place a scale of equal parts, either of miles or degrees for measuring distances. This is a very good method of drawing large maps, and is called the Globular Projection; all the parts of the earth being represented nearly of their due magnitude, excepting that they are a little distorted on the outsides. The following is a convenient method to draw a map of a considerable part of the earth's surface: as a map of Europe, which extends from 36° to 72° north latitude, draw a base-line GH, fig. 5, in the middle of which erect a perpendicular, IP, and assume any distance for 10° of latitude. Let the point I be 30°, from which set off six of the assumed distances to P, which will be the north pole. Number the distances 40, 50, 60, &c. and on the centre, P, describe arcs passing through the points of divisions on the line IP, which will be parallels of latitude. Divide the space assumed for 10° of latitude into 60 parts, by some diagonal-scale. Look into the above table, for the number of miles answering to 30°, which is 51,96; take this from the scale, and set it off on the arc 30° from the centre-line both ways. Do the same for 40°, 50°, 60°, &c., and through the corresponding divisions on all the arcs draw curve-lines; which will represent the meridian. When the degrees of latitude and longitude are marked the thing is done. We shall here add a very easy and correct method of drawing particular maps, which may be formed by means of the common compasses and ruler. Thus suppose it were required to draw a map of some part of the earth, including six degrees, as from the 39th to the 45th parallel of latitude, draw the line EF, and in the middle raise a perpendicular DC. Divide this perpendicular into six equal parts, representing the degrees of latitude, and through C draw a line parallel to EF. Divide a degree into ten, or if large enough, into 60 equal parts; and in the table for decreasing longitudes, find the contents of a degree of longitude in the latitude of 39°, viz. 46,62 miles. From the degree so divided, take the parts 46,62; set one-half of it from D to E, and the other from D to F. Find then the extent of a degree of longitude in the latitude of 45°, viz. 42,43 miles; and taking that distance from the scale of the degree, divide it as before, laying one-half from C to I, and the other from C to K. Draw straight lines between the points I and E, and K and F; divide them into six equal parts, and through these draw parallel lines, and thus I K E F is a projection for one degree of longitude, and six of latitude. The projection of the whole map is only a repetition of this operation; we have therefore only to take, with a pair of compasses, the distance from E to K, from F to I, and setting one foot in E, and then in F, describe the arches L and M; and in like manner set one foot in I, and then in K, and with the same extent draw the arches N and O. Then take the distance between E and F, and set from E to N, and from F to O. Set likewise the distance between I and K, and from I to L, and from K to M. Join LN and MO, divide them into degrees, and draw parallels to these points to their corresponding points in the meridians IE and KF. After the same manner may meridians and parallels be drawn to as many degrees of longitude as your map contains. If the map be very large so that the compasses cannot take in the whole extent of the diagonal IF, or EK, we may do it at twice by taking the

diagonals GF, or EH, by transferring them as already directed; after which, we may do the same with the other half. When the place for which a map is to be drawn, is but small, e. g. if a county were to be exhibited, the meridians, as to sense, will be parallel to each other, and the whole will differ very little from a plane. Such a map may be made more easily than by the preceding rules, merely by measuring the distances in miles, and so laying them down in a plane rectangular map. But this branch of map-making belongs more properly to surveying, which see.

The Use of MAPS is obvious from their construction. The degrees of the meridians and parallels shew the latitudes and longitudes of places, and the scale of miles annexed, their distances; the situation of places, with regard to each other, as well as to the cardinal points, appears on inspection; the top of the map being always the north, the bottom the south, the right hand the east, and the left the west, unless the compass, usually annexed, shew the contrary.

DESCRIPTION OF THE TERRESTRIAL GLOBE.

The equator, ecliptic, and tropics, polar circles, and meridians, are laid down upon the globe in the manner already described. The ecliptic is divided into 12 signs, and each sign into 30 degrees. Each tropic is 23½ degrees from the equator, and each polar circle is 23½ degrees from its respective pole. Circles are drawn parallel to the equator, at every 10 degrees distance from it on each side of the poles: these circles are called parallels of latitude. On large globes there are circles drawn perpendicularly through every tenth degree of the equator, intersecting each other at the poles; but on the globes of or under a foot diameter, they are only drawn through every 15th degree of the equator: these circles are generally called meridians, sometimes circles of longitude, and at other times hour circles. The globe is hung in a brass-ring, A, fig. 3, plate LXXV. called the brazen meridian, and turns upon a wire in each pole sunk half its thickness into one side of the meridian-ring; by which means that side of the ring divides the globe into two equal parts, called the eastern and western hemispheres; as the equator divides it into two equal parts, called the northern and southern hemispheres. The ring is divided into 360 equal parts or degrees, on the side wherein the axis of the globe turns. One half of these degrees are numbered, and reckoned from the equator to the poles, where they end at 90. Their use is to shew the latitudes of places. The degrees in the other half of the meridian are numbered from the poles to the equator, where they end at 90. Their use is to shew how to elevate either the north or south pole above the horizon, according to the latitude of any given place, as it is N. or S. of the equator. The brazen meridian is let into two notches made in a broad flat ring called the wooden horizon, B, C; the upper surface of which divides the globe into two equal parts, called the upper and lower hemispheres. One notch is in the north point of the horizon, and the other in the south. On this horizon are several concentric circles, which contain the months and days of the year, the signs and degrees answering to the sun's place for each month and day, the 32 points of the compass, and the circles of amplitude and azimuth. The graduated side of the brass-meridian lies towards the east side of the horizon, and should be generally kept towards the person who works problems by the globes. There is a small horary circle D, so fixed to the north part of the brazen meridian, that the wire in the north pole of the globe is in the centre of that circle; and on the wire is an index, which goes over all the 24 hours of the circle, as the globe is turned round its axis. Sometimes there are two horary circles, one between each pole of the globe and the brazen meridian. There is a thin slip of brass, called the Quadrant of Altitude, which is divided into 90 equal parts or degrees, answering exactly to so many degrees of the equator. It is occasionally fixed to the uppermost point of the brazen meridian by a nut and screw. The divisions end at the nut E, and the quadrant is turned round upon it. A magnetic needle, is applied to the globe which freely moves over a circle divided into four times 90 degrees; reckoning from the N. and S. points towards the E. and W. and also into the 32 points of the compass. As this needle makes nearly a certain constant angle with the meridian in every place, called the variation; therefore this compass, being added to the frame, will rectify the position of the meridian of the globe when the variation of the needle is known. Thus at

London,

London, the variation of the needle is at this time about 24 degrees northwest; therefore, by moving the frame of the globe about till the needle settles itself over the 24th degree, reckoning westward from the north point or fleur de lis, we shall have the brass-meridian coinciding with the true meridian. The compass is sometimes fixed between the legs underneath the globe.

DIRECTIONS FOR USING THE TERRESTRIAL GLOBE.

In using globes, keep the east side of the horizon towards you (unless the problem requires to turn it,) which side may be known by the word East upon the horizon; for then you have the graduated side of the meridian towards you, the quadrant of altitude before you, and the globe divided exactly into two equal parts, by the graduated side of the meridian.

PROB. I. *To find the latitude and longitude of any given place upon the globe.*—Turn the globe on its axis, until the given place comes exactly under that graduated side of the brazen meridian on which the degrees are numbered from the equator; and observe what degree of the meridian the place then lies under; which is its latitude N. or S. as the place is N. or S. of the equator. The globe remaining in this position, the degree of the equator, which is under the brazen meridian, is the longitude of the place, which is E. or W.; as the place lies on the E. or W. side of the first meridian of the globe. All the Atlantic ocean and America, are on the W. side of the meridian of London; and the greatest part of Europe, and of Africa, together with all Asia, are on the E. side of the meridian of London, which is reckoned the first meridian of the globe by the British geographers and astronomers.

PROB. II. *The longitude and latitude of a place being given, to find that place on the globe.*—Look for the given longitude in the equator (counting it eastward or westward from the first meridian, as it is mentioned to be E. or W.;) and bringing the point of longitude in the equator to the brazen meridian, on that side which is above the south point of the horizon; then count from the equator, on the brazen meridian, to the degree of the given latitude, towards the N. or S. pole, according as the latitude is N. or S.; and under that degree of latitude on the meridian you will have the place required.

PROB. III. *To find the difference of longitude, or difference of latitude, between any two given places.*—Bring each of these places to the brazen meridian, and see what its latitude is: the less latitude subtracted from the greater, if both places be on the same side of the equator, or both latitudes added together, if they be on different sides of it, is the difference of latitude required. And the number of degrees contained between these places, reckoned on the equator, when they are brought separately under the brazen meridian, is their difference of longitude, if it be less than 180; but if more, let it be subtracted from 360, and the remainder is the difference of longitude required. Or,

Having brought one of the places to the brazen meridian, and set the hour-index to XII. turn the globe until the other place comes to the brazen meridian; and the number of hours, and parts of an hour, passed over by the index, will give the longitude in time; which may be easily reduced to degrees, by allowing 15 degrees for every hour, and one degree for every four minutes.

N. B. When we speak of bringing any place to the brazen meridian, it is the graduated side of the meridian that is meant.

PROB. IV. *Any place being given, to find all those places that have the same longitude or latitude with it.*—Bring the given place to the brazen meridian; then all those places which lie under that side of the meridian, from pole to pole, have the same longitude with the given place. Turn the globe round its axis: and all those places, which pass under the same degree of the meridian that the given place does, have the same latitude with that place. Since all latitudes are reckoned from the equator, and all longitudes are reckoned from the first meridian, it is evident, that the point of the equator which is cut by the first meridian, has neither latitude nor longitude. The greatest latitude is 90 degrees, because no place is more than 90 degrees from the equator; and the greatest longitude is 180 degrees, because no place is more than 180 degrees from the first meridian.

PROB. V. *To find the Antæci, Periæci, and Antipodes, of any given Place.*—Bring the given place to the brazen meridian; and having found its latitude, keep the globe in that situation, and count the same number of degrees of latitude from the equator to-

wards the contrary pole; and where the reckoning ends, you have the antæci of the given place upon the globe. Those who live at the equator have no antæci. The globe remaining in the same position, set the hour-index to the upper XII. on the horary circle, and turn the globe until the index comes to the lower XII.; then the place which lies under the meridian, in the same latitude with the given place, is the periæci required. Those who live at the poles have no periæci. As the globe now stands (with the index at the lower XII.) the antipodes of the given place will be under the same point of the brazen meridian where its antæci stood before. Every place upon the globe has its antipodes.

PROB. VI. *To find the distance between any two places on the globe.*—Lay the graduated edge of the quadrant of altitude over both the places, and count the number of degrees intercepted between them on the quadrant; then multiply these degrees by 60, and the product will give the distance in geographical miles: but to find the distance in miles, multiply the degrees by 69½, and the product will be the number of miles required. Or, take the distance betwixt any two places with a pair of compasses, and apply that extent to the equator; the number of degrees, intercepted between the points of the compasses, is the distance in degrees of a great circle: which may be reduced either to geographical miles, or to English miles, as above.

PROB. VII. *A place on the globe being given, and its distance from any other place; to find all the other places upon the globe, which are at the same distance from the given place.*—Bring the given place to the brazen meridian, and screw the quadrant of altitude to the meridian directly over that place; then keeping the globe in that position, turn the quadrant quite round upon it, and the degree of the quadrant that touches the second place will pass over all the other places, which are equally distant with it from the given place. This is the same as if one foot of a pair of compasses were set in the given place, and the other foot extended to the second place, whose distance is known; for if the compasses be then turned round the first place as a centre, the moving foot will go over all those places which are at the same distance with the second from it.

PROB. VIII. *The hour of the day at any place being given, to find all those places where it is noon at that time.*—Bring the given place to the brazen meridian, and set the index to the given hour; this done, turn the globe until the index points to the upper XII. and then all the places that lie under the brazen meridian have noon at that time.

N. B. The upper XII. always stands for noon; and when the bringing of any place to the brazen meridian is mentioned, the side of that meridian on which the degrees are reckoned from the equator is meant, unless the contrary side be mentioned.

PROB. IX. *The hour of the day at any place being given, to find what o'clock it is then at any other place.*—Bring the given place to the brazen meridian, and set the index to the given hour; then turn the globe, until the place where the hour is required comes to the meridian, and the index will point out the hour at that place.

PROB. X. *To find the sun's place in the ecliptic, and his declination for any given day of the year.*—Look on the horizon for the given day, and right against it you have the degree of the sign in which the sun is (or his place) on that day at noon. Find the same degree of that sign in the ecliptic-line upon the globe, and having brought it to the brazen meridian, observe what degree of the meridian stands over it; for that is the sun's declination reckoned from the equator.

PROB. XI. *The day of the month being given, to find all those places of the earth, over which the sun will pass vertically on that day.*—Find the sun's place in the ecliptic for the given day, and having brought it to the brazen meridian, observe what point of the meridian is over it; then, turning the globe round its axis, all those places which pass under that point of the meridian are the places required; for as their latitude is equal, in degrees and parts of a degree, to the sun's declination, the sun must be directly over-head to each of them at its respective noon.

PROB. XII. *A place being given in the torrid zone, to find those two days of the year, on which the sun shall be vertical to that place.*—Bring the given place to the brazen meridian, and mark the degree of latitude that is exactly over it on the meridian; then turn the globe round its axis, and observe the two de-

degrees of the ecliptic which pass exactly under that degree of latitude: lastly, find on the wooden horizon the two days of the year in which the sun is in those degrees of the ecliptic, and they are the days required: for on them, and none else, the sun's declination is equal to the latitude of the given place; and, consequently, he will then be vertical to it at noon.

PROB. XIII. *To find all those places of the north frigid zone, where the sun shines constantly without setting, on any given day, from the 21st of March to the 23d of September.*—On these two days, the sun is in the equinoctial, and enlightens the globe exactly from pole to pole: therefore, as the earth turns round its axis, which terminates in the poles, every place upon it will go equally through the light and the dark, and so make the day and night equal to all places of the earth. But as the sun declines from the equator, towards either pole, he will enlighten as many degrees round that pole as are equal to his declination from the equator: so that no place within that distance of the pole will then go through any part of the dark, and consequently the sun will not set to it. Now, as the sun's declination is northward from the 21st of March to the 23d of September, he must constantly shine round the north pole all that time; and on the day that he is in the northern tropic, he shines upon the whole north frigid zone; so that no place within the north polar circle goes through any part of the dark on that day. Therefore, having brought the sun's place for the given day to the brazen meridian, and found his declination, (by Prob. IX.) count as many degrees on the meridian, from the north pole, as are equal to the sun's declination from the equator, and mark that degree from the pole where the reckoning ends; then turning the globe round its axis, observe what places in the north frigid zone pass directly under that mark; for they are the places required. The like may be done for the south frigid zone, from the 23d of September to the 21st of March, during which time the sun shines constantly on the south pole.

PROB. XIV. *To find the place over which the sun is vertical at any hour of a given day.*—Having found the sun's declination for the given day (by Prob. X.) mark it with chalk on the brazen meridian: then bring the given place to the brazen meridian, and set the index to the given hour; which done, turn the globe on its axis, until the index points to XII. at noon; and the place on the globe, which is then directly under the point of the sun's declination marked upon the meridian, has the sun that moment in the zenith, or directly over head.

PROB. XV. *The day and hour of a lunar eclipse being given; to find all those places of the earth to which it will be visible.*—The moon is never eclipsed but when she is full, and so directly opposite to the sun, that the earth's shadow falls upon her. Therefore, whatever place of the earth the sun is vertical to at that time, the moon must be vertical to the antipodes of that place: so that the sun will be then visible to one-half of the earth, and the moon to the other. Find the place to which the sun is vertical at the given hour (by Prob. XIV.) and bring the antipodes of that place to the meridian, and elevate the pole to its latitude: then, the moon will be visible to all those parts of the globe which are above the horizon, at the time of her greatest obscuration.

PROB. XVI. *To rectify the globe for the latitude, the zenith, and the sun's place.*—Find the latitude of the place (by Prob. I.), and if the place be in the northern hemisphere, raise the north pole above the north point of the horizon, as many degrees (counted from the pole upon the brazen meridian) as are equal to the latitude of the place. If the place be in the southern hemisphere, raise the south pole above the south point of the horizon as many degrees as are equal to the latitude. Then, turn the globe till the place comes under its latitude on the brazen meridian, and fasten the quadrant of altitude so, that the chamfered edge of its nut (which is even with the graduated edge) may be joined to the zenith, or point of latitude. This done, bring the sun's place in the ecliptic for the given day (found by Prob. X.) to the graduated side of the brazen meridian, and set the hour-index to XII. at noon, which is the uppermost XII. on the hour-circle; and the globe will be rectified.

PROB. XVII. *The latitude of any place, not exceeding 66 $\frac{2}{3}$ degrees, and the day of the month, being given; to find the time of the sun's rising and setting, and consequently the length of the day and night.*—Having rectified the globe for the latitude; and

for the sun's place on the given day (as directed in the preceding problem), bring the sun's place in the ecliptic to the eastern side of the horizon, and the hour-index will shew the time of sun-rising; then turn the globe on its axis, until the sun's place comes to the western side of the horizon, and the index will shew the time of sun-setting. The hour of sun-setting doubled, gives the length of the day; and the hour of sun-rising doubled, gives the length of the night.

PROB. XVIII. *The latitude of any place, and the day of the month, being given; to find when the morning twilight begins, and the evening twilight ends, at that place.*—This problem is often limited: for, when the sun does not go 18 degrees below the horizon, the twilight continues the whole night; and for several nights together in summer, between 49 and 66 $\frac{2}{3}$ degrees of latitude; and the nearer to 66 $\frac{2}{3}$, the greater is the number of these nights. But when it does begin and end, the following method will shew the time for any given day. Rectify the globe, and bring the sun's place in the ecliptic to the eastern side of the horizon; then mark with chalk that point of the ecliptic which is in the western side of the horizon, it being the point opposite to the sun's place; this done, lay the quadrant of altitude over the said point, and turn the globe eastward, keeping the quadrant at the chalk-mark, until it is just 18 degrees high on the quadrant; and the index will point out the time when the morning-twilight begins: for the sun's place will then be 18 degrees below the eastern side of the horizon. To find the time when the evening-twilight ends, bring the sun's place to the western side of the horizon; and the point opposite to it, which was marked with the chalk, will be rising in the east: then bring the quadrant over that point, and keeping it thereon, turn the globe westward, until the said point be 18 degrees above the horizon on the quadrant, and the index will shew the time when the evening twilight ends; the sun's place being then 18 degrees below the western side of the horizon.

PROB. XIX. *To find on what day of the year the sun begins to shine constantly, on any given place in the north frigid zone; and how long he continues to do so.*—Rectify the globe to the latitude of the place, and turn it about until some point of the ecliptic, between Aries and Cancer, coincides with the north point of the horizon where the brazen meridian cuts it; then find, on the wooden horizon, what day of the year the sun is in that point of the ecliptic; for that is the day on which the sun begins to shine constantly on the given place without setting. This done, turn the globe, until some point of the ecliptic, between Cancer and Libra, coincides with the north point of the horizon, where the brazen meridian cuts it; and find, on the wooden horizon, on what day the sun is in that point of the ecliptic; which is the day that the sun leaves off constantly shining on the said place, and rises and sets to it as to other places on the globe. The number of natural days, or complete revolutions of the sun about the earth, between the two days above found, is the time that the sun keeps constantly above the horizon without setting: for all that portion of the ecliptic, which lies between the two points which intersect the horizon in the very north, never sets below it; and there is just as much of the opposite part of the ecliptic that never rises; therefore the sun will keep as long constantly below the horizon in winter as above it in summer.

PROB. XX. *To find in what latitude the sun shines constantly, for any length of time less than 182 $\frac{1}{2}$ of our days and nights.*—Find a point in the ecliptic half as many degrees from the beginning of Cancer (either toward Aries or Libra) as there are natural days in the time given; and bring that point to the north side of the brazen meridian, on which the degrees are numbered from the pole towards the equator: then keep the globe from turning on its axis, and slide the meridian up or down, until the foresaid point of the ecliptic comes to the north point of the horizon, and then the elevation of the pole will be equal to the latitude required.

PROB. XXI. *The latitude of a place, not exceeding 66 $\frac{2}{3}$ degrees, and the day of the month, being given; to find the sun's amplitude or point of the compass, on which he rises or sets.*—Rectify the globe, and bring the sun's place to the eastern side of the horizon; then observe what point of the compass on the horizon stands right against the sun's place, for that is his amplitude at rising. This done, turn the globe westward, until the sun's place

place comes to the western side of the horizon; and it will cut the point of his amplitude at setting. Or, you may count the rising-amplitude in degrees, from the east point of the horizon to that point where the sun's place cuts it; and the setting-amplitude from the west point of the horizon to the sun's place at setting.

PROB. XXII. *The latitude, the sun's place, and his altitude, being given; to find the hour of the day, and the sun's azimuth, or number of degrees that he is distant from the meridian.*—Rectify the globe, and bring the sun's place to the given height upon the quadrant of altitude; on the eastern side of the horizon, if the time be in the forenoon; or the western side, if it be in the afternoon: then the index will shew the hour; and the number of degrees in the horizon, intercepted between the quadrant of altitude and the south point, will be the sun's true azimuth at the time.

PROB. XXIII. *The latitude, hour of the day, and the sun's place, being given; to find the sun's altitude and azimuth.*—Rectify the globe, and turn it until the index points to the given hour; then lay the quadrant of altitude over the sun's place in the ecliptic, and the degree of the quadrant cut by the sun's place is his altitude at that time above the horizon; and the degree of the horizon cut by the quadrant is the sun's azimuth, reckoned from the S.

PROB. XXIV. *The latitude, the sun's altitude, and his azimuth, being given; to find his place in the ecliptic, the day of the month, and the hour of the day, though they had all been lost.*—Rectify the globe for the latitude and zenith, and set the quadrant of altitude to the given azimuth in the horizon; keeping it there, turn the globe on its axis until the ecliptic cuts the quadrant in the given altitude; that point of the ecliptic which cuts the quadrant there will be the sun's place; and the day of the month answering thereto will be found over the like place of the sun on the wooden horizon. Keep the quadrant of altitude in that position; and, having brought the sun's place to the brazen meridian, and the hour-index to XII. at noon, turn back the globe, until the sun's place cuts the quadrant of altitude again, and the index will shew the hour. Any two points of the ecliptic, which are equi-distant from the beginning of Cancer or of Capricorn, will have the same altitude and azimuth at the same hour, though the months be different; and therefore it requires some care in this problem, not to mistake both the month and the day of the month; to avoid which, observe, that from the 20th of March to the 21st of June, that part of the ecliptic which is between the beginning of Aries and the beginning of Cancer is to be used; from the 21st of June to the 23d of September, between the beginning of Cancer and beginning of Libra; from the 23d of September to the 21st of December, between the beginning of Libra and the beginning of Capricorn; and from the 21st of December to the 20th of March, between the beginning of Capricorn and beginning of Aries. And as one can never be at a loss to know in what quarter of the year he takes the sun's altitude and azimuth, the above caution with regard to the quarters of the ecliptic will keep him right as to the month and day thereof.

PROB. XXV. *To find the length of the longest day at any given place.*—If the place be on the N. side of the equator, find its latitude (by Prob. I.) and elevate the north pole to that latitude; then bring the beginning of Cancer to the brazen meridian, and set the hour-index to XII. at noon. But if the given place be on the S. side of the equator, elevate the south pole to its latitude, and bring the beginning of Capricorn to the brass meridian, and the hour-index to XII. This done, turn the globe westward, until the beginning of Cancer or Capricorn (as the latitude is N. or S.) comes to the horizon; and the index will then point out the time of sun-setting, for it will have gone over all the afternoon-hours, between mid-day and sun-set; which length of time being doubled, will give the whole length of the day from sun-rising to sun-setting. For, in all latitudes, the sun rises as long before mid-day as he sets after it.

PROB. XXVI. *To find in what latitude the longest day is of any given length less than 24 hours.*—If the latitude be N. bring the beginning of Cancer to the brazen meridian, and elevate the north pole to $66\frac{1}{2}$ degrees; but if the latitude be S. bring the beginning of Capricorn to the meridian, and elevate the south pole to $66\frac{1}{2}$ degrees; because the longest day in N. latitude is,

when the sun is in the first point of Cancer; and in S. latitude, when he is in the first point of Capricorn. Then set the hour-index to XII at noon, and turn the globe westward, until the index points at half the number of hours given; which done, keep the globe from turning on its axis, and slide the meridian down in the notches, until the aforesaid point of the ecliptic (viz. Cancer or Capricorn) comes to the horizon; then the elevation of the pole will be equal to the latitude required.

PROB. XXVII. *The latitude of any place, not exceeding $66\frac{1}{2}$ degrees, being given; to find in what climate the place is.*—Find the length of the longest day at the given place, (by Prob. XXV.) and whatever be the number of hours whereby it exceedeth twelve, double that number, and the sum will give the climate in which the place is.

PROB. XXVIII. *The latitude, and the day of the month, being given; to find the hour of the day, when the sun shines.*—Set the wooden horizon truly level, and the brazen meridian due N. and S. by a mariner's compass; then, having rectified the globe, stick a small sewing needle into the sun's place in the ecliptic, perpendicular to that part of the surface of the globe; this done, turn the globe on its axis, until the needle comes to the Brazen meridian, and set the hour-index to XII at noon; then turn the globe on its axis, until the needle points exactly towards the sun, and the index will shew the hour.

DIRECTIONS FOR USING THE CELESTIAL GLOBE.

The celestial globe is of admirable use for exhibiting the celestial properties of places: we shall therefore now proceed to the use of this globe, premising, that as the equator, ecliptic, tropics, polar circles, horizon, and brazen meridian, are exactly alike on both globes, all the former problems concerning the sun are solved in the same way. The method also of rectifying the globe is the same. N. B. The sun's place for any day of the year stands directly over that day on the horizon of the celestial globe, as on the terrestrial. The latitude and longitude of the stars, and of all other celestial phenomena, are reckoned differently from that of places on the earth: for all terrestrial latitudes are reckoned from the equator; and longitudes from the meridian of some remarkable place; but all astronomers reckon the latitudes of the heavenly bodies from the ecliptic; and their longitudes from the equinoctial colure, in that semicircle of it which cuts the ecliptic at the beginning of Aries; and thence eastward, quite round; so that stars between the equinoctial and the northern half of the ecliptic, have north declination and south latitude; those, between the equinoctial and the southern half of the ecliptic have south declination and north latitude; and all between the tropics and poles, have declinations and latitudes of the same denomination. There are six great circles on the celestial globe, which cut the ecliptic perpendicularly, and meet in two opposite points in the polar circles; which points are each ninety degrees from the ecliptic, and are called its poles. These polar points divide those circles into 12 semicircles; which cut the ecliptic at the beginning of the twelve signs. They resemble so many meridians on the terrestrial globe; and as all places which lie under any particular meridian-semicircle on that globe have the same longitude; so all those points of the heaven, through which any of the above semicircles are drawn, have the same longitude. And as the greatest latitudes on the earth are at the north and south poles of the earth, so the greatest latitudes in the heavens are at the north and south poles of the ecliptic. For the division of the stars into constellations, &c. See ASTRONOMY.

PROB. I. *To find the right ascension and declination of the sun, or any fixed star.*—Bring the sun's place in the ecliptic to the brazen meridian: then that degree in the equinoctial which is cut by the meridian, is the sun's right ascension; and that degree of the meridian which is over the sun's place is his declination. Bring any fixed star to the meridian, and its right ascension will be cut by the meridian in the equinoctial; and the degree of the meridian that stands over it is its declination. So that right ascension and declination, on the celestial globe, are found in the same manner as longitude and latitude on the terrestrial.

PROB. II. *To find the latitude and longitude of any star.*—If the given star be on the north side of the ecliptic, place the 90th degree of the quadrant of altitude on the north pole of the ecliptic, where the 12 semicircles meet, which divide the ecliptic into the 12 signs; but if the star be on the S. side of the ecliptic, place the 90th degree of the quadrant on the south pole of the ecliptic: keep-

ing the 90th degree of the quadrant on the proper pole, turn the quadrant about, until its graduated edge cuts the star: then the number of degrees in the quadrant, between the ecliptic and the star, is its latitude; and the degree of the ecliptic cut by the quadrant, is the star's longitude, reckoned according to the sign in which the quadrant then is.

PROB. III.—*To represent the face of the starry firmament, as seen from any given place of the earth, at any hour of the night.*—Rectify the celestial globe for the given latitude, the zenith, and sun's place in every respect, as taught by the XVIth problem for terrestrial; and turn it about, until the index points to the given hour: then the upper hemisphere of the globe will represent the visible half of the heaven for that time; all the stars upon the globe being then in such situations as exactly correspond to those in the heaven. And if the globe be placed duly north and south, every star in the globe will point toward the like star in the heaven: by which means the constellations and remarkable stars may be easily known; all those stars under the upper part of the brazen meridian, between the south point of the horizon and the north pole, are at their greatest altitude, if the latitude of the place be N. but if the latitude be S. those stars which lie under the upper part of the meridian, between the north point of the horizon and the south pole, are at their greatest altitude.

PROB. IV.—*The latitude of the place, and day of the month, being given; to find the time when any known star will rise, or be upon the meridian, or set.*—Having rectified the globe, turn it about until the given star comes to the eastern side of the horizon, and the index will shew the time of the star's rising; then turn the globe westward, and when the star comes to the brazen meridian, the index will shew the time of the star's coming to the meridian of your place; lastly, turn on, until the star comes to the western side of the horizon, and the index will shew the time of the star's setting. N. B. In northern latitudes, those stars which are less distant from the north pole than the quantity of its elevation above the north point of the horizon never set; and those which are less distant from the south pole than the number of degrees by which it is depressed below the horizon never rise: and vice versa in southern latitudes.

PROB. V.—*To find at what time of the year a given star will be upon the meridian at a given hour of the night.*—Bring the given star to the upper semicircle of the brass meridian, and set the index to the given hour; then turn the globe, until the index points to XII at noon, and the upper semicircle of the meridian will then cut the sun's place, answering to the day of the year sought; which day may be easily found against the like place of the sun among the signs on the wooden horizon.

PROB. VI.—*The latitude, day of the month, and azimuth of any known star, being given; to find the hour of the night.*—Having rectified the globe for the latitude, zenith, and sun's place, lay the quadrant of altitude to the given degree of azimuth in the horizon: then turn the globe on its axis, until the star comes to the graduated edge of the quadrant; and when it does, the index will point out the hour of the night.

PROB. VII.—*The latitude of the place, the day of the month, and altitude of any known star, being given; to find the hour of the night.*—Rectify the globe as in the former problem, guess at the hour of the night, and turn the globe until the index points at the supposed hour; then lay the graduated edge of the quadrant of altitude over the known star; and if the degree of the star's height in the quadrant upon the globe answers exactly to the degree of the star's observed altitude in the heaven, you have guessed exactly; but if the star on the globe is higher or lower than it was observed to be in the heaven, turn the globe backwards or forwards, keeping the edge of the quadrant upon the star, until its centre comes to the observed altitude in the quadrant; and then the index will shew the true time of the night.

PROB. VIII.—*An easy method for finding the hour of the night by any two known stars, without knowing either their altitude or azimuth; and then of finding both their altitude and azimuth, and thereby the true meridian.*—Tie one end of a thread to a common musket-bullet; and having rectified the globe as above, hold the other end of the thread in your hand, and carry it slowly round betwixt your eye and the starry heaven, until you find it cuts any two known stars at once. Then guessing at the hour of the night, turn the globe until the index points to that time in the hour-circle; which done, lay the graduated edge of the quadrant over any one

of these two stars on the globe which the thread cuts in the heaven. If the said edge of the quadrant cuts the other star also, you have guessed the time exactly; but if it does not, turn the globe slowly backwards or forwards, until the quadrant (kept upon either star) cuts them both through their centres: and then the index will point out the exact time of the night; the degree of the horizon cut by the quadrant will be the true azimuth of both these stars from the south; and the stars themselves will cut their true altitudes in the quadrant. At which moment, if a common azimuth-compass be so set upon a floor or level pavement, that these stars in heaven may have the same bearing upon it (allowing for the variation of the needle) as the quadrant of altitude has in the wooden horizon of the globe, a thread extended over the north and south points of that compass will be directly in the plane of the meridian; and if a line be drawn upon the floor or pavement, along the course of the thread, and an upright wire be placed in the southmost end of the line, the shadow of the wire will fall upon that line, when the sun is on the meridian, and shines upon the pavement.

PROB. IX.—*To find the place of the moon, or of any planet; and thereby to shew the time of its rising, southing, and setting.*—Seek in an almanack or ephemeris the geocentric place of the moon or planet in the ecliptic, for the given day of the month; and according to its longitude and latitude, as shewn by the ephemeris, mark the same with chalk upon the globe. Then, having rectified the globe, turn it round its axis westward; and as the said mark comes to the eastern side of the horizon, to the brazen meridian, and to the western side of the horizon, the index will shew at what time the planet rises, comes to the meridian, and sets, in the same manner as it would do for a fixed star.

The most esteemed globes are those of Mr. Jones, mathematical instrument-maker, Holborn, who mounts them so as to retain the principal improvements which have been made by the different authors, who have applied to this subject.

Most of the above problems may also be performed by accurate maps; but this requires a great deal of calculation, which is often very troublesome. The Analemma, or Orthographic Projection, delineated on Plate LXXXI, fig. 3, will solve many of the most curious; and with the assistance of the maps will be almost equivalent to a terrestrial globe. The parallel lines drawn on this figure represent the degrees of the sun's declination from the equator, whether N. or S. amounting to $23\frac{1}{2}$ nearly. On these lines are marked the months and days which correspond to such declinations. The size of the figure does not admit of having every day of the year inserted; but by making allowance for the intermediate days, in proportion to the rest, the declination may be guessed at with tolerable exactness. The elliptical lines are designed to shew the hours of sun-rising or sun-setting, before or after six o'clock. As 60 minutes make an hour of time, a fourth part of the space between each of the hour-lines will represent 15 minutes; which the eye can readily guess at, and which is as great exactness as can be expected from any mechanical invention, or as is necessary to answer any common purpose. The circles drawn round the centre at the distance of $11\frac{1}{4}$ each, shew the point of the compass on which the sun rises and sets, and on what point the twilight begins and ends. To make use of this analemma, it is only necessary to consider, that, when the latitude of the place and the sun's declination are both north or both south, the sun rises before six o'clock, between the east and the elevated pole; that is, towards the north, if the latitude and declination are north; or towards the south, if the latitude and declination are south. Let us now suppose it is required to find the time of the sun's rising and setting, the length of the days and nights, the time when the twilight begins and ends, and what point of the horizon the sun rises and sets on, for the Lizard point in England, Frankfort in Germany, or Abbeville in France, on the 30th of April. The latitude of these places by the maps will be found nearly 50° north. Place a scale or moveable index from the centre, so that its point may touch 50° on the quadrant of north latitude in the figure; then observe where its edge cuts the parallel line on which April 30th is wrote. From this reckon the hour-lines towards the centre, and you will find that the parallel line is cut by the index nearly at the distance of one hour and 15 minutes. So the sun rises at one hour 15 minutes before six, or 45 minutes after four in the morning, and sets 15 minutes after seven in the evening. The length of the day is 14 hours 30 minutes. Observe how far the intersections of the edge of the index with the parallel of April 30th.

30th is distant from any of the concentric circles; which you will find to be a little beyond that marked two points of the compass; and this shews, that on the 30th of April the sun rises two points and somewhat more from the east towards the north, or a little to the northward of E. N. E. and sets a little to the northward of W. N. W. To find the beginning and ending of twilight, take from the graduated arch of the circle 18 degrees with a pair of compasses; move one foot of the compasses extended to this distance along the parallel for the 30th of April, till the other just touches the edge of the index, which must still point at 50. The place where the other foot rests on the parallel of April 30th then denotes the number of hours before six at which the twilight be-

gins. This is somewhat more than three hours and an half; which shews, that the twilight then begins soon after two in the morning, and likewise that it begins to appear near five points from the east towards the north. The uses of this analemma may be varied in a great number of ways; but the example just now given will be sufficient for the ingenious reader. The small circles on the same plate, marked Island, Promontory, &c. are added, to render the maps more intelligible, by shewing how the different subjects are commonly delineated on them. If an analemma of this kind be accurately drawn from a large scale, it will be found very useful and instructive.

GEOLOGY.

GEOLOGY, [*γῆ* and *λογος*,] the science which treats on the formation and structure of the earth. This science is crowded with difficulties; the locality of our situation, the short period allotted us for investigations, the very small depth, to which we can penetrate below the earth's surface, and the contracted extent of excavations which can be made by art, render our knowledge of the formation and structure of the earth, very deficient and contracted. Hence have arisen widely varying theories of the earth, some of which, though framed by philosophers, are more wild and fanciful than the visionary scenes of the poets. However we find some rational intelligence in the "Elements of Geognosy," by Professor Jameson, who places in a beautiful view the system of the celebrated Werner. We shall select a few observations from this treatise, and refer to the work itself for fuller information. "When we examine the surface of the globe particularly, a certain locality of its inequalities is to be observed. Thus the most considerable inequalities, those, namely, which present the most frequent and the deepest sections and fissures, are always found in the more elevated regions; while in the lower places, we observe very few, and by no means special elevations and depressions. We further observe, that the masses of which the higher and lower parts of the earth are composed, are by no means of the same nature; elevated, rugged, and very uneven places, are mostly composed of rocky masses, which present to the eye rough, bare, fissured cliffs, mural precipices, and even entire rocky valleys. On the other hand, in the lower parts of the earth, we find in general earthy masses, as clay, loam, sand, and rolled stones; but neither cliffs, nor rocky valleys; and only single blocks of the materials of the more elevated places. The rocks of which the elevated parts of the earth are composed, are also different, according to their local situation. Thus the most elevated parts are principally composed of fossils belonging to the flint, clay, and talc genera, as quartz, felspar, mica, and chlorite, and these are usually crystallized. The elevations, which are somewhat lower, or those of middle height, are composed of clayey fossils. The calcareous genus here makes its appearance in considerable quantity, and increases very much; so that at length, in the form of gypsum and limestone, it forms the prevalent substance in the lower rocky places. Even in still lower places, we meet with formations of flinty fossils, derived from rocks that compose the higher parts of the globe, as sand-stone. The sand and gravel which occur in still lower situations, are nearly allied to the last-mentioned rocks. There is still another general and very interesting observation to be made, namely, that the remains of organic beings, more or less changed (what are denominated petrifications,) are found imbedded in these rocks. These remarkable bodies are generally found in the middle and lower heights of the earth. In the middle heights they are still very rare; but they increase in variety and number as we approach the lower places, and are at length accumulated in immense quantities in the lowest parts. We also observe that the organic remains found in the middle heights are totally changed

into stone, but the more we descend into the lower places, the more these bodies appear unaltered, or approach to their original state. It is also observed, that the higher places afford different genera and species of petrifications from those found in the lower; and although we are able to shew the originals of many of those bodies, which are found in the lower places, as proofs of their origin, there occur in the middle heights some whose originals we are ignorant of. Lastly, we may remark, that in all the situations already mentioned, that is, from the middle to the lowest height, but particularly in the latter, there are some rocks, in which few or no traces of such bodies have ever been found; although from the local situation of the rocks, we might readily expect to find petrifications in them, as in other rocks of the same relative height. When we examine the surface of the earth more particularly, we find that the special inequalities are included in others more general; that these general inequalities are again contained in others still more general; and that at length the whole are included in the most general. Those inequalities may be divided into five classes or degrees. The first contains the most general inequalities; these are the bottom of the sea and the dry land. The second comprehends what may be termed low country, and high country. The third, which is more special, comprehends mountain-groups. The fourth, which is still more particular, comprehends mountain-chains and valleys. The fifth and last, which is most special, comprehends single mountains, and the ravines or valleys between them. We have thus a most beautiful series from the single mountain and the ravine, to the great fabric of the high country, and still further to the most general division of the inequalities of the earth's surface, the dry land and the bottom of the sea." According to the system of Werner, the earth is supposed to have existed originally in a fluid state, which appears to be evinced from the figure of the earth, and from the substances composing the different rocks and mountains, as well as from their formations. From a very attentive consideration, and close investigation of this subject, which is evidenced every where in his work, he has determined the order of the different formations as follows:

I. CLASS. Primitive Rocks. By the earliest separations from the chaotic mass, which are discovered in the crust of the globe, was formed a class of rocks, which are therefore termed primitive rocks, being chiefly composed of silex, alumina, and magnesia, constituting by their various intermixtures, 1. granite; 2. gneiss; 3. mica-slate; 4. clay-slate; 5. primitive lime-stone; 6. primitive trap; 7. serpentine; 8. porphyry; 9. sienite; 10. topaz-rock; 11. quartz-rock; 12. primitive flinty-slate; 13. primitive gypsum; 14. white-stone. The circumstances which chiefly mark the high antiquity of these rocks are, that they form the fundamental rock of the other classes; and that the outgoings of their strata are generally higher than those of the other classes. Having been formed in the uninhabitable state of the globe, they contain no petrifications; and, excepting the small portion which sometimes accom-

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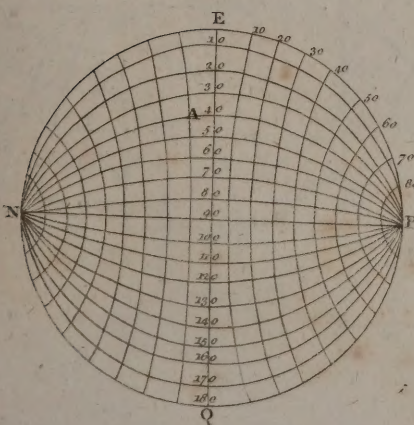
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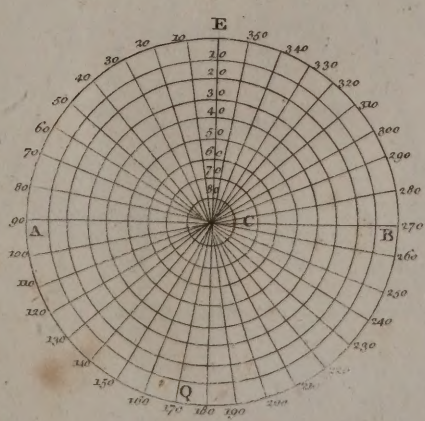
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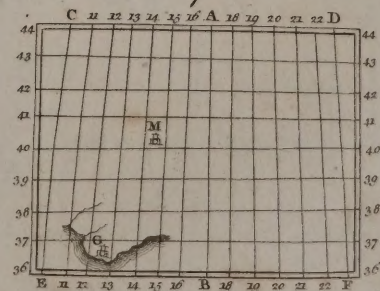
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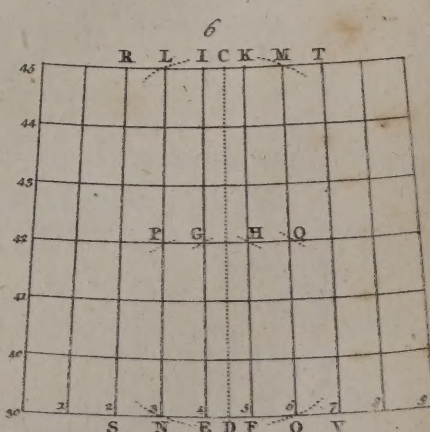
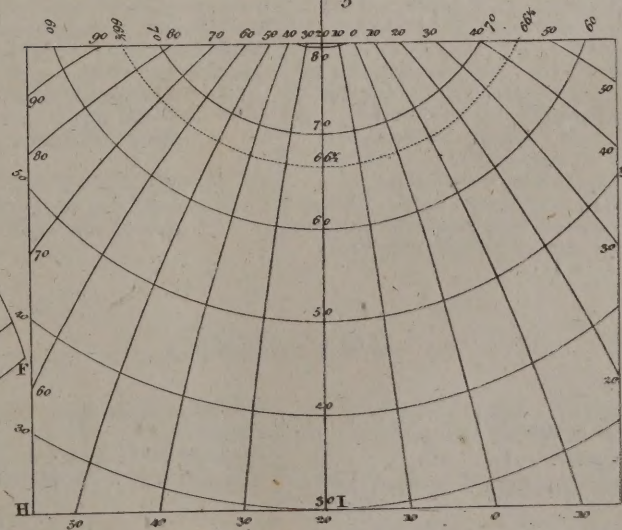
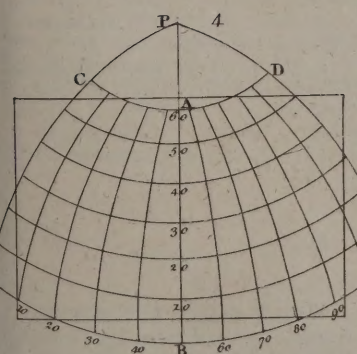
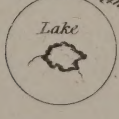
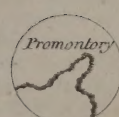
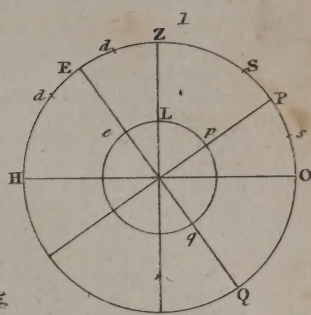
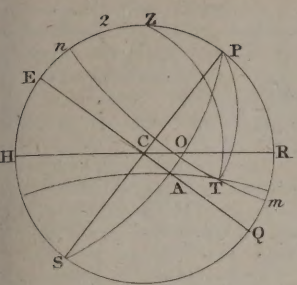
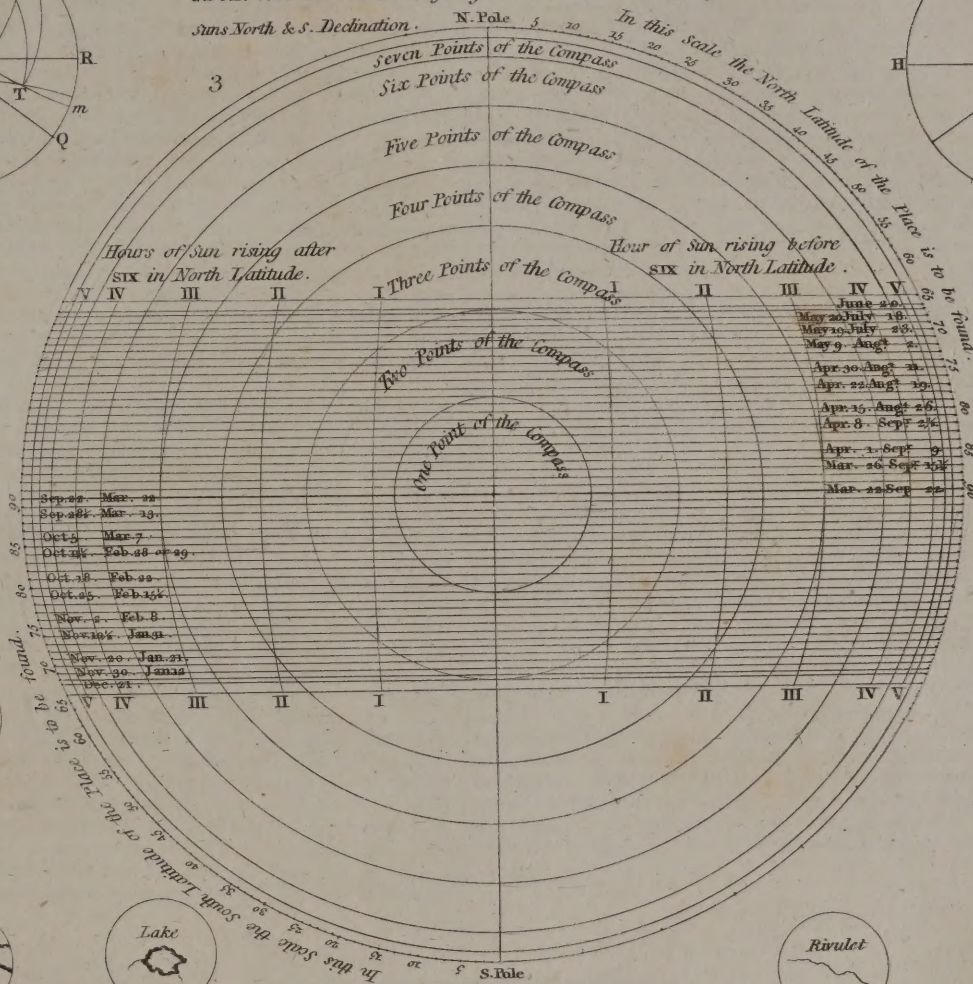
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GEOGRAPHY.

An Analemma, shewing the time of Sun rising and sun setting, the length of the Days and Nights, & the point of the Compass on which the Sun rises and sets, for every Degree of Latitude & for every Degree of the Sun's North & S. Declination.



company those which will be next mentioned, they contain no mechanical deposits, but are throughout pure chemical productions. Small portions of carbonaceous matter occur only in the newer members of the class.

II. CLASS. *Transition Rocks.* On the appearance of land, or during the transition of the earth from its chaotic to its habitable state, rocks which, from this circumstance, are denominated transition-rocks, were formed. In these rocks the first slight traces of petrifications, and of mechanical depositions, are to be found. The species of rocks which come under this class are the transition lime-stone, transition-trap, grey-wacke, and flinty-slate. The petrifications are corallites, encrinites, pentacrinites, entrochites, and trochites. The lime-stone of Derbyshire is said to be of this kind. As the former class of rocks were purely of chemical formation, so the contents of these are chiefly chemical productions, mingled with a small proportion of mechanical depositions. To explain the cause of this mixture, we are referred to the period of their formation, that at which the summits of the primitive mountains just appeared above the waters, when, by the attrition excited by the motion of the waves, and which we are reminded extends to no great depth, particles of the original mountains were worn off and deposited.

III. CLASS. *Flatz Rocks.* As the height of the level of the ocean diminished, so would the surface on which its waves acted increase, and of course the quantity of the mechanical depositions. Hence these are much more abundant in the rocks of the next formation, which are denominated flatz rocks, on account of their being generally disposed in horizontal or flat strata. In these, petrifications are very abundantly found, having been formed whilst vegetables and animals existed in great numbers. These rocks are generally of very wide extent, and commonly placed at the feet of primitive mountains. They are seldom of very great height, from whence it may be inferred, that the water had considerably subsided at the time of their formation, and did not then cover the whole face of the earth. Countries composed of these rocks are not so rugged in their appearance, nor so marked by rapid inequalities, as those in which the primitive and transition-rocks prevail. The formations of this class are supposed to be, 1. first or old red sand-stone; 2. first or oldest flatz lime-stone; 3. first or oldest flatz gypsum; 4. second or variegated sand-stone; 5. second flatz gypsum; 6. second flatz or shell lime-stone; 7. third flatz sand-stone; 8. Rock-salt formation; 9. chalk-formation; 10. flatz-trap formation; 11. independent coal-formation; 12. newest flatz-trap formation. Most of the rocks which have been just enumerated are covered by the formations

which is named the newest flatz trap. This formation also covers many of the high primitive mountains: it has but little continuity, but is very widely distributed. It contains considerable quantities of mechanical deposits, such as clay, sand, and gravel. The remains both of vegetables and animals also occur very abundantly in these deposits. Heaps of trees and of parts of plants, and an abundance of shells and other marine productions, with the horns of stags, and great beds of bituminous fossils, point out the lateness of the period when this formation was deposited. In this formation several rocks occur which are also met with in other flatz-formations; but the following are supposed to be peculiar to this class, basalt, wacke, grey-stone, porphyry slate and trap tuff. These rocks are said to have been formed during the settling of the water consequent to a vast deluge, which is supposed to have taken place when the surface of the earth was covered with animals and vegetables, and when much dry land existed. From various appearances observed in these rocks it is concluded, that the waters, in which they were formed, had risen with great rapidity, and had afterwards settled into a state of considerable calmness.

IV. CLASS. *Alluvial Rocks.* The collections and deposits derived from the materials of pre-existing masses, worn down by the powerful agency of air and water, and afterwards deposited on the land or on the sea-coasts, are termed alluvial, and are, of course, of much later formation than any of the preceding classes. These deposits may be divided into, 1. Those which are formed in mountainous countries, and are found in vallies, being composed of rolled masses, gravel, sand, and sometimes loam, fragments of ores, and different kinds of precious stones. 2. Those which occur in low and flat countries, being peat, sand, loam, bog iron-ore, nagelflech, calc-tuff and calc-sinter: the three latter being better known by the names breccia, tufa, and stalactite.

V. CLASS. *Volcanic Rocks.* The abovementioned formations are called *aquatic*, as being effected principally in aqueous solutions, or by the agency of water. This class is termed igneous, because it is effected by means of fire, and is the last in the arrangement because of its newness. In this class are these substances, viz. 1. burnt-clay; 2. porcelain-jasper; 3. earth-slug; 4. columnar clay-iron stone; 5. polishing slate; 6. ejected stones, and ashes; 7. different kinds of lava; 8. the matter of muddy eruptions. The five first are called pseudo-volcanic rocks; the three last, true volcanic rocks. The reader who wishes to pursue this subject, will find much profit and pleasure in the perusal of Professor Jameson's Treatise on Geognosy which we have already noticed.

GEOMANCY, or GEOMANTIA, is performed by means of a number of little points, or dots, made on paper at random; and by forming from the various lines and figures which those points present, a pretended judgment of futurity, upon any question proposed. The word is derived from the Greek, *γῆα*, earth, and *μαντεία*, divination; it being the ancient custom to cast little pebbles on the earth, and thence to form their conjectures, instead of the points afterwards made use of.

GEOMETRICAL CONSTRUCTION, or CONSTRUCTION OF EQUATIONS. See ALGEBRA and EQUATION.

GEOMETRICAL CURVES. See ALGEBRA and CURVES.

GEOMETRICAL LINE. See LOCUS.

GEOMETRICAL PACE, a measure five feet long.

GEOMETRICAL PROGRESSION, a progression in which the terms have all successively the same ratio; as, 1, 2, 4, 8, 16, &c. where the common ratio is 2. See ALGEBRA.

GEOMETRICAL PROPORTION is the similitude or equality of ratios, called also simply Proportion. See GEOMETRY.

GEOMETRICAL SERIES. See ALGEBRA.

GEOMETRICAL SOLUTION is when a problem is resolved according to the strict rules of geometry, and by lines truly geometrical. This expression is used in contradistinction to an arithmetical, instrumental, or mechanical solution.

GEOMETRICUS LOCUS. See LOCUS.

GEOMETRY.

GEOMETRY, [*γῆα*, the earth, and *μετρεω*, to measure,] originally signified the art of measuring the earth, or any distances or dimensions on or within it; but it is now used for the science of quantity, extension, or magnitude, abstractedly considered, with-

out any regard to matter. Geometry, together with arithmetic, now forms the chief foundation of all the mathematics.

HISTORY.

The invention of geometry is generally ascribed to the Egyptians.

tians. Herodotus, Diodorus, Strabo, and Proclus, all agree that the annual inundations of the Nile gave rise to it, by carrying away the land-marks and boundaries of estates and farms; and covering the surface of the ground with mud, which effaced every trace of their former limits. Hence the Egyptians were obliged every year to distinguish and lay out their lands by the consideration of their figure and quantity, that every person might have his own property: and thus, by repeated experience and practice, in drawing figures, lines, and schemes, for this purpose, they gradually formed an art which, from its origin, in the measuring of lands, the Greeks at last named *Γεωμετρία*, Geometry, from *γη* or *γῆ*, the land or earth, and *μετρον*, a measure, from *μετρον* to measure; hence the Romans called this science *geometria*, the French *geometrie*, &c. By farther contemplation of the draughts of figures, their wonderful properties were more and more discovered, and the art continually gained ground and improved, by the discoveries of succeeding mathematicians. This appears to be the most probable origin of this science; though Josephus seems to ascribe the invention to the Hebrews; while others of the ancients make Mercury the inventor. Polyd. Virg. de Inv. Rer. l. 1. c. 18. Thales is said to have introduced this science from Egypt into Greece; where it was greatly cultivated and improved by himself, as well as by Pythagoras, Anaxagoras of Clazomene, Hippocrates of Chios, and Plato; who testified his conviction of the necessity and importance of Geometry to the successful study of Philosophy, by inscribing over the door of his Academy, "Let no one ignorant of Geometry enter here." Plato thought the word Geometry too mean a name for this science; and substituted instead of it the more extensive name of Mensuration; and after him others gave it the title of Pantometry. But even these are now become too confined in their import, fully to comprehend its extent; for it not only inquires into, and demonstrates the quantities of magnitudes, but also their qualities, as the species, figures, ratios, positions, transformations, descriptions, divisions, the finding of their centres, diameters, tangents, asymptotes, curvatures, &c. About 50 years after Plato, Euclid collected together all those theorems, which had been invented by his predecessors in Egypt and Greece, and digested them into 15 books, entitled "The Elements of Geometry;" demonstrating and arranging the whole in a very accurate and perfect manner. The next to Euclid, of those ancient authors whose works are extant, is Apollonius Pergæus, who flourished in the reign of Ptolemy Euergetes, about B. C. 230, and 100 years after Euclid. He was author of the first and principal work on Conic Sections; on account of which, and his other accurate and ingenious geometrical works, he acquired from his patron the emphatical appellation of the Great Geometrician. The contemporary with Apollonius, or perhaps a few years, before him, flourished Archimedes, celebrated for his extraordinary mechanical inventions during the siege of Syracuse, and no less so for his many ingenious geometrical compositions. Eudoxus of Cnidus, Archytas of Tarentum, Philolaus, Eratosthenes, Aristarchus of Samos, Dinostratus, the inventor of the quadratrix, Menæchmus his brother, and the disciple of Plato, the two Aristeuses, Conon, Thracidius, Nicoteles, Leon, Theudius, Hermotimus, Hero, and Nicomedes, the inventor of the conchoid; besides many other ancient geometricians, have contributed to the improvement of geometry. The Greeks continued their attention to it, even after they were subdued by the Romans; whereas the Romans themselves were so little acquainted with it, even in the most flourishing time of their republic, that Tacitus informs us they gave the name of mathematicians to those who pursued the chimeras of divination and judicial astrology. Nor does it appear they were disposed to cultivate geometry during the decline, and after the fall of the Roman empire. But the case was different with the Greeks; among whom are found many excellent geometricians since the commencement of the Christian era, and after the translation of the Roman empire. Ptolemy lived under Marcus Aurelius; and we have still extant the works of Pappus of Alexandria, who lived in the time of Theodosius; the commentary of Eutocius, the Ascalonite, who lived about A. D. 540, on Archimedes's mensuration of the circle; and the commentary on Euclid, by Proclus, who lived under the empire of Anastasius. The consequent inundation of ignorance and barbarism was unfavourable to geometry, as well as to the other sciences; and the few who applied themselves to this science, were calumniated as magicians. However, in those times of European darkness, the

Arabians were distinguished as the guardians and promoters of science; and from the 9th to the 14th century, they produced many astronomers, geometricians, geographers, &c.; from whom the mathematical sciences were again received into Spain, Italy, and the rest of Europe, somewhat before the year 1400. Some of the earliest writers after this period, are Leonardus Pisanus, Lucas Pacciolus or De Burgo, and others between 1400 and 1500. And after this appeared many editions of Euclid, or commentaries upon him: thus, Orontius Finæus, in 1530, published a commentary on the first six books; as did James Peletarius, in 1556; and about the same time Nicholas Tartaglia published a commentary on the whole 15 books. There have been also the editions, or commentaries, of Commandine, Clavius, Billingsly, Scheubelius, Herlinus, Dasypodius, Ramus, Herigon, Stevinus, Saville, Barrow, Tacquet, Dechales, Fournier, Scarborough, Keill, Stone, and many others; but the completest edition of all the works of Euclid, is that of Dr. Gregory, printed at Oxford in 1703, in Greek and Latin. The edition of Euclid, by Dr. Robert Simson of Glasgow, containing the first six books, with the 11th and 12th, is much esteemed for its correctness. The principal other elementary writers, besides the editors of Euclid, are Pardies, Marchetti, Wolfius, Simpson, &c. And among those who have gone beyond Euclid in the nature of the elementary parts of geometry, may be chiefly reckoned, Apollonius, in his *Cônes*, his *Loci Plani*, *De Sectione Determinata*, his *Tangencies*, *Inclinations*, *Section of a Ratio*, *Section of a Space*, &c.; Archimedes, in his treatises of the *Sphere* and *Cylinder*, the *Dimension of the Circle*, of *Conoids* and *Spheroids*, of *Spirals*, and the *quadrature of the Parabola*: Theodosius, in his *Spherics*, Serenius, in his *Sections of the Cone and Cylinder*; Kepler's *Nova Stereometria*; Cavalieri's *Geometria Indivisibilium*; Torricelli's *Opera Geometrica*; Viviani in his *Divinationes Geometricæ*, *Exercitatio Mathematica*, *De Locis Solidis*, *De Maximis et Minimis*, &c.; Vieta, in his *Effectio Geometrica*, Supplement. *Geometria*, *Sectiones Angulares*, *Responsum ad Problema*, Apollonius Gallus, &c.; Gregory St. Vincent's *Quadratura Circuli*; Fermat's *Varia Opera Mathematica*; Dr. Barrow's *Lectiones Geometricæ*; Bulliald de *Lineis Spiralibus*; Cavalieri; Schooten and Gregory's *Exercitationes Geometricæ*, and Gregory's *Pars Universalis*, &c.; De Billy's treatise *De Proportionibus Harmonicis*; La Douera's *Geometria Veterum promota*; Slusius *Mesolabium*, *Problemata Solida*, &c.; Wallis in his treatises *De Cycloide*, *Cissoide*, &c.; *De Proportionibus*, *De Sectionibus*, *Conicis*, *Arithmetica Infinitorum*, *De Centro Gravitatis*, *De Sectionibus Angularibus*, *De Angulo Contactus*, *Cuno Cuneus*, &c. &c.; Hugo De Omerique, in his *Analysis Geometrica*; Pascal on the *Cycloid*; Steph. Angeli's *Problemata Geometrica*; Alex. Anderson's *Suppl. Redivivi*, *Variorum Problemata Practica*, &c.; Baroni's *Geomet. Prob.* &c.; Guido Grandini *Geometr. Demonstr.* &c.; Ghetaldi Apollonius *Redivivus*, &c.; Ludolph van Colen or a Ceulen, de *Circulo et Adscriptis*, &c.; Snell's Apollonius *Batavus*, *Cyclometricus*, &c.; Heberstein's *Diotomo Circulorum*; Palma's *Exercit. in Geometriam*; Guldini *Centro Baryca*; with several others equally eminent, of more modern date, as Dr. Rob. Simson, Dr. Mat. Stewart, Mr. Tho. Simpson, &c. Since the introduction of the new geometry, or the geometry of curve lines, as expressed by algebraical equations, in this part of geometry, the following names, among many other, are more especially to be respected, viz. Des Cartes, Schooten, Newton, Maclaurin, Brackenridge, Cramer, Cotes, Waring, &c. &c. As to the subject of practical geometry, the chief writers are Beyer, Kepler, Ramus, Clavius Mallet, Tacquet, Ozanami, Wolfius, Gregory, with innumerable others. On the whole, the history of geometry may be divided into four grand eras; viz. 1. From its invention to its introduction into Greece by Thales: 2. From that period to its meridian-glory under Euclid; 3. From Euclid and Archimedes to Descartes, who, by applying algebra to the elements of geometry, gave a new turn to this science: and, 4. From Descartes to its perfection by Sir Isaac Newton and M. Leibnitz, who introduced still greater improvements by the application of Fluxions. This science is generally divided into two parts: viz. I. Theoretical Geometry, containing the general principles of the science: and, II. Practical Geometry, or the application of these principles to the mensuration of surfaces, solids, &c. We shall in the sequel of this article treat of these two grand branches of Geography in the order just laid down.

PART I.

THEORETICAL GEOMETRY;

OR, GENERAL PRINCIPLES OF THE SCIENCE.

Of STRAIGHT LINES and PLANE FIGURES.

DEFINITIONS.

1. A POINT is that which has position, but not magnitude.
2. A LINE is length without breadth or thickness; the extremities of a line are therefore points.
3. A RIGHT LINE, or STRAIGHT LINE, is that which lies evenly between its extreme points. Fig. 1. Plate LXXXII. and LXXXIII.
4. A SUPERFICIES is that which has only length and breadth; the extremities of a superficies are therefore lines, and the intersections of superficies with one another are also lines.
5. A PLANE SUPERFICIES is that in which any two points being taken, the straight line between them lies wholly in that superficies.
6. A PLANE RECTILINEAL ANGLE is the inclination of two straight lines to one another, which meet together, but are not in the same straight line. Fig. 2.
- Note. When several angles are formed at the same point, as at B, fig. 3, each particular angle is described by three letters, whereof the middle one shews the angular point, and the other two the lines that form the angle thus, CBD, or DBC, denotes the angle contained by the lines CB and DB.
7. When a straight line standing on another straight line makes the adjacent angles equal to one another, each of the angles is called a RIGHT ANGLE, and the straight line which stands on the other is called a PERPENDICULAR. Fig. 4.
8. An OBTUSE ANGLE is that which is greater than a right angle. Fig. 5.
9. An ACUTE ANGLE is that which is less than a right angle. Fig. 6.
10. PARALLEL STRAIGHT LINES are such as are in the same plane, and which being produced ever so far both ways do not meet. Fig. 7.
11. A FIGURE is that which is enclosed by one or more boundaries.
12. RECTILINEAL FIGURES are those which are contained by straight lines.
13. Every plane figure bounded by three straight lines is called a TRIANGLE, of which the three straight lines are called the SIDES, that side upon which the triangle is conceived to stand is called the BASE, and the opposite angular point the VERTEX.
14. An EQUILATERAL TRIANGLE is that which has three equal sides. Fig. 8.
15. An ISOSCELES TRIANGLE is that which has only two equal sides. Fig. 9.
16. A SCALENE TRIANGLE is that which has all its sides unequal. Fig. 11.
17. A RIGHT-ANGLED TRIANGLE is that which has a right angle. Fig. 10.
18. An OBTUSE-ANGLED TRIANGLE is that which has an obtuse angle. Fig. 11.
19. An ACUTE-ANGLED TRIANGLE is that which has all its angles acute. Fig. 12.
20. Every plane figure bounded by four straight lines is called a QUADRILATERAL, and the right line joining the opposite angles is called a DIAGONAL.
21. A PARALLELOGRAM is a quadrilateral of which the opposite sides are parallel. Fig. 13.
22. A RECTANGLE is a parallelogram which has all its angles right angles. Fig. 14.
23. A SQUARE is a parallelogram which has all its sides equal, and all its angles right. Fig. 15.
24. A RHOMBUS is a parallelogram which has all its sides equal. Fig. 17.
25. A TRAPEZIUM is a quadrilateral which has not its opposite sides parallel. Fig. 18.
26. A TRAPEZOID is a quadrilateral which has two of its opposite sides parallel. Fig. 19.
27. Plane figures bounded by more than four straight lines are called POLYGONS. Fig. 16.
28. A PENTAGON is a polygon of five sides; a HEXAGON hath

six sides; a HEPTAGON seven; an OCTAGON eight; a NONAGON nine; a DECAGON ten; an UNDECAGON eleven; and a DODECAGON hath twelve sides.

29. A REGULAR POLYGON hath all its sides, and all its angles, equal; if they be not equal, the polygon is IRREGULAR.

30. A CIRCLE is a plane figure bounded by one line called the circumference, which is such that all straight lines drawn to it from a certain point within it called the centre are equal; and these straight lines are called the RADII of the circle. The circumference itself is also often called a circle. Fig. 20.

31. The DIAMETER of a circle is a straight line passing through the centre, and terminated both ways by the circumference, as AB. Fig. 20.

32. An ARC of a circle is any part of its circumference, as ABC. Fig. 21.

33. A CHORD is a straight line joining the extremities of an arc, as AC. Fig. 21.

34. A SEGMENT is any part of a circle bounded by an arc and its chord, as ABCA. Fig. 21.

35. A SEMICIRCLE is half the circle, or a segment cut off by a diameter. The half-circumference is also sometimes called a semicircle. Fig. 20.

36. A SECTOR is any part of a circle which is bounded by an arc, and two radii drawn to its circumference, as ABC. Fig. 22.

37. A QUADRANT, or quarter of a circle, is a sector having a quarter of a circle for its arc, and its two radii are perpendicular to each other. A quarter of the circumference is also called a quadrant, as ABC. Fig. 23.

38. The HEIGHT or ALTITUDE of a figure is a perpendicular let fall from an angle or its vertex to the opposite side or base, as FE. Fig. 24.

39. In a right-angled triangle the side opposite the right angle is called the HYPOTHENUSE, and the other two sides are called the LEGS, or sides, or sometimes the base and perpendicular. Fig. 10.

40. The circumference of every circle is supposed to be divided into 360 equal parts called DEGREES, and each degree into 60 MINUTES, each minute into 60 SECONDS, and so on. Hence a semicircle contains 180 degrees, and a quadrant 90 degrees.

41. The MEASURE of a RECTILINEAL ANGLE is an arc of any circle contained between the two lines which form that angle, the angular point being the centre, and it is estimated by the number of degrees in that arc. Fig. 25.

42. The IDENTICAL FIGURES are such as have all the sides and all the angles of the one, respectively equal to all the sides and all the angles of the other, each to each, so that if the one figure were applied to, or laid upon the other, all the sides of the one would exactly fall upon and cover all the sides of the other, the two becoming as it were but one and the same figure.

43. The DISTANCE of a POINT from a LINE is the straight line drawn from that point perpendicular to, and terminating in, that line.

44. An ANGLE in a SEGMENT of a CIRCLE is that which is contained by two lines drawn from any point in the arc of the segment to the extremities of that arc, as ABC in the segment ABC. Fig. 26.

45. An ANGLE on a SEGMENT, or an ARC, is that which is contained by two lines drawn from any point in the opposite, or supplemental part of the circumference, to the extremities of the arc, and containing the arc between them, as ABC on the segment ADC. Fig. 26.

46. An ANGLE at the CIRCUMFERENCE is that whose angular point is any where in the circumference, and an angle at the centre is that whose angular point is at the centre.

47. A TANGENT to a CIRCLE is a straight line that meets the circumference at one point, and every where else falls without it. Fig. 27.

48. A SECANT is a straight line that cuts the circle, lying partly within and partly without it. Fig. 27.

49. A RIGHT-LINED FIGURE is inscribed in a circle, or the circle circumscribes it when all the angular points of the figure are in the circumference of the circle. Fig. 28.

50. A RIGHT-LINED FIGURE circumscribes a circle, or the circle is inscribed in it when all the sides of the figure touch the circumference of the circle. Fig. 28.

51. ONE RIGHT LINE A FIGURE is inscribed in another, or the latter

latter circumscribes the former when all the angular points of the former are placed in the sides of the latter. Fig. 29.

52. **SIMILAR FIGURES** are those that have all the angles of the one equal to all the angles of the other, each to each, and the sides about these angles proportional.

The **PERIMETER** of a **FIGURE** is the sum of all its sides taken together.

Note. When the word **line** occurs, without the addition of either *straight* or *curved*, a straight line is always meant; also the contractions (Def.) (Ax.) (Th.) are references to the definitions, axioms, and theorems, that have been before mentioned.

AXIOMS.

1. Things which are equal to the same thing are equal to one another.
2. When equals are added to equals, the wholes are equal.
3. When equals are taken from equals, the remainders are equal.
4. When equals are added to unequals, the wholes are unequal.
5. When equals are taken from unequals, the remainders are unequal.
6. Things which are doubles of the same thing are equal to one another.
7. Things which are halves of the same thing are equal.
8. The whole is equal to all its parts taken together.
9. Things which coincide, or fill the same space, are identical, or mutually equal in all their parts.
10. All right angles are equal to one another.
11. Angles that have equal measures, or arcs, are equal.
12. More than one straight line cannot be drawn from any given point to another given point. Fig. 1.
13. If two straight lines meet one another, they are not both parallel to one and the same straight line. Thus CD and CE are not both parallel to AB . Fig. 29.

REMARKS. A **PROPOSITION** is something proposed to be done, and is either a **Problem** or **Theorem**.

A **PROBLEM** is something proposed to be done.

A **THEOREM** is something proposed to be demonstrated.

A **LEMMA** is something premised or demonstrated, in order to make what follows the more easy.

A **COROLLARY** is a consequent truth gained immediately from some preceding truth or demonstration.

A **SCHOLIUM** is a remark or observation made upon something going before.

THEOREM I. fig. 30. If two triangles have two sides and the included angle of the one equal to two sides and the included angle of the other, the triangles will be identical, or equal in all respects.

In the two triangles ABC , DEF , if the side AB of the one be equal to the side DE of the other, and the side AC equal to DF , also the angle A equal to the angle D , the triangles shall be identical, or equal, in all respects. For conceive the triangle ABC , to be applied to, or placed upon, the triangle DEF ; so that the point A may coincide with D , and the side AB with the side DE ; then since the angles A and D are equal, the side AC shall also coincide with DF ; and since AB is equal to DE , and AC is equal to DF , the points B and E shall coincide, as also the points C and F ; consequently the side BC will coincide with the side EF ; (Ax. 12.) therefore the two triangles are identical (Ax. 9.) and have all their other corresponding parts equal.

THEOREM II. fig. 30. Triangles which have two angles and the side which lies between them equal are identical, or have their other sides and angles equal. Let the two triangles ABC , DEF , have the angle B equal to the angle E , the angle C equal to the angle F , and the side BC equal to the side EF , then these triangles will be identical. For conceive the triangle ABC placed upon DEF , so that BC may fall exactly upon EF , then since the angle B is equal to the angle E , the side BA will fall upon DE , and in like manner because the angles C and F are equal, the side CA will fall upon FD , thus the triangles will exactly coincide, and therefore, (Ax. 9.) are identical.

THEOREM III. fig. 31. In an isosceles triangle the angles at the base are equal. If the triangle ABC be isosceles, or have a side AB equal to a side AC ; then will the angle at B be equal to the angle at C . For conceive the angle at A to be bisected, or di-

vided into two equal parts by the line AD . Then the triangles BAD , CAD , having two sides and a contained angle of the one equal to two sides and the contained angle of the other, namely, AB equal to AC , and AD common to both, and the angle BAD equal to the angle CAD , are equal in all respects (Th. 1.) therefore the angle B is equal to the angle C .

COROLLARY I. An equilateral triangle is also equiangular.

COR. 2. A line that bisects the vertical angle of an isosceles triangle bisects also the base, and is perpendicular to it.

THEOREM IV. fig. 31. If a triangle have two of its angles equal, the sides which subtend or lie opposite to these angles are also equal. Let ABC be a triangle, of which the angles at B and C are equal, the side AB will be equal to the side AC . For conceive the angle A to be bisected by AD ; then the angles BDA and CDA are equal, being right angles (Th. 3. Cor. 2.) and the angles at A are equal, also AD is common; hence the triangles BAD , CAD , are identical, (Th. 2.) and AB is equal to AC .

COR. Hence every equiangular triangle is also equilateral.

THEOREM V. fig. 32. Triangles which have their three sides mutually equal, are identical, or have all their three angles equal, each to each. Let the triangles ABC , ADC , have their three sides mutually equal, viz. AC equal to AC , AB equal to AD , and BC equal to DC , the angles opposite to these sides shall be equal, namely BAC to DAC , BCA to DCA , and ABC to ADC . Suppose the triangles joined by their longest equal sides, and join BD . Then the angle ABD is equal to ADB , and the angle CBD to the angle CDB (Th. 3.) therefore the whole angle ABC is equal to the whole angle ADC , (Ax. 2.) and since AB is equal to AD , also BC to DC , the triangle ABC , ADC , are identical. (Th. 1.)

THEOREM VI. fig. 33. The angles which one line makes with another upon one side of it are together equal to two right angles. Let the line AB make with CD upon one side of it, the angles ABD , ABC ; these are together equal to two right angles. If AB be perpendicular to CD , the angles ABC , ABD , are evidently equal to two right angles (def. 7.) But if AB be not perpendicular to CD , draw BE perpendicular to CD , dividing the greater angle ABC into the two angles EBC , EBA ; then the former EBC being a right angle, and the remaining part EBA together with the whole less angle ABD , is equal to another right angle; the whole of both the proposed angles is therefore equal to two right angles. (Ax. 2.)

COR. 1. Hence also, conversely, if the two angles ABC , ABD , on both sides of the line AB , make up together two right angles, then CB and BD form one continued straight line.

COR. 2. All the angles that can be made round a point by any number of lines are equal to two right angles.

THEOREM VII. fig. 34. If two lines intersect each other, the opposite angles are equal. Let AB and CD intersect each other in E , the angle AEC is equal to BED , and AED to BEC ; for the angles AEC , AED , are together equal to two right angles (Th. 6.) and in like manner BED , AED , are equal to two right angles; therefore the angles AEC , AED , are together equal to BED , AED (Ax. 1.) and taking away the common angle AED from both, there remains AEC equal to BED (Ax. 3.) In like manner it will appear that AED is equal to BEC .

THEOREM VIII. fig. 35. If a line intersecting two other lines, make the alternate angles equal, the lines are parallel. Let EF intersect the lines AB , CD , and make the alternate angles AGH , and GHD , equal, then AB is parallel to CD . For if not they will meet on one side, let them meet in I , and let GH be bisected in K , and IK joined and produced to L , so that KL be equal to IK , and let GL be joined; then because LK is equal to KI , and GK to KH , and the included angles at K equal, being vertical angles, the triangles LKG and IHK are identical (Th. 1.) Therefore the angle LKG is equal to KHD , and therefore (by Hyp.) equal to AGH , which is impossible. Therefore the lines AB , CD , do not meet, consequently they are parallel (def. 10.)

COR. If a line intersecting two other lines make the exterior angle equal to the interior angle on the same side, or the two interior angles on the same side equal to two right angles, these lines are parallel.

THEOREM IX. fig. 36. If a line intersect two parallel lines, it makes the alternate angles equal.

Let the line EF intersect the parallel lines AB , CD , at G and H .

H, the alternate angles AGH, GHD, are equal. For if not, let the angle KGB be equal to GHD, then KG is parallel to CD (Th. 8;) therefore AG and KG are both parallel to CD, which is impossible, (Ax. 13.)

COR. If a line intersect two parallel lines it makes the exterior angle equal to the interior and opposite on the same side, and also the two interior angles on the same side equal to two right angles. For the interior angle GHD is equal to AGH, that is, (Th. 7,) to the exterior angle EGB; to each of these add BGH, and the two interior angles BGH, GHD, are together equal to BGH, BGE, that is, to two right angles. (Th. 6.)

THEOR. X. fig. 37. If one side of a triangle be produced, the exterior angle is equal to both the interior and opposite angles, and the three interior angles are equal to two right angles.

Let BC, a side of the triangle ABC, be produced to D, the exterior angle ACD is equal to the two interior and opposite angles BAC, ABC, and the three interior angles ABC, BAC, BCA, are equal to two right angles. Let CE be parallel to AB, then the angle ACE is equal CAB (Th. 9,) and the angle ABC to ECD, (Th. 9, Cor.) therefore the angle ACD is equal to the two angles CAB, CBA; to each of these equals add ACB, thus the angles ACB, ACD, are equal to the three angles ABC, CBA, BAC, but ACB, ACD, are equal to two right angles (Th. 6,) therefore the three angles of the triangle are equal to two right angles.

COR. 1. The exterior angle of a triangle is greater than either of the interior opposite angles.

COR. 2. Any two angles of a triangle are together less than two right angles.

COR. 3. If two triangles have two angles of the one equal to two angles of the other, the remaining angle of the one is equal to the remaining angle of the other.

COR. 4. The two acute angles of a right-angled triangle are together equal to a right angle.

THEOR. XI. fig. 38. The greatest side of every triangle subtends the greatest angle.

Let ABC be a triangle of which the side AB is greater than AC, the angle ACB is greater than ABC. Take AD equal to AC, and join DC, then the angle ACD is equal to ADC (Th. 3;) but ADC is greater than ABC (Th. 10, Cor. 1,) therefore ACD is greater than ABC, much more then is ACB greater than ABC.

COR. The greatest angle of every triangle is subtended by the greatest side.

THEOR. XII. fig. 39. The opposite sides and opposite angles of a parallelogram are equal, and the diagonal divides the parallelogram into two equal parts.

Let ABC be a parallelogram, AB is equal CD, and AC to BD, also the angle CAB is equal to CDB, and ACD to ADB, and the triangle ACD is equal to ABD. For since AB is parallel to CD (def. 21,) the angles BAD, CDA, are equal (Th. 10,) and since AC is parallel to BD, for the same reason, the angles CAD, BDA, are equal, now AD is common to the triangles ABD, ACD, therefore these triangles are identical, (Th. 2;) hence AB is equal to CD, AC to BD, the angle ACD to ABD, the angle CAD to ADB, and BAD to ADC, and consequently the whole angle CAB to the whole angle CDB.

THEOR. XIII. fig. 39. The lines which join the extremities of equal and parallel lines towards the same parts are themselves equal and parallel.

Let AB be equal and parallel to CD, then AC and BD are also equal and parallel. Join AD, then the angles BAD, CDA, are equal, (Th. 9,) and since AB is equal to CD, and AD common to the triangles ABD, ACD, these triangles are equal in all respects (Th. 1,) therefore AC is equal to BD, and the angle CAD to ADB, hence AC is also parallel to BD. (Th. 8.)

THEOR. XIV. fig. 40. Parallelograms standing upon the same base, and between the same parallels, are equal.

Let ABCD, EBCF, be parallelograms standing on the same base BC, and between the same parallels BC, AF, they are equal to one another. For since AD is equal to BC, that is to EF, (Th. 12,) therefore AE is equal to DF, now AB is equal to DC (Th. 12;) and the angle BAE to CDF, (Th. 9, Cor.) therefore the triangles BAE and CDF are equal. (Th. 1.) Now if from the whole figure BAFC there be taken away the triangle CDF, there remains the parallelogram ABCD, and if from the same figure there be taken away the equal triangle BAE, there remains

the parallelogram EBCF, therefore these parallelograms are equal to one another.

COR. 1. Hence triangles standing upon the same base, and between the same parallels, are equal to one another.

For let BAC, BEC, be two triangles standing on the same base BC, and between the parallels AF, BC, it is evident that they are the halves of the parallelograms BADC, BEFC, and therefore equal.

COR. 2. Hence if a triangle and parallelogram stand on the same base, the triangle is half of the parallelogram.

COR. 3. Therefore all parallelograms or triangles whatever whose bases and altitudes are equal, are also equal among themselves.

THEOR. XV. fig. 41. The complements of a parallelogram are equal.

Let BD the diagonal of a parallelogram ABCD be drawn, and let HK, EG, parallels to its sides, intersect each other at F a point in the diagonal; the whole parallelogram is thus divided into four parallelograms; two of these, viz. EK, HG, stand about the diameter, and the remaining two HE, GK, are called the complements, and are to be proved equal. The whole triangle DAB is equal to the whole triangle DCB, (Th. 12,) and for the same reason the parts DEF, FHB, are respectively equal to the parts DKE, FGB, therefore the remaining parts HE, GK, must likewise be equal.

THEOR. XVI. fig. 42. In a right-angled triangle the square of the hypotenuse is equal to the sum of the squares upon the other two sides.

Let AD be a square upon the hypotenuse of a right-angled triangle ABC, and BG, BI, squares upon its sides, AD is equal to the sum of BG and BI. Let MBH be parallel to AE meeting GF, produced in H, and let EA, produced, meet GH in N. If from the equal angles GAB, CAN, the angle NAB, common to both, be taken away, there remains NAG equal to BAC, now the angle AGN is equal to ABC, and the side AG is equal to AB, therefore AN is equal to AC (Th. 2,) or to AE; and therefore the parallelograms AM, AH, are equal, (Th. 14, Cor. 3,) but AH is equal to the square BG (Th. 14,) therefore AM is equal to BG, and in the same way it will appear that CM is equal to the square BI, therefore the whole square AD is equal to the sum of the squares BG and BI.

THEOR. XVII. fig. 43. A perpendicular drawn from the centre of a circle to a chord bisects that chord.

Let CD be drawn from the centre C perpendicular to AB a chord in the circle, AD is equal to DB. Join CA, CB. Because AC is equal to CB (def. 3,) the angles CAB, CBA, are equal (Th. 3,) now ADC, BDC, are equal, being right angles, therefore the angles ACD, BCD, are equal, (Th. 10, Cor. 3,) therefore the triangles ACD, BCD, are in all respects equal, (Th. 1,) and consequently AD equal to DB.

COR. A perpendicular bisecting any chord at right angles passes through the centre of the circle.

THEOR. XVIII. fig. 44. A straight line drawn through any point in the circumference of a circle, at right angles to the radius terminating in that point, is a tangent to the circle.

Let AB be perpendicular to the radius AC, the line AB is a tangent to the circle at the point A. Draw CE any line from the centre cutting the circle at D, and the line AB at E. Because CAE is a right angle, CEA is less than a right angle, (Th. 10,) therefore CE is greater than CA, or, than CD, (Th. 11,) therefore the point E is without the circle, and the same may be shewn of every point in AB, except A, therefore AB is a tangent to the circle. (def. 47.)

COR. If a line be perpendicular to a tangent at the point of contact, that line passes through the centre.

THEOR. XIX. fig. 45. An angle at the centre of a circle is double the angle at the circumference which stands upon the same arc.

Let ACB be the angle at the centre of a circle, and ADB the angle at the circumference, the angle ACB is double ADB. Join DC, which produce to E. The angle ACE is equal to both the angles CAD, CDA (Th. 10,) that is, since CD and CA are equal to twice ADC (Th. 3;) in like manner it will appear that BCE is equal to twice BDE; therefore the whole angle ACB is double ADB.

COR. 1. All angles in the same segment of a circle are equal to each other.

COR. 2. In the same circle, or in circles of equal radii, if two angles at the circumference stand upon equal arches, they are equal to one another, and conversely.

THEOR. XX. fig. 46. An angle in a semicircle is a right angle.

Let ACB be an angle in a semicircle, draw the diameter CDE. The angle ACE at the circumference is half of ADE at the centre, and in like manner BCE is half of BDE (Th. 19;) therefore the whole angle ACB is half the sum of the angles ADE, ECB, or is equal to a right angle. (Th. 6.)

THEOR. XXI. fig. 47. The sum of any two opposite angles of a quadrilateral inscribed in a circle, is equal to two right angles.

Let ABCD be a quadrilateral in a circle, the sum of BAD, BCD, also the sum of ADC, ABC, is equal to two right angles. Join AC, BD. The angle BAC is equal to BDC, also the angle DAC is equal to DBC (Th. 19, cor. 1;) therefore the whole angle DAB is equal to the two angles BDC, DBC; and the sum of DAB and DCB is equal to the three angles BDC, DBC, and DCB, that is, equal to two right angles. (Th. 10.)

THEOR. XXII. fig. 48. The angle formed by a tangent to a circle, and a chord drawn to the point of contact, is equal to the angle in the alternate segment of the circle.

Let AB be a tangent, and AC a chord, the angle CAB is equal to any angle CEA in the alternate segment. Draw AF perpendicular to AB, meeting the circle in F, and join EF; thus AF will be the diameter of the circle (Th. 18, cor.) and FEA a right angle (Th. 20); therefore equal to FAB, but FEC, FAC, parts of these angles, are equal. In like manner, the angle CAD is equal to CGA; for FGA is equal to FAD, and FGC to FAC; therefore the wholes CAD, CGA, are equal.

OF RATIOS AND PROPORTIONS.

In the treating of proportion, the algebraic notation is here adopted for the sake of brevity; it will therefore be proper to observe,

1. That the letters A, B, &c. are used to denote quantities of any kind, and the letters m, p, q , &c. to denote numbers only.

2. The sign + (plus) written between the symbols of two quantities or numbers, signifies the sum of those quantities or numbers. Thus $A + B$ means the sum of the quantities denoted by A and B, &c.

3. The sign - (minus) written between the symbols of two quantities, signifies the difference of these quantities. Thus $A - B$ means the difference between A and B.

4. When a letter denoting a number is written close to a letter denoting any quantity, it signifies that the quantity is multiplied by the number; thus mA means m times A; also gmB means that B is multiplied by the product of the numbers g and m .

5. The quotient arising from the division of any quantity A by another quantity B, is written thus $\frac{A}{B}$.

6. The sign = signifies the equality of quantities denoted by the letters that stand on the opposite sides of it. Thus $\frac{mA}{mB} = \frac{A}{B}$ de-

notes that the quotient arising from the division of m times A by m times B is the same as the quotient arising from the division of A by B.

7. It is likewise supposed that the following principle in the arithmetic of fractional quantities is already known, namely, that if both the numerator and denominator of a given fraction be divided by the same number, the resulting quotients are the numerator and denominator of a fraction of the same value as the given one.

It is thus that the fractional quantity $\frac{mA}{mB}$ is concluded to

be equal to $\frac{A}{B}$, viz. by dividing both numerator and denominator by m , and so of other quantities.

DEFINITIONS.

54. When one quantity contains another a certain number of

times exactly, the former is said to be a multiple of the latter; and the latter a part of the former; thus 20 is a multiple of 5, and 5 a part of 20; and, in general, m being any number, and A any quantity, mA is a multiple of A, and A a part of mA .

55. When several quantities are multiples of as many others, and each contains its part of the same number of times, the former are said to be equimultiples of the latter, and the latter like parts of the former; thus 20 and 30 are equimultiples of 2 and 3, and in general mA and mB are equimultiples of A and B; also A and B are like parts of mA and mB .

56. Ratio is the proportion which one magnitude bears to another magnitude of the same kind, with respect to quantity.

Note. The measure, or quantity of a ratio, is conceived by considering what part or parts of the leading quantity called the antecedent is of the other called the consequent. So the ratio of a quantity expressed by the number 2 to a like quantity expressed by the number 6 is denoted by 6 divided by 2, or $\frac{6}{2}$ or 3; the number 2 being 3 times contained in 6, or the third of it, and in general the measure of the ratio of A to B is expressed by the quotient of B divided by A, or the fraction $\frac{B}{A}$.

57. Proportion is an equality of ratios, and three quantities are said to be proportional when the ratio of the first to the second is equal to the ratio of the second to the third. As of the three quantities A (2), B (4), C (8); where $\frac{4}{2} = \frac{8}{4} = 2$, the same ratio.

58. Four quantities are said to be proportional when the ratio of the first to the second is the same as the ratio of the third to the fourth. As of the four quantities A (2), B (4), C (5), D (10); where $\frac{4}{2} = \frac{10}{5} = 2$, the common ratio.

Note. To denote that four quantities A, B, C, D, are proportional, they are usually placed thus, $A : B :: C : D$, and read thus, As A is to B, so is C to D; but when three quantities are proportional, the middle one is repeated, and they are written thus, $A : B :: B : C$.

59. Of three proportional quantities, the middle one is said to be a mean proportional between the other two, and the last a third proportional to the first and second.

60. Of four proportional quantities, the last is said to be a fourth proportional to the other three taken in order.

61. Quantities are said to be continually proportional, or in continued proportion, when the ratio is the same between every two adjoining terms, thus, 1, 2, 4, 8, 16, &c. are in continued proportion.

62. In a series of quantities continually proportional, the ratio of the first and third is said to be duplicate to that of the first and second; and the ratio of the first and fourth is said to be triplicate to that of the first and second, and so on.

63. Inverse ratio is, when the antecedent is made the consequent, and the consequent the antecedent; thus, if $1 : 2 :: 3 : 6$; then inversely $2 : 1 :: 6 : 3$.

64. Alternate proportion is, when antecedent is compared with antecedent, and consequent with consequent, as if $1 : 2 :: 3 : 6$; then by alternation or permutation, $1 : 3 :: 2 : 6$.

65. Compounded ratio is, when the sum of the antecedent and consequent is compared, either with the antecedent or consequent, thus, if $1 : 2 :: 3 : 6$; then by composition, $1 + 2 : 1 :: 3 + 6 : 3$, and $1 + 2 : 2 :: 3 + 6 : 6$.

66. Divided ratio is, when the difference of the antecedent and consequent is compared, either with the antecedent or consequent, thus, if $1 : 2 :: 3 : 6$, then by division $2 - 1 : 1 :: 6 - 3 : 3$; also $2 - 1 : 2 :: 6 - 3 : 6$.

THEOR. XXIII. Equimultiples of any two quantities are in the same ratio as the quantities themselves.

Let A and B be any two quantities, and mA, mB , any equimultiples of them, m being any number whatever; then will mA and mB have the same ratio as A and B, or $A : B :: mA : mB$.

For $\frac{mA}{mB} = \frac{A}{B}$, both the same ratio.

COR. Hence, like parts of quantities have the same ratio as the wholes, because the wholes are equimultiples of the like parts, or A and B are like parts of mA and mB .

THEOR. XXIV. If four quantities of the same kind are proportional,

portional, they will be proportional also by alternation or permutation, or the antecedents will have the same ratio as the consequents.

Let $A : B :: mA : mB$, then will $A : mA :: B : mB$.

For $\frac{A}{mA} = m$ and $\frac{B}{mB} = m$, both the same ratio.

THEOR. XXV. If four quantities are proportional, they will be proportional also by inversion, or inversely.

Let $A : B :: mA : mB$, then will $B : A :: mB : mA$.

For $\frac{B}{mB} = \frac{A}{mA}$, both the same ratio.

THEOR. XXVI. If four quantities be proportional, they will also be proportional by composition, and by division.

Let $A : B :: mA : mB$.

Then will $B + A : A :: mB + mA : mA$.

or, $B + A : B :: mB + mA : mB$

For $\frac{B + A}{mA} = \frac{B + A}{A}$ and $\frac{mB + mA}{mB} = \frac{B + A}{B}$

In like manner it will appear that

$B - A : A :: mB - mA : mA$.

or, $B - A : B :: mB - mA : mB$.

For $\frac{B - A}{mA} = \frac{B - A}{A}$ and $\frac{mB - mA}{mB} = \frac{B - A}{B}$

THEOR. XXVII. If of four proportional quantities there be taken any equimultiples whatever of the two antecedents, and any equimultiples whatever of the two consequents, the quantities resulting will be still proportional.

Let $A : B :: mA : mB$, also let pA and pmA be any equimultiples, of the two antecedents, and qB and qmB any equimultiples of the two consequents, then will $pA : qB :: pmA : qmB$.

For $\frac{qmB}{pmA} = \frac{qB}{pA}$, the same ratio.

THEOR. XXVIII. If there be four proportional quantities, and the two consequents be either augmented or diminished, by quantities that have the same ratio as the respective antecedents, the results and the antecedents will still be proportional.

Let $A : B :: mA : mB$, and nA and nmA any two quantities having the same ratio as the two antecedents; then will.

$A : B + nA :: mA : mB + nmA$.

Also $A : B - nA :: mA : mB - nmA$.

For $\frac{mB \pm nmA}{mA} = \frac{B \pm nA}{A}$, the same ratio.

THEOR. XXIX. If any number of quantities be proportional, any one of the antecedents will be to its consequent, as the sum of all the antecedents to the sum of all the consequents.

Let $A : B :: mA : mB :: nA : nB$, &c.

Then will be $A : B :: A + mA + nA : B + mB + nB$, &c.

For $\frac{B + mB + nB}{A + mA + nA} = \frac{B}{A}$, the same ratio.

THEOR. XXX. If a whole magnitude be to a whole, as a quantity taken from the first to a quantity taken from the other, the remainder is to the remainder, as the whole is to the whole.

Let $A : B :: \frac{m}{n}A : \frac{m}{n}B$.

Then will $A : B :: A - \frac{m}{n}A : B - \frac{m}{n}B$.

For $\frac{A - \frac{m}{n}A}{B - \frac{m}{n}B} = \frac{A}{B}$, the same ratio.

THEOR. XXXI. If there be two sets of proportionals; then the products or rectangles of the corresponding terms are also proportional.

Let $A : B :: mA : mB$.

And $C : D :: nC : nD$,

then will $AC : BD :: mnAC : mnBD$, where AC represents the product or rectangle of A and C , and BD the product or rectangle of B and D .

For $\frac{mnBD}{mnAC} = \frac{BD}{AC}$, the same ratio.

COR. 1. If there be any number of sets of proportionals; the products of the corresponding terms are proportional.

COR. 2. If four quantities be proportional, their squares and cubes are also proportional, and in general any powers of them are proportional.

THEOR. XXXII. If four quantities be proportional, the rectangle or product of the two extremes is equal to the rectangle or product of the two means.

Let $A : B :: mA : mB$.

Then is $A \times mB = B \times mA = mAB$, as is evident.

COR. If three quantities be continual proportionals, the rectangle or product of the extremes will be equal to the square of the mean.

THEOR. XXXIII. fig. 49. Triangles and also parallelograms having the same altitude, or that are between the same parallels, are to one another in the same ratio as their bases.

Let the triangles ADC , DEF , have the same altitude, or be between the same parallels AE , CF , then $AD : DE ::$ Triangle ADC : Triangle DEF . For let AD contain a number of parts, m of which DE contains the number n , and call each of the parts A , and since triangles are equal, there will be a number of triangles in ADC denoted by m , and in DEF a number denoted by n , all equal among themselves: call each of them B ; then $AD = mA$, $DE = nA$, the triangle $ADC = mB$, and $DEF = nB$,

but $\frac{nB}{mB} = \frac{nA}{mA}$, that is, the triangle $ADC : DEF :: AD : DE$.

In like manner the parallelogram $ADCI$ is to the parallelogram $DEFG$ as the base AD to the base DE .

COR. fig. 50. Triangles and parallelograms having equal bases are to one another as their altitudes. For let ABC , BFE , be triangles having their equal bases AB , BE , in the same straight line AE ; let BK be perpendicular to AE , draw CK , FL , parallel to AE , and join AK , AL . The triangles ACB , AKB , are equal; also the triangles ALB , BFE . (Th. 16. Cor. 3.) And by the theorem the triangle AKB is to the triangle ALB as KB to LB , but KB and LB are equal respectively to CG and FH the altitudes of the triangles ACB , BFE ; therefore the triangles ACB , BFE , are to each other as their altitudes.

THEOR. XXXIV. fig. 51. If a line be drawn in a triangle parallel to one of its sides, it cuts the two other sides proportionally.

Let DE be drawn parallel to BC one of the sides of the triangle ABC , then $AD : DB :: AE : EC$. Join BE and CD . The triangles BDE , CDE , are equal (Th. 14. Cor. 1.) therefore, since any magnitude must necessarily have the same ratio to each of two equal magnitudes, the triangle ADE is to the triangle BDE as the same triangle ADE is to the triangle CDE , but ADE is to EDB as AD to DB (Th. 33,) and ADE is to EDC as AE to EC ; therefore $AD : DB :: AE : EC$.

COR. 1. Hence also the whole lines AB , AC , are proportional to their proportional segments (Cor. Th. 23,) namely $AB : AC :: AD : AE$, and $AB : AC :: BD : CE$.

COR. 2. A straight line which divides the sides of a triangle proportionally is parallel to the remaining side.

THEOR. XXXV. fig. 52. If a line bisect the vertical angle of a triangle and meet the base, the segments of the base will be directly proportional to the other two sides of the triangle.

In the triangle ABC let BD bisect the vertical angle, then $AB : BC :: AD : DC$. For, draw CE parallel to DB , meeting AB produced in E . The angle ECB is equal to CBD (Th. 9,) or to DBA (by hyp.) that is to CEA or CEB (Th. 9, Cor.) therefore CB is equal to BE (Th. 4.) In the triangle AEC , the line BD is parallel to EC , therefore $AB : BE :: AD : DC$, or since BE is equal to BC , $AB : BC :: AD : DC$.

COR. Hence, conversely, if a line be drawn from the vertex of a triangle

a triangle to divide the base into segments directly proportional to the sides, that line will bisect the vertical angle.

THEOR. XXXVI. fig. 53. Equiangular triangles are similar, or have their like sides proportional.

Let ABC , DEF , be two equiangular triangles having the angle A equal to the angle D , the angle B to the angle E , and consequently the angle C to the angle F , then will $AB : AC :: DE : DF$. Take DG equal to AB , and DH to AC , and join HG . Then the triangles ABC , DGH are equal in all respects, (Th. 1,) namely, the angles B and C equal to the angles G and H , but B and C are equal to E and F , (by hyp.) therefore G and H are equal to E and F , and consequently GH is parallel to EF , (Th. 8, Cor.), therefore $DG : DH :: DE : DF$ (Th. 34, Cor. 1.) but DG and DH are equal to AB and AC , therefore $AB : AC :: DE : DF$.

THEOR. XXXVII. fig. 53. Triangles which have their sides proportional are equiangular.

In the triangles ABC , DEF , if $AB : AC :: DE : DF :: BC : EF$, the triangles will have their corresponding angles equal. Take DH equal to AC , and DG equal to AB . Then $DG : DH :: DE : DF$, therefore GH is parallel to EF (Th. 34, Cor. 2); hence the triangles DGH , DEF are equiangular (Th. 9); wherefore $DG : GH :: DE : EF$ (Th. 36) :: $AB : BC$ (by hyp.); since therefore $DG : GH :: AB : BC$, and that DG is equal to AB , therefore GH is equal to BC . Thus the triangles DGH , ABC , having the three sides of the one respectively equal to the three sides of the other, are equiangular (Th. 5,) therefore also the triangles ABC , DEF , are equiangular.

THEOR. XXXVIII. fig. 53. Triangles which have one angle to the one equal to one angle in the other, and the sides about these angles proportional, are equiangular.

Let ABC , DEF , be two triangles having the angles A and D equal, and $AB : AC :: DE : DF$; these triangles shall be equiangular. Make DG equal to AB , and DH to AC , and join HG : thus the triangles ABC , DGH , are identical and equiangular (Th. 1); therefore $HD : DG :: CA : AB :: FD : DE$ (by hyp.); therefore HG is parallel to FE , (Th. 34, Cor. 2,) and the triangles HGD , FDE , also CAB , FDE , are equiangular.

THEOR. XXXIX. fig. 54. If four lines are proportional, the rectangle of the extremes will be equal to the rectangle of the means; and if the rectangle of the extremes be equal to the rectangle of the means, the four lines are proportional.

Let the four lines A , B , C , D be proportional, or $A : B :: C : D$, then will the rectangle of A and D be equal to the rectangle of B and C . Let the four lines be placed with their extremities meeting at a common point, and forming four right angles; and draw lines parallel to them to complete the rectangles P , Q , R ; where P is the rectangle of A and D , Q the rectangle of B and C , and R the rectangle of B and D . Then the rectangles P and R will be to each other as A and B (Th. 33,) and in like manner the rectangles Q and R will be to each other as C and D ; but the ratio of A to B is the same as the ratio of C to D ; therefore the ratio of P to R is the same as the ratio of Q to R , and consequently P and Q are equal.

Again, if the rectangle of A and D be equal to the rectangle of B and C , $A : B :: C : D$. For the rectangles being placed as before, it is evident that P and Q have each the same ratio to R ; but P is to R as A to B , and Q to R as C to D , therefore $A : B :: C : D$.

COR. If three lines are proportional, the rectangle of the extremes is equal to the square of the mean: and if the rectangle of the extremes be equal to the square of the mean, the three lines are proportional.

THEOR. XL. fig. 55 and 56. If two lines meeting a circle cut each other, either within it, or without, the rectangle of the parts of the one will be equal to the rectangle of the parts of the other; the parts of each being measured from the point of meeting to the two intersections with the circumference.

Let the two chords AB , CD , meet each other in E , the rectangle of AE , EB , is equal to the rectangle of CE , ED . Join AD , and CB . The triangles AED , CEB , are equiangular, for the angles at D and B are equal (Th. 19, Cor. 1,) and the angles AED , CEB , are opposite (fig. 54,) and therefore equal (Th. 7): or the angle at E is common to both triangles (fig. 57,) in either case the triangles are equiangular; therefore $DE : EA :: EB : EC$ (Th. 36); hence the rectangle of DE , EC , is equal to the rectangle of AE , EB , (Th. 39.)

COR. If the line BAE , (fig. 56,) be supposed by revolving to come into the position of the tangent AE , (fig. 57,) the distances BE , AE , will thus have become equal. Hence we have this Theorem. If from a point without a circle two lines be drawn, one touching it, and the other cutting it, the rectangle of the distances of that point from the intersections of the cutting line, or secant, is equal to the square of the tangent.

THEOR. XLI. fig. 58. In a right-angled triangle, a perpendicular from the right angle is a mean proportional between the segments of the hypotenuse; and each of the sides about the right angle is a mean proportional between the adjacent segment, and the hypotenuse.

Let ABC be a right-angled triangle, and CD a perpendicular upon the hypotenuse; then will $AD : DC :: DC : DB$, and $AB : AC :: AC : AD$, and $AB : BC :: BC : BD$.

For the triangles ACB , ADC , having the right angles at C and D equal, and the angle at A common, have their third angles equal, and are equiangular; and in like manner it will appear that the triangles ACB , CDB , are equiangular. Hence these three triangles ACB , ADC , CDB , being equiangular, will have the sides about the equal angles proportional; thus we get $AD : DC :: DC : DB$, and $AB : AC :: AC : AD$, and $AB : BC :: BC : BD$, (Th. 36.)

THEOR. XLII. fig. 59. Equiangular or similar triangles are to each other as the squares of their like sides.

Let ABC , DEF , be two equiangular triangles, AB and DE being their homologous or like sides, and AL , DN , squares on these sides. The triangle ABC is to the triangle DEF as the square AL to the square DN . Draw CG and FH perpendicular to AB and DE , and join BK and EM . The triangles ACG , DFH , are equiangular (Th. 10, Cor. 3); therefore $AC : DF :: CG : FH$ (Th. 36); but the triangles ABC , DEF , being equiangular, we have $AC : DF :: AB : DE$; therefore, from equality of ratios, we have $CG : FH :: AB : DE :: AK : DM$, and by alternation, $CG : AK :: FH : DM$. Now $CG : AB ::$ triangle ABC : triangle ABK , (Th. 33, Cor.); and in like manner $FH : DM ::$ triangle DEF : triangle DME , therefore triangle ABC : triangle $ABK ::$ triangle DEF : triangle DME , and by alternation, triangle ABC : triangle $DEF ::$ triangle ABK : triangle DME . But the squares AL , DN , being the doubles of the triangles ABK , DME , have the same ratio with them. Therefore the triangle ABC is to the triangle DEF , as the square AL to the square DN .

THEOR. XLIII. fig. 60. Similar rectilineal figures are to each other as the squares of their like sides.

Let $ABCDE$, $FGHK$, be two similar figures, the like sides being AB and FG , BC and GH , and so on; the figure $ABCDE$ will be to the figure $FGHK$ as the square of AB to the square of FG . Join BE , BD , GK , GI . Because the angles A and F are equal, and $BA : AE :: GF : FK$, the triangles BAE , GFK , are equiangular (Th. 38,) hence $AE : EB :: FK : KG$, but $AE : ED :: FK : KI$ (by hyp.), therefore $BE : ED :: GK : KI$. Now the angles AED , FKI , are equal, and the angles AEB , FKG , have been proved equal; therefore the angles BED , GKI , are equal; thus the triangles BED , GKI , are also equiangular, and in the same way it may be shewn that the triangles BDC , GIH , are equiangular. The triangle ABE is to FGK as the square of BE to the square of GK , that is, as the triangle EBD to the triangle KGI , (Th. 42,) and in like manner it will appear, that EBD is to KGI as DBC to IGH : therefore the whole figure $ABCDE$ is to the figure $FGHK$, as the triangle ABE to the triangle FGK (Th. 29); that is, as the square of AB to the square of FG , (Th. 42.)

COR. 1. Circles are to one another as the squares of their diameters. And in general, that all similar plane figures whatever, are to one another as the squares of lines similarly drawn in them.

For let $ABCDEF$, $GHIKLMN$, (fig. 61,) be any two regular polygons, of the same number of sides, inscribed in circles whose diameters are AD , GL . Draw AO , FO , to the centre of the one polygon, and GP , NP , to the centre of the other. The angles AOF , GPN , standing each upon the same part of the whole circumference, are evidently equal, and consequently the isosceles triangles, AOF , GPN , are similar: thus it appears that each of the polygons is made up of the same number of similar triangles; therefore the polygon $ABCDEF$, is to the polygon $GHIKLMN$, as the triangle AOF to the triangle GPN ; that is, as the square

of AO to the square of GP, or as the square of the diameter AD to the square of the diameter GL. Now whatever be the number of the sides of the polygon, it is evident, that their proportion to each other will be the same; namely, that of the squares of the diameters of their circumscribing circles. By supposing the number of the sides of the polygons continually increased, it is evident that their areas will approach more and more to the areas of their circumscribing circles, which may be considered as their limits; for it may be demonstrated, that a polygon may have its sides so numerous as to differ from the area of its circumscribing circle by less than any assignable quantity. Hence we may conclude, that the areas of the circles themselves have to each other the same proportion as their inscribed polygons; namely that of the squares of the diameters.

COR. 2. If circles or any similar plane figures be described on the three sides of the right-angled triangle, that on the hypotenuse is equal to the other two.

For since the two squares GB, GI, on the sides of the right-angled triangle ABC (fig. 42,) are equal to the square AD, (Th. 16,) and similar figures described on the lines are as the squares, we have as the square AD to the figure on AC, so is the square GB to the similar figure on AB, and so is the square BI, to the similar figure on BC: therefore AD is to the figure on AC as GB and BI to the figure on AB and BC, (Th. 29); but $AD = GB + BI$, therefore the figure AC is equal to those on AB and BC.

Of PLANES and SOLIDS.

DEFINITIONS.

67. The common section of two planes, is the line in which they meet, or cut each other.

68. A straight line is perpendicular to a plane, when it is perpendicular to every line which meets it in that plane.

69. One plane is perpendicular to another, when every right line in the one, which is perpendicular to their line of common section, is perpendicular to the other.

70. The inclination of one plane to another, or the angle they form between them, is the angle contained by two right lines, drawn from any point in the common section, and at right angles to the same.

71. Parallel planes are such as being produced ever so far both ways, will never meet, or which are every where at an equal perpendicular distance.

72. A solid is that which has length, breadth, and thickness.

73. Similar solids are such as are bounded by an equal number of similar planes.

74. A prism is a solid, of which the sides are parallelograms, and the two ends or bases are similar and equal polygons, parallel to each other. Prisms are denominated according to the number of angles in the base, triangular prisms, quadrangular, heptangular, and so on, as figs. 62, 63, 64, 65. If the sides are perpendicular to the plane of the base, it is called an upright prism; if they are inclined, it is called an oblique prism.

75. When the base of a prism is a parallelogram, it is called a parallelopipedon, as figs. 64 and 65. Hence a parallelopipedon is a solid terminated by six parallelograms.

76. When all the sides of the parallelopipedon are squares, the solid is called a cube, as fig. 65.

77. A rhomboidal prism is an oblique prism, whose bases are parallelograms (fig. 66.)

78. A pyramid (figs. 67 and 68,) is a solid bounded by, or contained within, a number of planes, whose base may be any polygon, and whose faces are terminated in one point, B, commonly called the vertex of the pyramid.

79. When the figure of the base is a triangle, it is called a triangular pyramid; when the figure of the base is a quadrilateral, it is called a quadrilateral pyramid, &c.

80. A pyramid is either regular or irregular, according as the base is regular or irregular.

81. A pyramid is also right or upright, or it is oblique. It is right, when a line drawn from the vertex to the centre of the base, is perpendicular to it, as fig. 67, and oblique, when this line inclines, as fig. 68.

82. A cylinder is a solid (figs. 69 and 70,) generated by the ro-

tation of a rectangle about one of its sides, supposed to be at rest; this quiescent side is called the axis of the cylinder. Or it may be conceived to be generated by the motion of a circle, in a direction perpendicular to its surface, and always parallel to itself.

83. A cylinder is either right or oblique, as the axis is perpendicular to the base or inclined.

84. A cone is a solid (figs. 71 and 72,) having a circle for its base, and its sides a convex surface, generated by a line revolving about the circle, on a fixed point as A, called the vertex or apex of the cones.

85. A line drawn from the vertex to the centre of the base is the axis of the cone.

86. When this line is perpendicular to the base, the cone is called an upright, or right cone, fig. 71; but when it is inclined it is called an oblique cone, fig. 72.

87. A sphere is a solid, terminated by a convex surface, every point of which is at an equal distance from a point within, called the centre, (fig. 76.) It may be conceived to be formed by the revolution of a semicircle round its diameter. The diameter of the semicircle round which it revolves, is called the axis of the sphere.

88. A spheroid is a solid (fig. 77,) generated by the rotation of a semi-ellipsis about the transverse or conjugate axis; and the centre of the ellipsis is the centre of the spheroid.

89. The spheroid is denominated prolate or oblate respectively according as the ellipsis revolves on the transverse or conjugate diameter.

THEOR. XLIV. fig. 78. A perpendicular is the shortest line that can be drawn from any point to a plane.

Let AB be perpendicular to the plane DE, then any other line, as AC, drawn from the same point A to the plane, will be longer than AB. Join BC; then ABC is a right angle, hence BCA is less than a right angle, and consequently BA less than AC. (Th. 11.)

COR. A perpendicular measures the distance of any point from a plane.

THEOR. XLV. fig. 79. The common section of two planes is a straight line.

Let ACBDA, AEBFA, be two planes cutting each other, and A, B, two points in which the two planes meet; the straight line joining these points will be the common intersection of the planes. For, because the straight line AB touches both planes at the points A, B, it touches them in all points (Def. 5); this line is therefore common to both planes, that is, their common intersection is a straight line.

THEOR. XLVI. fig. 80. If a straight line be perpendicular to two other straight lines, at their common intersection, it will be perpendicular to the plane of those straight lines.

Let the line AB make right angles with the lines AC, AD, it will be perpendicular to the plane CDA, which passes through these lines. For, if the line AB were not perpendicular to the plane CDE, another plane might pass through the point A, to which AB would be perpendicular; but this is impossible, for since the angles BAC, BAD, are right angles, this other plane must pass through the points C, D. Hence this plane passing through the points A, C of the line AC, and also through the points A, D, of the line AD, it will pass through both these lines, and therefore be the same plane with the former.

COR. If a straight line stand at right angles to each of three straight lines at the same point, these three lines are in one plane.

THEOR. XLVI. fig. 81. If two straight lines be perpendicular to the same plane, they will be parallel to each other.

Let AB and CD be both perpendicular to the plane EF; these lines are parallel. Join the points B and D, and draw DG perpendicular to BD, in the plane EF; make DG equal to BA, and join AD, AG. The triangles BDG, DBA, have the sides DG, BA, equal, and BD common to both; the angles BDG, DBA, are also equal, being right angles; therefore these triangles are identical, (Th. 1,) hence BG is equal to AD, and the triangles ABG, GDA, have two sides AB, BG, of the one, equal to two sides GD, DA, of the other, each to each, and the side AG common to both; therefore these also are identical (Th. 5,) hence the angle ADG is equal to ABC, that is to a right angle. Hence

it appears that DG is perpendicular to the lines BD, AD ; and it is also perpendicular to DC ; (Def. 68.) Therefore the lines BD, DA, DC , are in the same plane. (Th. 46. Cor.) Since AB, CD , are in the same plane, and both perpendicular to BD , they are parallel. (Th. 8.)

COR. If two lines be parallel, and one of them perpendicular to any plane, the other will also be perpendicular to the same plane.

THEOR. XLVIII. fig. 82. If two planes cut each other at right angles, and a straight line be drawn in one of the planes, perpendicular to their common intersection, it will be perpendicular to the other plane.

Let the planes $ACBD, AEBF$, cut each other at right angles, and the line CG be perpendicular to their common section AB ; then will CG be perpendicular to the plane $AEBF$. For, let EG be perpendicular to AB , thus the angle CGE is the angle of inclination of planes, (Def. 70,) and is therefore a right angle; since therefore the line CG is perpendicular to the two lines AG, GE , it is perpendicular to the plane $AEBF$, in which these lines are drawn. (Th. 46.)

THEOR. XLIX. fig. 83. Planes, which are perpendicular to the same straight line, are parallel to one another.

Let the planes EF, GH , be perpendicular to AB , they are parallel; if not, let them meet, and let C be a point in the common section, join AC and BC , then the angles CBA, CAB , are right angles, which is impossible (Th. 10. Cor. 2); hence the planes do not meet, and are therefore parallel. (Def. 71.)

COR. Hence straight lines perpendicular to one of two parallel planes are also perpendicular to the other plane.

THEOR. L. fig. 84. If two straight lines be parallel to a third line, though not in the same plane with it, they will be parallel to each other.

Let AB, CD , be each parallel to the same line EF , though not in the same plane with it, AB shall be parallel to CD . For, let GH and GI be perpendicular to EF , in the planes AF and DE of the parallels; then shall GF be perpendicular to the plane passing by HGI (Th. 46.); and HB, ID , will also be perpendicular to the same plane (Th. 47. Cor.), and therefore parallel. (Th. 47.)

THEOR. LI. fig. 85. If two lines that meet each other, be parallel to two other lines that meet each other, though not in the same plane with them; the angles contained by these lines will be equal.

Let the lines AB, AC , be parallel to the lines DE, DF , then will the angles BAC, EDF , be equal. For, take AB, AC, DE, DF , all equal, and join EB, FC, BC, EF . Then the lines AB, DE , being equal and parallel, the lines AD, BE , will also be equal and parallel, (Th. 13,) and for the same reason AD, CF , are equal and parallel; therefore CF is parallel to BE , (Th. 50,) and also equal to it; hence BC is equal to EF . Thus the triangles ABC, DEF , are in all respects equal, (Th. 5,) and therefore the angles BAC, EDF , are equal.

THEOR. LII. fig. 86. The sections made by a plane cutting two parallel planes are also parallel to each other.

Let the parallel planes AB, CD , be cut by the third plane, $EFHG$, in the line EF, GH . These lines are parallel. For, suppose, EG, FH , to be drawn parallel to each other in the plane $EFHG$; also, let EI, FK , be perpendicular to the plane CD , and let IG, KH , be joined: then EG, FH , being parallels, and EI, FK , being both perpendicular to the plane CD , are also parallel to each other, (Th. 47,) therefore the angle HFK is equal to the angle GEL (Th. 51,) but the angles FKH, EIG , are equal, being right angles; therefore the triangles FKH, EIG , are equiangular, (Th. 10, Cor. 3,) and the sides FK, EI , being equal, (Def. 71,) it follows, that the sides FH, EG , are also equal, (Th. 2;) but these two lines are parallel, (by hyp.) as well as equal; therefore also EF and GH , which join their extremities, are parallel. (Th. 13.)

THEOR. LIII. If from two cubes, parts similar, and similarly situated, be cut off, these parts are to one another as the cubes from which they are cut.

Let the cubes be FB and fb , fig. 87, and let $LHIK$ be the planes by which the cubes are cut, then the parts are proportional to the whole cubes.

For let BA, AE , be divided into an equal number of equal parts, and ba, ae , into the same number, and through the points

of division on each side let planes pass parallel to the other sides, then the two cubes will be divided into an equal number of small cubes, and those of each cube equal among themselves; therefore as one of the cubes in FB , is to one in fb , so is the cube FB , to the cube fb , (Th. 23). Again, because the parts cut off are similar, and similarly situated, their terminating planes and lines are cut proportionally by the planes, forming the cubes, into which the whole is divided; hence there is an equal number of cubes in the parts cut off; and the magnitudes which remain in the parts cut off, besides the entire cubes, are divided into an equal number of cubes, by taking the divisions in BA, ba , less; therefore, as one of the cubes in FB is to one in fb , that is as the cube FB is to fb , so is the part cut from FB , to the similar part cut off from fb .

COR. 1. If several parts similar, and similarly situated, be cut from two cubes, the like parts are to one another, as the whole cubes from which they were cut off.

COR. 2. Any two similar solids may be considered as being similarly cut from two cubes, which are to one another as those solids; or which is the same thing, the solids may be considered as similarly situated in the cubes; and hence are like parts of them.

THEOR. LIV. Similar solids are to one another as the cubes of their like sides.

Let AB, ab , fig. 87, be the like sides of any two similar solids, these solids shall be to one another as FB , the cube on AB , to fb , the cube on ab .

For let two cubes A and B be taken, so that A may be to B , as the solid figure on AB to the similar solid figure on ab , and let the solid on AB be situated in the cube A , and the solid on ab similarly situated in the cube B , then are they like parts of the cubes A and B ; also on AB , and ab , in the cubes A and B . Let the cubes FB and fb be similarly situated, then in the same manner the cubes FB and fb are like parts of A and B , therefore $A : B :: FB : fb$, but $A : B ::$ the solid figure on AB , to the similar solid figure on ab ; therefore the solid on AB , is to the similar solid on ab , as the cube on AB , to the cube on ab .

COR. Hence globes are as the cubes of their diameters.

THEOR. LV. If a prism be cut by a plane parallel to the base, the section will be equal and like to the base.

Let AG , fig. 88, be a prism, IL a section parallel to the base AC ; IL is equal and similar to AC .

For IM and AD are parallel, being the common sections of parallel planes, with a third plane (Th. 52.); also IA, MD , are parallel (Def. 74); therefore ID is a parallelogram; hence IM is equal AD , and thus $KL = BC$, and $LM = CD$, and because the corresponding sides are parallel, their contained angles are equal (Th. 51); therefore, the sections are equal and similar.

COR. The same is true of cylinders; for if MLK be the axis, and any sections MC, MB , be drawn through MK , it may be demonstrated as above, that LI, LH , are equal to KC, KB ; hence CHI is a circle equal to ABC . Fig. 89.

THEOR. LVI. All prisms of equal bases and altitudes are equal.

Let AC and DF , fig. 90, be two prisms, and a cylinder, having their bases and altitudes equal, they are equal to one another. For, let PQ, RS , be any two sections parallel to the bases and equidistant from them. Then since these sections are equal to the bases (Th. 55); and the bases equal to one another, these sections are equal to one another. Since then the corresponding sections are every where equal, the prisms of which they are the sections are equal.

THEOR. LVII. Rectangular parallelopipedons, of equal altitudes, are to one another as their bases.

Let AC, EG , fig. 91, be two rectangular parallelopipedons having equal altitudes, $AC : EG ::$ the base $AB : EF$.

For conceive the base AB to be divided into any number of equal parts m , by lines IL, KM , parallel to BN , and through these let planes be passed parallel to AQ , and let EG , be divided in the same manner, having a number of parts n in the base EF each equal those in the base AB ; then because prisms of equal bases and altitudes are equal, AC and EG will be divided into equal prisms, AC into the number m , and EG into the number n , therefore, $AC : EG :: m : n :: AB : EF$.

COR. From this, and the last, it appears that all prisms and cylinders of equal altitudes are as their bases.

THEOR. LVIII. If a section of a pyramid be parallel to the base,

base, it is also similar to it, and these two planes are to one another, as the squares of their distances from the vertex.

Let ABCD, fig. 92, No. 1, be a pyramid, BD the base, and EG parallel to it, and AIH a perpendicular from the vertex: EG is similar to BD, and BD: EG:: AH²: AI².

For, join CH, FI. Then because the planes BD, EG are parallel, their corresponding sides are parallel, being the common sections of parallel planes with a third plane; therefore the corresponding angles are equal (Th. 51.): also AC: AF:: BC: EF:: CD: FG (Th. 34): therefore BD and EG are similar (Def. 52). Again, BD: EG:: BC²: EF² (Th. 43); but by similar triangles BC²: EF²:: CA²: FA²:: HA²: IA²; therefore BD: EG:: HA²: IA².

COR. The section of a cone parallel to the base is a circle, which is to the base, as the squares of their distances from the vertex. For let MPQ, MKR, No. 3, be sections, passing through the axis MK, MLT, perpendicular to the base, and NS, the parallel section; it may be shewn as above, that OS, OW, ON, are parallel and proportional to KQ, KR, and KP; hence they are equal, and the section is a circle; and as above, TM²: LM²:: KR²: OW²:: cir. PRQ: cir. NWS.

THEOR. LIX. Pyramids and cones of equal bases and altitudes are equal.

Let ABC, MPQ, fig. 92, be any pyramids, and cone, having equal bases and altitudes, they are equal to one another.

For, let EG, NS, be sections, parallel to the bases and at equal altitudes; then since these planes are as the squares of the distances from the vertex, (Th. 58.) and since the bases are equal, and the distances from the vertex respectively equal, the sections are equal to one another; and because all the corresponding sections are equal; the solids ABC, MPQ, are also equal.

THEOR. LX. A triangular prism, is three times a pyramid of the same base and altitude.

Let AEF, fig. 93, be the prism, it is three times the pyramid, BDEF, having the same base and altitude. For join BD, BF, and CD; then the prism is divided into three pyramids BDEF, DABC, DBCF; the first two are equal because they have equal bases, ABC, EDF, and equal altitudes, (Def. 74, and Th. 59); also the pyramid DBCF is equal to BDEF, for EBF, (being taken for the base) is equal to CBF, (Th. 12.) and they have the common vertex D; therefore, the three pyramids are equal; and therefore, the prism is triple of any one of them.

COR. 1. Every pyramid is the third part of a prism of the same base and altitude. For every prism, may be divided into triangular prisms.

COR. 2. A cone is the third part of a cylinder of equal base and altitude. For a cylinder is equal to a prism, and a cone to a pyramid of equal base and altitude.

COR. 3. Pyramids and cones of equal altitudes, are as their bases. For the prisms, of which they are the third part, are as their bases. (Th. 57.)

THEOR. LXI. A sphere is two-thirds of its circumscribing cylinder.

Let ABCD, fig. 94, be a cylinder, circumscribing the sphere EFGH. The sphere is two thirds of the cylinder. For let AC, be a section passing through the common axis of the sphere and cylinder, join NA, NB, NI, and draw OIL parallel to AB or EG; it is evident, ANB, is the section of a cone having the same base with the cylinder, and vertex N; and that KL, KI, and KM, are the radii of the circular sections (parallel to the base) of the cylinder, sphere, and cone, respectively; and since NF, is equal to FB, NK is equal to KM; but a circle described on the radius NI is equal to the two circles on NK, KI, (Th. 43, Cor. 2); therefore, the circle on the radius KL is equal to the two circles on the radii KI, KM; hence the section of the cylinder is always equal to the corresponding sections of the sphere and cone. But the cone is a third part of the cylinder; therefore, the sphere is two-thirds of it, or the whole sphere is two-thirds of its circumscribing cylinder.

COR. A cone, hemisphere, and cylinder, of the same base and altitude are to each other as the numbers 1, 2, 3.

We have now delivered the most useful part of Theoretical Geometry: to those who wish to pursue the subject further, we recommend a careful perusal of the works of Euclid, Apollonius, and Archimedes.

What has already been demonstrated in this treatise will be found sufficient for connecting Geometry with Algebra, Conic Sections, Perspective, Navigation, Trigonometry, plane and spherical, and the different branches of mixed Mathematics, such as Optics, &c. all which are treated in their order, in this work. We shall, therefore, in the second part, on Practical Geometry, concisely state the method and rules by which geometry is to be applied to a few easy but useful geometrical problems, and to the mensuration of all the figures, whether superficial or solid, that commonly occur in the ordinary affairs of life.

PRACTICAL GEOMETRY.

GEOMETRICAL PROBLEMS.

PROBLEM I. fig. 95. To divide a given line AB into two equal parts.—1. From the points A and B as centres, with any distance greater than half AB, describe arcs cutting each other in *m* and *n*. 2. Through these points draw the line *mn*, and the point E, where it cuts AB, will be the middle of the line required.

PROB. II. fig. 96. To divide a given angle ABC, into two equal parts.—1. From the point, B, with any radius, describe the arc AC. 2. And from A and C with the same, or any other radius, describe arcs cutting each other in *n*. 3. Through the point *n* draw *nB*, and it will bisect the angle ABC, as was required.

PROB. III. fig. 97, 98. From a given point C, in a given straight line AB, to erect a perpendicular.

CASE I. When the point is near the middle of the line. Fig. 97.—1. On each side of the point C, take any two equal distances *Cn*, *Cm*. 2. From *n* and *m*, with any radius greater than *Cn* or *Cm*, describe arcs cutting each other in *s*. 3. Through the point *s* draw the line *sC*, and it will be the perpendicular required.

CASE II. When the point is at or near the end of the line. Fig. 98.—1. Take any point *o* and with the radius or distance *oC*, describe the arc *mCn*, and draw *mon*, cutting the arc *mCn* in *n*. 2. From the point *n* draw the line *nC*, and it will be the perpendicular required.

PROB. IV. fig. 99, 100. From a given point C, out of a given line AB, to let fall a perpendicular.

CASE I. When the point is nearly opposite to the middle of the line. Fig. 99.—1. From the point C, with any radius, describe the arc *mCn*, cutting AB in *n* and *m*. 2. From the points *n* and *m*, with the same or any other radius, describe two arcs cutting each other in *s*. 3. Through the points *Cs* draw the line *CGs*, and *CG* will be the perpendicular required.

CASE II. When the point is nearly opposite to the end of the line. Fig. 100.—1. To any point *m* in the line AB draw the line *Cm*. 2. Bisect the line *Cm*, or divide it into two equal parts, in the point *n*. 3. From *n*, with the radius *nm*, or *nG*, describe the arc *CGm*, cutting AB in *G*. 4. Through the point C, draw the line *CG*, and it will be the perpendicular required.

PROB. V. fig. 101. At a given point D, to make an angle equal to a given angle, ABC.—1. From the point B with any radius describe the arc *nm*, cutting the legs BA, BC, in the points *m*, *n*. 2. Draw the line DE, and from the point D, with the same radius as before, describe the arc *rs*. 3. Take the distance *mn* on the former arc, and apply it to the arc *rs*, from *r* to *s*. 4. Through the points *Ds* draw the line DF, and the angle EDF will be equal to the angle ABC, as was required.

PROB. VI. To draw a line parallel to a given line AB. Fig. 102, 103.

CASE I. When the parallel line is to pass through a given point C. Fig. 102.—1. To AB from the point C, draw any straight line *Cm*. 2. From the point *m*, with the radius *MC*, describe the arc *Cn* cutting AB in *n*. 3. And with the same radius, from the point C, describe the arc *mr*. 4. Take the distance *Cn*, and apply it to the arc *mr* from *m* to *r*. 5. Through the points *Cr*, draw the line *CGrH*, and it will be parallel to AB, as required.

CASE II. When the parallel line is to be at a given distance from AB. Fig. 103.—1. From any two points *r*, *s*, in the line AB, with a radius equal to the given distance, describe the arcs *n*, *m*. 2. Draw the line DG, to touch those arcs without cutting them, and it will be parallel to AB, as was required. N. B. The former case of this problem, as well as several other operations of practical geometry, may be more easily effected by a mathematical instrument known by the name of a parallel ruler.

PROB.

PROB. VII. fig. 104. To divide a given line AB, into any proposed number of equal parts.—1. From one end of the line A, draw Am , making any angle with AB; and from B the other end, draw Bn , making an equal angle ABn . 2. In each of the lines $A m$, Bn , beginning at A and B, set off as many equal parts, of any length, as AB is to be divided into. 3. Join the parts A 5, 14, 23, &c. and AB will be divided as required.

Note. Bn may be drawn parallel to Am by means of a parallel ruler.

PROB. VIII. fig. 105. To find the centre of a given circle, or one already described.—1. Draw any chord AB, and bisect it with the perpendicular CD. 2. Bisect CD in like manner with the chord EF, and their intersection O will be the centre required.

Note. The centre of a given circle, or any arch of it, may be found as in the next problem by taking three points in the circumference.

PROB. IX. fig. 106. To describe the circumference of a circle through three given points A, B, C.—1. From the middle point draw the lines or chords, BA and BC. 2. Bisect these chords perpendicularly with lines meeting each other in O. 3. From the point of intersection O, with the distance OA, OB, or OC, describe the circle ABC, and it will be that required.

PROB. X. fig. 107, 108. To draw a tangent to a given circle that shall pass through a given point A.

CASE I. When the point A is in the circumference of the circle. Fig 107.—1. From the given point A, to the centre of the circle, draw the radius OA. 2. Through the point A draw CD perpendicular to OA, and it will be the tangent required.

CASE II. When the point A is without the circle. Fig. 108.—1. To the point A from the centre O draw the line OA and bisect it in n . 2. From the point n with the radius nA or nO describe the semicircle ABO, cutting the given circle in B. 3. Through the points A, B, draw the line BA, and it will be the tangent required.

PROB. XI. fig. 109. To find a third proportional to two given lines A, B.—1. From the point C, draw two right lines, making any angle FCG. 2. In these lines take CE equal to the first term A, and CG, CD, each equal to the second term B. 3. Join ED, and draw GF parallel to it, and CF will be the third proportional required. That is, $CE(A) : CG(B) :: CD(B) : CF$.

PROB. XII. fig. 110. To find a fourth proportional to three given right lines A, B, C.—1. From the point D, draw two right lines, making any angle GDH. 2. In these lines, take DF, equal to the first term A, DE, equal to the second term B, and DH, equal to the third term C. 3. Join FE, and draw HG parallel to it, and DG will be the fourth proportional required. That is, $DF(A) : DE(B) :: DH(C) : DG$.

PROB. XIII. fig. 111. To find a mean proportional between two given right lines A, B.—1. Draw any right line in which take CE equal to A, and ED equal to B. 2. Bisect CD in O, and with OD, or OC, as a radius, describe the semicircle CFD. 3. From the given point E, draw EF perpendicular to CD, and it will be the mean proportional required. That is, $CE(A) : EF :: EF : ED(B)$.

PROB. XIV. fig. 112. To divide a given line AB, in the same proportion with which another given line C is divided.—1. From the point A draw AD equal to the given line C, and making any angle with AB. 2. To AD apply the several divisions of C, and join DB. 3. Draw the several lines 44, 33, &c. each parallel to DB, and the line AB will be divided as required.—That is, the parts A 1, 12, 23, 34, 4 B, on the line AB, will be proportional to the parts 10, 12, 23, 34, 45 on the line C.

PROB. XV. fig. 113. To make a triangle whose three sides shall be respectively equal to three given lines A, B, C.—1. Draw a line DE equal to one of the given lines C. 2. On the point D, with a radius equal to B, describe an arc. 3. And on the point E, with a radius equal to A, describe another arc, cutting the former in F. 4. Draw the lines DF, EF, and DFE will be the triangle required.

COR. Hence it is evident how an equilateral triangle may be described upon a given straight line.

Note. The three given lines must be of such a length that any two of them must be together greater than the third.

PROB. XVI. fig. 114. Upon a given line AB to describe a square.—1. From the point B, draw BC perpendicular, and equal,

to AB. 2. On A and C, with the radius AB, describe two arcs cutting each other in D. 3. Draw the lines AD, CD, and the figure ABCD will be the square required.

PROB. XVII. fig. 115. To describe a rectangle whose length and breadth shall be equal to two given lines AB and C.—1. At the point B, in the given line AB, erect the perpendicular BD, and make it equal to C. 2. From the points D, A, with the radii AB and C, describe two arcs cutting each other in E. 3. Join EA and ED, and ABDE will be the rectangle required.

PROB. XVIII. fig. 116. In a given triangle ABC to inscribe a circle.—1. Bisect the angles at A and B by the straight lines AO and BO. 2. From the point of intersection O, let fall the perpendicular On, and it will be the radius of the circle required.

PROB. XIX. fig. 117. About a given triangle ABC, to circumscribe a circle.—1. Bisect the two sides AB, BC, by the perpendiculars mo and no . 2. From the point of intersection o , with the distance OA, OB, or OC, describe the circle ACB, and it will be that required.

PROB. XX. fig. 118. To make a figure similar to a given figure ABCDE.—1. Take A b equal to the side of the figure required, and from the angle A draw the diagonals AC, AD. 2. From the points b, c, d , draw bc, cd, de , parallel to BC, CD, DE, and A $b c d e$ will be similar to ABCDE. The same thing may also be done by making the angles b, c, d, e , respectively equal to the angles B, C, D, E.

PROB. XXI. fig. 119. To construct a scale of chords to any given radius, AB.—1. Draw AC perpendicular to AB, and on A as a centre, with the given radius AB, describe the arc BC, which will be a quadrant. 2. On B, as a centre, with the given radius AB, describe an arc cutting the quadrantal arc at D, then BD will be an arc of 60 degrees. 3. Take an arc DE equal to DC, thus the quadrant BC will be divided into three equal arcs, each containing 30°. 4. Let each of the arcs BE, ED, DC, be divided into 30 equal parts, (which must be done by trials, for it cannot be done by any direct geometrical method,) and thus the whole quadrant will be divided into 90°. 5. Join BC, and on B, as a centre, with the distances between B and each of the divisions as radii, let arcs be described to meet BC, as in the figure. Thus the distance, between B and any one of the divisions of the scale BC, will be equal to the chord of the corresponding arc of the quadrant BEDC.

PROB. XXII. fig. 120. To make an angle of any proposed number of degrees.—1. Take the first 60 degrees from the scale of chords, and from the point A, with this radius, describe an arch nm . 2. Take the chord of the proposed number of degrees from the same scale, and apply it from n to m . 3. From the point A draw the lines A n and A m , and they will form the angle required. 4. If the given angle be greater than 90°, it may be taken at twice.

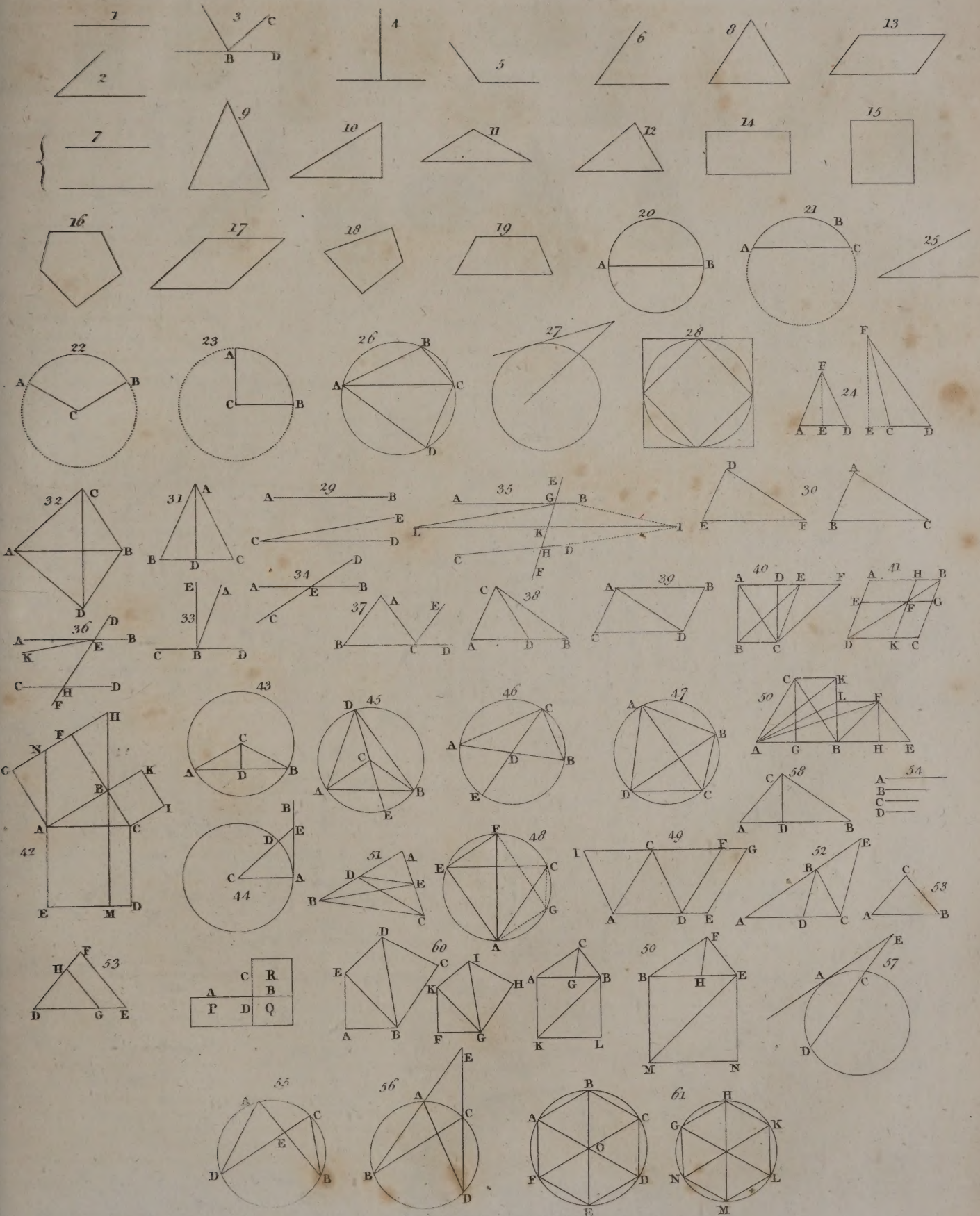
PROB. XXIII. fig. 120. An angle, BAC, being given to find the number of degrees it contains.—1. From the angular point A with the chord of 60 degrees describe the arc nm cutting the legs in the points n and m . 2. Take the distance nm , and apply it to the scale of chords, and it will shew the degrees required. 3. When the distance nm is greater than 90°, it must be taken at twice.

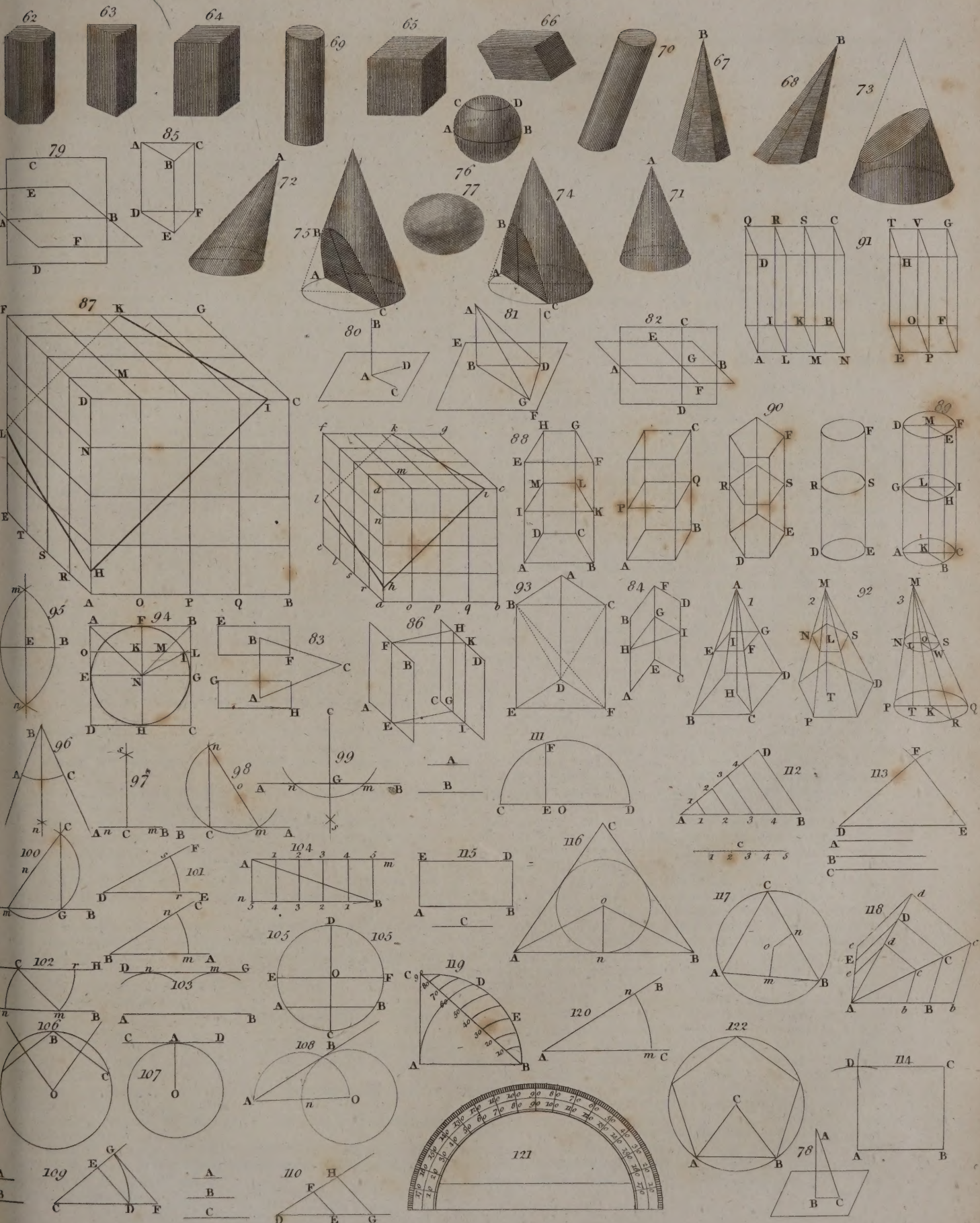
Note. Both this and the last problem may be performed by means of a protractor, which is a graduated arc designed for the purpose. See fig. 121.

PROB. XXIV. fig. 122. In a given circle, to describe a polygon of any proposed number of sides.—1. Divide 360° by the number of sides, and make an angle ACB, at the centre, whose measure shall be equal to the degrees in the quotient. 2. Join the points A, B, and apply the chord AB, to the circumference the given number of times, and it will form the polygon required.

PROB. XXV. fig. 122. On a given line AB to form a regular polygon of any proposed number of sides.—1. Divide 360° by the number of sides, and subtract the quotient from 180 degrees. 2. Make the angles ABC and BAC each equal to half the difference last found. 3. From the point of intersection C, with the distance CA, or CB, describe a circle. 4. Apply a chord, AD, to the circumference the proposed number of times, and it will form the polygon required.

Note. By this method the circumference of a circle may be divided into any number of equal parts.





GEOMETRY, SPHERIC. See PROJECTION OF THE SPHERE.

GEORGE LEWIS I. king of Great Britain, was the son of Ernest Augustus, elector of Hanover, by Sophia, daughter of Frederick, elector Palatine, and the grand-daughter of James I. of England. He was born in 1660, created duke of Cambridge in 1706, and succeeded queen Anne in 1714. The next year a rebellion broke out in Scotland in favour of the pretender, which was soon suppressed. In his reign parliaments were made septennial, and the order of the Bath revived. In 1720 happened the failure of the famous South-sea scheme, by which thousands of families were ruined. He died suddenly, June 11, 1727, at Osnaburgh.

GEORGE AUGUSTUS II. was born in 1683. He married, in 1705, princess Caroline, of Brandenburg-Anspach, who died in 1737. In 1714 he came to England with his father, whom he succeeded in 1727. In 1739 admiral Vernon was sent with a squadron to the West Indies, where he demolished Porto Bello, but failed in his attempt on Carthagena. In 1743 the king headed his army on the continent, and gained the battle of Dettingen. In 1745 the pretender's eldest son landed in the Highland, and was joined by several clans. After obtaining various successes, the rebels were defeated by the duke of Cumberland at Culloden in 1746. In 1748 peace was concluded at Aix-la-Chapelle. In 1755 war broke out between England and France, and in 1758 a treaty was entered into between England and Prussia. The French power was nearly destroyed in the East Indies. In America Louisburg was taken, and the capture of Quebec was followed by the conquest of Canada. The island of Guadaloupe and the settlement of Senegal were taken by the English. Admiral Hawke defeated the French fleet under Conflans, and the British flag waved triumphant in every part of the world. Amid this blaze of glory George II. died suddenly, by the bursting of the right ventricle of the heart, October 25, 1760.

GEORGE ST. THE CAPPADOCIAN, bishop of Alexandria on the expulsion of St. Athanasius. He was a native of Epiphania in Cilicia, and was, for some time, a purveyor in the army, but his frauds were so great that he was obliged to fly to avoid justice. He then went to Alexandria, where he displayed great zeal for Arianism, and in 356 was elected bishop by the prevailing party. His conduct was so cruel and oppressive that the people put him to death in 362. Great difficulties have been raised about this saint or hero. His very existence has been called in question. However the above is generally received. He is famous throughout all the East, and is called by the Greeks *Μεγαλομάρτυρ ὁ ἁγίου* the great martyr. England and Portugal have both chosen him for their patron saint.

GEORGE, FORT ST. a town and fort on the coast of Coromandel, in India. See MADRAS. Lat. 13°. 4'. 54". N. Lon. 80°. 24'. 49". E.

GEORGE, ST. in geography, one of the Azores. Lon. 28. 0. W. Lat. 38. 53. N.

GEORGE, ST. CROSS OF, a red cross in a field argent, which makes part of the British standard.

GEORGE, ST. DEL MINA, a fort on the Gold Coast of Guinea, the principal settlement of the Dutch in those parts, who took it from the Portuguese in 1630. It is about 10 miles W. of Cape Coast Castle. Lon. 0. 22. W. Lat. 5. 0. N.

GEORGE, ST. KNIGHTS OF. See GARTER. There have been various orders under this denomination, most of which are now extinct.

GEORGE, ST. RELIGIOUS OF. Of these there are divers orders and congregations; particularly canons regular of St. George in Alga, at Venice, founded by Bartholomew Colonna, in 1396, and established by Pope Boniface IX. in 1404. Pope Pius V. in 1570, gave these canons precedence of all other religious. There is another congregation in Sicily.

GEORGE THE III^d'S ISLAND, KING, the name given by Capt. Cook to Otaheite.

GEORGE'S BANK, ST. a fishing-bank of Massachusetts, on the Atlantic, E. of Cape Cod; extending between Lon. 67. 50. and 68. 40. W. and from Lat. 41. 15. to 42. 22. N.

GEORGE'S CHANNEL, ST. the channel between the W. coast of England and the S. E. of Ireland.

GEORGE'S ISLAND, ST. an island of England, in Cornwall, opposite to E. and W. Loe.

GEORGE'S ISLANDS, ST. islands in the Gulf of Mexico, on the coast of E. Florida, nearly opposite to the mouth of the Apalachicola. Lon. 84. 50. W. Lat. 29. 30. N.

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GEORGE'S RIVER, ST. a river of the United States, in the district of Maine, which becomes an arm of the sea, 2 leagues S. W. of Penobscott Bay.

GEORGE'S RIVER, ST. a very broad but short river of Maryland, in St. Mary's county.

GEORGE'S, ST. the largest of the Bermuda Islands, lying 500 miles E. of the continent of N. America. Lon. 63. 30. W. Lat. 32. 45. N.

GEORGE'S, ST. the capital of the island of Grenada, formerly called Fort Royal, from its fort.

GEORGETOWN, a large maritime district of S. Carolina, bounded on the N. E. by N. Carolina, S. E. by the Atlantic, S. W. by the Santee and N. W. by Camden and Cheraws districts. It is 112 miles long from N. to S. and 63 broad; and contains four counties, viz. Liberty, Winyaw, Kingston, and Williamsburg. It produces rice, Indian corn, cotton, indigo, wood, &c.

GEORGETOWN, the capital of the above district, 53 miles N. by E. of Charlestown.

GEORGETOWN, a town of Delaware, capital of Sussex county, 16 miles W. S. W. of Lewistown, and 103 S. of Philadelphia.

GEORGETOWN, a flourishing town of Georgia, 55 miles from Augusta.

GEORGETOWN, a town of Kentucky, 14 miles N. N. W. of Lexington, and 20 E. by N. of Frankfort.

GEORGIA, a country of Asia, bounded on the N. by Circassia, on the E. by Daghestan and Shirvan, on the S. by Armenia, and on the W. by the Euxine or Black Sea; comprehending the greatest part of the ancient Colchis, Iberia, and Albania. About the etymology of the name, authors differ. The most probable opinion is, that it is a corruption by the softening of Kurgia, from the river Kur; whence also it is supposed that the inhabitants are called by the Persians indifferently Gurgi and Kurgi; and the country Kurgistan and Gurgistan. Georgia is divided by a ridge of mountains into eastern and western; the former of which is again subdivided into the kingdoms of Caket, Carduel or Carthuel, and Goguetia; and the latter into the provinces of Abcassia, Mireta or Imeritia, and Guriel. Another division is into Georgia Proper, Abcassia, and Mingrelia. Teflis is the capital. This whole country is so extremely beautiful that some fanciful travellers have imagined they had here found the situation of the original garden of Eden. The hills are covered with forests of oak, ash, beech, chesnuts, walnuts, and elms, encircled with vines, growing perfectly wild, but producing vast quantities of grapes. From these is annually made as much wine as is necessary for the yearly consumption; the remainder are left to rot on the vines. The wine is so rich, that the Persian monarch has it always at his table. The whole country is very fertile, and abounds with cattle and wild fowls of various kinds. The bread is excellent, and the fruits, apples, pears, pomegranates, &c. have an exquisite flavour. Cotton grows spontaneously, as well as the finest European fruit-trees. Rice, wheat, millet, hemp, and flax, are raised on the plains, almost without culture. The valleys afford the finest pasturage: the rivers are full of fish; the mountains abound in minerals, and the climate is delicious; so that nature appears to have lavished on this favoured country every production that can contribute to the happiness of its inhabitants. The government of Georgia is despotic; but, were it not for the assistance of the Russian troops, the prince would frequently be unable to carry his decrees into execution. The punishments in criminal cases are shockingly cruel; fortunately they are not frequent, because it is easy to escape into some of the neighbouring countries, and because the prince is more enriched by confiscating the property of the criminal, than by putting him to torture. Judicial combats are considered as the privilege of nobility, and take place when the cause is extremely intricate, or when the power and interest of two claimants are so equal, that neither can force a decision of the court in his favour. This mode of trial is called an appeal to the judgement of God. This country formerly abounded with great cities, as appears from the ruins of many of them still visible, which shew that they must have been very large, opulent, and magnificently built. These were all destroyed by the northern barbarians from mount Caucasus, as the Alans, Huns, Suevi, and others, so much noted in history for their strength, courage, and conquests. In the fifteenth century, a king of Georgia divided among his five sons the provinces of Carduel and Caket, Imeritia, Mingrelia, Guriel, and Abcassia. These petty princes were too

jealous to unite for their common defence, and too weak singly to resist a foreign enemy, or even to check the encroachments of their great vassals, who soon became independent. By forming a party among these nobles, the Turks gradually gained possession of all the western provinces, while the Persians occupied the governments of Carduel and Caker. Since that period the many unsuccessful attempts of the Georgians to recover their liberty have repeatedly produced the devastation of their country. "The inhabitants, (says Sir George Chardin,) are robust, valiant, and of a jovial temper; great lovers of wine, and esteemed very trusty and faithful; endowed with good natural parts, but, for want of education, very vicious. The women are generally so fair and comely, that the wives and concubines of the king of Persia and his court are for the most part Georgian women. The Georgians are Christians of the Greek communion. Their dress nearly resembles that of the Cossacks; but men of rank frequently wear the habit of Persia. They usually dye their hair, beard, and nails, with red. The Georgian women employ the same colour to stain the palms of their hands. On their heads they wear a cap or fillet, under which their black hair falls on their forehead: behind, it is braided into several tresses. Their eyebrows are painted with black, so as to form one entire line, and their faces are perfectly coated with white and red.

GEORGIA, the most southern of the United States of America, bounded on the E. by the Atlantic Ocean, on the S. by E. and W. Florida, on the W. by the Mississippi, and on the N. E. and N. by S. Carolina and Tennessee. It is 666 miles long and 262 broad, lying between 80° and 91° Lon. W.; and 30° 17' and 35° Lat. N. The winters in Georgia are very mild and pleasant. Snow is seldom or never seen. The soil and its fertility are various, according to situation and improvements. By culture are produced rice, indigo, cotton, silk, Indian corn, potatoes, oranges, figs, pomegranates, &c. Rice at present is the staple commodity; but great attention is also paid to the raising of tobacco. Georgia, before the revolution, was divided into parishes; afterwards into three districts, but now into two, called the Upper and Lower; which are subdivided into twenty-four counties; nine in the Lower District, viz. Camden, Glynn, Liberty, Chatham, Bryan, McIntosh, Effingham, Scriven, and Burke; and fifteen in the Upper, viz. Montgomery, Washington, Hancock, Greene, Franklin, Oglethorpe, Elbert, Wilkes, Lincoln, Warren, Jefferson, Jackson, Bullock, Columbia, and Richmond. The chief towns are Savannah, the former capital of the state; Augusta, the late seat of government, Louisville, the present metropolis; (see these articles); Sunbury, Brunswick, Frederica, Washington, St. Patricks, Golinton, Greensborough, &c. The whole coast of Georgia is bordered with islands, the principal of which are Skiddaway, Wassaw, Ossabaw, St. Catherines, Sapelo, Frederica, Jekyll and Cumberland. Near Augusta, there is a bank of oyster-shells ninety miles from the sea; and in Wilkes county, near Washington, there is a remarkable spring which rises from a hollow tree, five feet long. The inside of the tree is covered with a coat of matter an inch thick, and the leaves around the spring are incrustated with a peculiar substance as white as snow. The water is said to be an effectual remedy for the scurvy, scrofula, gout, rheumatism, and consumption. The chief rivers in this state are the Savannah, Turtle river, Little and Great Satilla, Crooked river, and St. Mary's which forms a part of the southern boundary of the United States. The rivers in the middle and western parts are the Apalachicola, formed by the Chatahouchee and Flint rivers, Mobile, Pascagoula, and Pearl rivers. All these run southward into the Gulf of Mexico.

GEORGIA, South, an island of the S. Pacific Ocean, discovered and named by Captain Cook in 1775. Lon. between 38. 13. and 35. 34. W. Lat. 53. 57. and 54. 57. S.

GEORGICS, [*γεωργικόν*, *georgiques*, Fr.] poetical compositions upon husbandry. Hesiod and Virgil are the two greatest masters in Georgics. The moderns have produced nothing in this kind, except Rapin's book of Gardening; and the celebrated poem entitled Cyder, by Mr. Philips, who, if he had enjoyed the advantage of Virgil's language, would have been second to Virgil in a much nearer degree.

GEORGIEV, a town of Russia, in the government of Caucasus, thirty-two miles W. N. W. of Ekaterinograd.

GEORGINA, in botany, a genus of the syngenesia superflua

class and order. Receptacle chaffy; no down; calyx double; the outer many-leaved; inner one-leaved, eight-parted. There are three species.

GEORGITZ, a town of Wallachia, eighteen miles N. N. E. of Bucharest, and twenty-four S. E. of Tergovisto.

GEORGIUM SIDUS, or the GEORGIAN PLANET. See ASTRONOMY.

GEOSCOPY, [from *γη*, earth, and *σκοπεω*, to view,] an observation of the different qualities of the earth.

GEPIDÆ, GEPIDES, or GEPID, in ancient geography, according to Procopius, were a Gothic people, some of whom, in the migration of the Goths, settled in an island at the mouth of the Vistula, which they called Gepidos after their own name, which denotes lazy or slothful; others in Dacia, calling their settlement there Gepidia.

GEPPING, a town of Wirtemberg, twenty-five miles E. of Stutgard. Lon. 9. 45. E. Lat. 48. 44. N.

GERA, a town of Saxony in Misnia, on the Elster; thirty miles S. S. W. of Leipsic, and sixty-eight W. of Dresden.

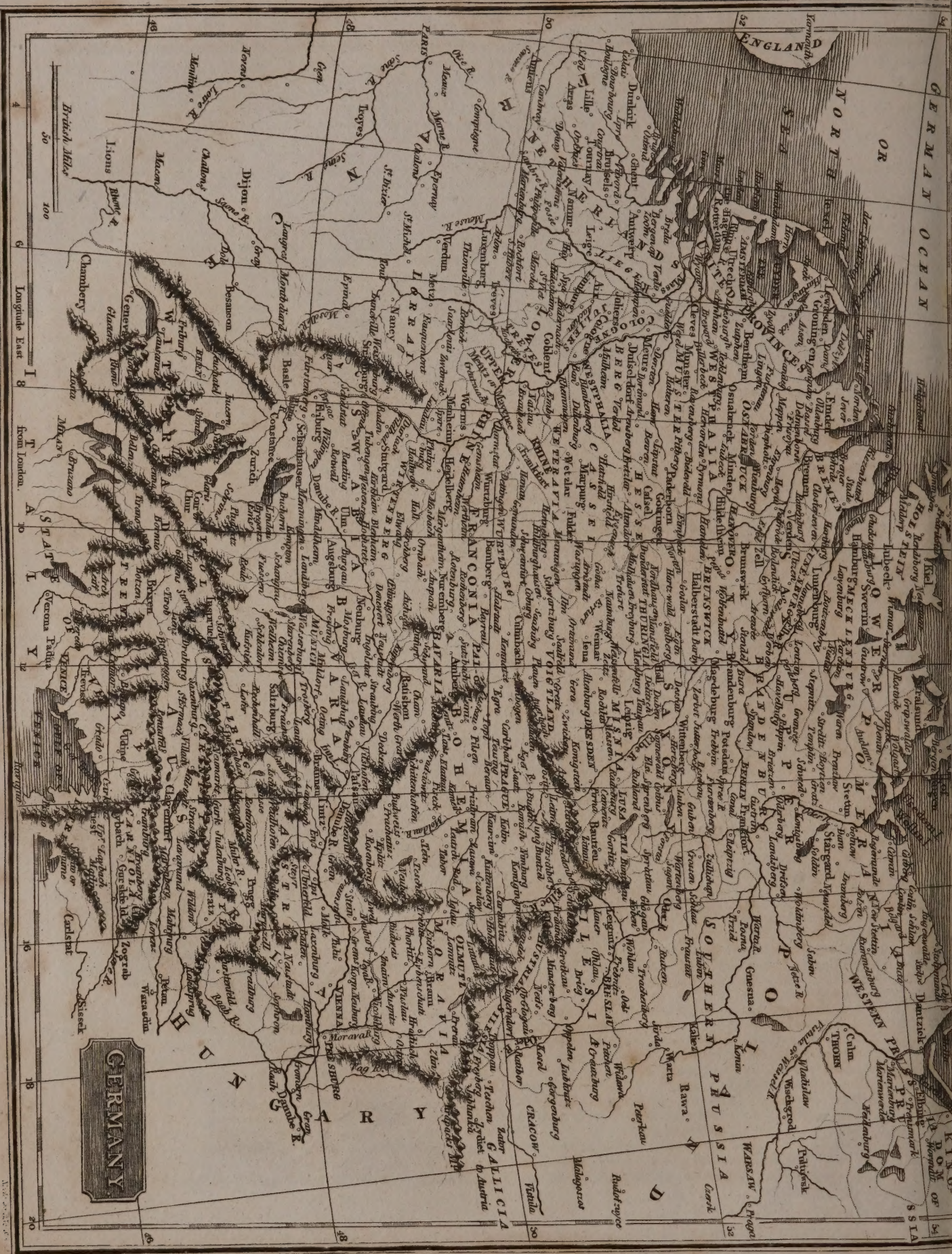
GERAH, [גרה, Heb.] the smallest silver coin among the Hebrews, in value sevenpence-halfpenny sterling.

GERANITES, in natural history, an appellation given to such of the semi-pellucid gems as are marked with a spot resembling a crane's eye.

GERANIUM, CRANE'S-BILL, in botany, a genus of the monadelphia decandria class and order. Natural order, Grinales. Calyx five-leaved; corolla five-petaled, regular; nectary five-horned glands, fastened to the base of the longer filaments; fruit five-grained, beaked; beaks simple, naked, neither spiral nor bearded. There are thirty-two species. The common wild sorts, and those which are brought from the colder climates, are hardy enough, and require little care; but the African species, and the others from hot countries which make so very beautiful a figure in our greenhouses, require great care in their culture and propagation. These may be propagated by seed, which should be sown toward the end of March in beds of light earth, carefully shading them from the sun, and giving them frequent but gentle waterings, till they are well rooted. The shrubby African geraniums are commonly propagated by cuttings, which planted in a shady border, in June or July, will take good root in five or six weeks; and they may then be taken up and planted in separate pots, placing them in the shade till they have taken new root, after which they may be removed into a sheltered situation. Geranium is recommended as one of the greatest vulneraries and abstersgents of the vegetable world, and is highly extolled for its power of stopping profusion of the menses, and hemorrhages of all kinds. Experience confirms this, especially among the poor people in the country; and it were to be wished, that the plant could be brought into more esteem in the shops, where at present it is disregarded.

GERAR, or GERARA, in ancient geography, the south boundary of Canaan near Beersheba; situated between Cades and Zur; two deserts, the one facing Egypt and the other Arabia Petraea.

GERARD, ALEXANDER, D. D. professor of divinity in King's college, Aberdeen, and one of his majesty's chaplains for Scotland. He was eldest son of the Rev. Gilbert Gerard, and was born the 22d Feb. 1728. He studied theology at the universities of Aberdeen and Edinburgh, was chosen assistant to professor D. Fordyce, in 1750, and was afterwards appointed his successor, upon his untimely death, in 1752. In 1754, a material alteration being made in the order of teaching philosophy in the university, professor Gerard was appointed to lay before the public the reasons which had influenced them to deviate from the former practice; which he accordingly did in a small pamphlet, that gave universal satisfaction; wherein he pointed out the inconveniences of the old, and the advantages of the new, plan; which was at this time adopted by both colleges. About this time too he was an active member of a respectable literary society, which met once a fortnight at Aberdeen, and of which Drs. Blackwell, Beattie, Gregory, Reid, Campbell, and other eminent literary gentlemen were members. On the 5th of Sept. 1759, he was ordained a minister of the church of Scotland; on the 11th of June, 1760, he was appointed professor of divinity in the Marischal college, and minister of the Grayfriars church at Aberdeen; and about the same time he was created D. D. Dr. Gerard's character in private life was amiable and exemplary. Kindness to his relations, affability with his dependants



GERMANY

Map showing the geographical layout of Germany and surrounding regions, including labels for major cities, rivers, and neighboring countries. The map includes a grid of latitude and longitude coordinates.

Major cities labeled include: Berlin, Warsaw, Prague, Vienna, and others. Rivers shown include the Rhine, Danube, and others. Neighboring countries shown include France, Poland, and others.

Geographical features include the North Sea, Baltic Sea, and various mountain ranges.

Latitude and longitude coordinates are marked along the edges of the map.

ants, steadiness and warmth in his attachments to his friends, and hospitality to strangers without extravagance or ostentation, were conspicuous in his general conduct. His public discourses, as a minister and professor, were equally marked by distinctness of arrangement, accuracy of composition, and justness of reasoning. His friend, Dr. Beattie, (who himself stands high in the republic of letters) assures us, that "he had improved his memory to such a degree, that, in little more than an hour, he could get by heart any sermon of ordinary length; though far from availing himself of this talent, as many would have done, he composed with care all the sermons that he preached." He was author of, 1. An Essay on Taste: 8vo. 1759. 2. Dissertations on Subjects relating to the Genius and Evidences of Christianity: 8vo. 1766. 3. An Essay on Genius: 8vo. 1774. 4. Several Sermons on Various Subjects, published from 1760 to 1782; and 5. A part of his Theological Course, entitled "The Pastoral Care, published in 1799, by his son, Dr. Gilbert Gerard, who succeeded him in his professorship. His Essay on Taste gained the gold prize medal given by the Philosophical Society of Edinburgh in 1756.

GERARD, TUNG, or TOM, founder and first Grand Master of the Knights hospitaliers of St. John, or Knights of Malta, was born at Amalfi, in Italy, in the eleventh century. In A. D. 1100, he assumed a religious habit, with a white cross on the breast, and, with many others, engaged in vows of chastity, poverty, and to relieve all Christians in distress, &c. He died in 1120, and was succeeded as grand master by Raymond du Puy.

GERARDE, JOHN, surgeon in London, the greatest botanist of his time, and many years chief gardener to lord Burleigh; who was himself a great lover of plants, and had the best collection in the kingdom, among which were many exotics introduced by Gerarde. In 1597, he published his Herbal, which was printed at the expence of J. Norton, who procured the figures from Frankfurt. In 1663, Thomas Johnson, an apothecary, published an improved edition of Gerarde's book; which met with such approbation by the university of Oxford, that they conferred upon him the degree of M. D. and it is still much esteemed. The descriptions in the herbal are plain and familiar; and are calculated to make the reader understand the characters of the plants.

GERARDIA, in botany, a genus of the angiospermia order, and didynamia class of plants; natural order, Personate. Calyx five-cleft; corolla two-lipped, lower lip three-parted, the lobes emarginate, the middle segments two-parted; capsule two-celled, gaping. There are ten species.

GERAW, GERAU, or GROSS, a town of Hesse Darmstadt, ten miles S. E. of Mentz.

GERBEROY, a town of France, in the department of Oise, and late province of Isle of France, six miles N. E. of Gournay, and fifty N. of Paris.

GERFALCON. See FALCO.

GERGESEI, or GERGESENES, one of the seven ancient nations of Canaan, less frequently mentioned than the rest. They appear to have been less considerable and more obscure: their name is from Girgasi, one of Canaan's sons.

GERGINSWALDE, a town of Saxony, in the circle of Leipzig, four miles N. E. of Rochlitz.

GERMAIN, or ST. GERMAIN, a town of France, in the department of Seine and Oise, and late province of the Isle of France, ten miles N. W. of Paris.

GERMAIN LAVAL, St. a town of France, in the department of Rhone and Loire, 18 miles S. of Roanne, and 225 S. E. of Paris. Lon. 4. 2. E. Lat. 45. 50. N.

GERMAINS, St. a borough of England, in Cornwall, ten miles W. of Plymouth.

GERMAN, in genealogy, signifies whole, entire, or own. Germani, quasi eadem stirpe geniti. Festus. Hence, Brother German, denotes a brother both by the father's and mother's side, in contradistinction to uterine brothers, &c. who are only so by the mother's side. And Cousins German, are those in the first degree, the children of brothers or sisters.

GERMAN PLATS, a town and township of New York, the capital of Herkemer county, eighty miles N. W. by W. of Albany.

GERMANDER, in botany. See TEUCRIUM.

GERMANICUS CÆSAR, CLAUDIUS, the son of Drusus, and nephew to the emperor Tiberius, who adopted him. By his mother Antonia, daughter of Mark Antony and Octavia, he was

grand-nephew to Augustus. He was much renowned as a general, but still more for his virtues. He took the title of Germanicus from his conquests in Germany; but though he refused the empire offered to him by his army, Tiberius, jealous of his success and popularity, caused him to be poisoned, A. D. 29, aged 34. He was a protector of learning; and composed some Greek comedies and Latin poems, some of which are still extant.

GERMANO, St. a town of Naples, at the foot of Mount Casano. Lon. 13. 59. E. Lat. 41. 13. N.

GERMANY, till very lately a powerful empire of Europe, but which, in different ages, has had very different limits. The name, according to the most probable conjecture, is derived from the Celtic words, *Ghar man*, signifying a warlike man, to which their other name, Allman, or Aleman, likewise alludes. The ancient history of the Germans is altogether wrapped up in obscurity; nor do we, for many ages, know any thing more of them than what we learn from the history of their wars with the Romans. The first time they are mentioned by the Roman historians, is about B. C. 211, when Marcellus subdued Insurbia and Liguria, and defeated the Gasatæ, a German nation situated on the banks of the Rhine. From this time history is silent with regard to all these northern nations till the eruption of the Cimbri and Teutones, who inhabited the most northerly parts of Germany. It is indeed very difficult to fix the limits of the country called Germany by the Romans. The southern Germans were intermixed with the Gauls, and the northern ones with the Scythians; and thus the ancient history of the Germans includes that of the Dacians, Huns, Goths, &c. till the destruction of the western Roman empire by them. Ancient Germany, therefore, we may reckon to have included the northern part of France, the Netherlands, Holland, Germany so called at present, Denmark, Prussia, Poland, Hungary, part of Turkey in Europe, and Muscovy. The Romans divided Germany into two regions; 1. Belgic, or Lower Germany, which lay to the southward of the Rhine; and 2. Germany Proper, or High Germany.

1. GERMANY, BELGIC, or LOWER GERMANY, lay between the rivers Seine and the Rhine; and in this we find a number of different nations, the most remarkable of which were the following: 1. The Ubii, whose territory lay between the Rhine and the Mosæ, (or Maese,) and whose capital was Cologne. 2. Next to them were the Tungri, supposed to be the same, whom Cæsar calls Eburones and Condrusi; and whose metropolis, then called Attuatica, has since been named Tongres. 3. Higher up from them, and on the other side of the Moselle, were the Treviri, whose capital was Augusta Trevirorum, now Triers. 4. Next to them were the Tribocci, Nemetes, and Vangiones. The former dwelt in Alsace, and had Argentoratum, now Strasburg, for their capital: the others inhabited the cities of Worms, Spire, and Mentz. 5. The Mediomatrici were situated along the Moselle, about the city of Mentz in Lorraine: and above them were situated another German nation, named Raurici, Rauraci, or Rauriaci, who inhabited that part of Helvetia, above Basil. To the W. and S. of these were the Nervi, Suevones, Silvanectes, Leuci, Rhemi, Lingones, &c. who inhabited Belgic Gaul. Between the heads of the Rhine and Danube were seated the ancient kingdom of Vindelicia, whose capital was called Augusta Vindelicorum, now Augsburg. Below it, on the banks of the Danube, were the kingdoms of Noricum and Pannonia. The first of these was divided into Noricum-Ripenses and Mediterraneum. It contained a great part of the present Austria, Styria, Carinthia, Tyrol, Bavaria, and some others of less note. The latter contained the kingdom of Hungary, divided into Upper and Lower; and extending from Illyricum to the Danube, and the mountains Cæti in the neighbourhood of Vindobona, now Vienna.

II. GERMANY, PROPER, UPPER, or HIGH GERMANY, lay beyond the Rhine and Danube. Between the Rhine and the Elbe were the following nations. 1. The Chævi, Upper and Lower: who were divided from each other by the river Visurgæ, now the Weser. Their country contained what is now called Bremen, Lunenburg, Friesland, and Groningen. The upper Chævi had the Cherusi, and the lower the Chamavi on the south-east, and the German Ocean on the north-west. 2. The Frisi, Upper and Lower, were divided from the lower Chævi by the river Amisia, now the Ems; and from one another by an arm of the Rhine. Their country still retains the name of Friesland, and is divided into

into East and West; but the latter has been long dismembered from Germany, as one of the seven United Provinces, and now forms the department of Ems in the French empire. 3. Beyond the Isela (now the Yssel), which bounded the country of the Frisii, were situated the Brueteri, who inhabited the tract now called Broecmorland; and the Mercii, about the river Lupe. On the other side of that river were the Usippii, or Uspites; but these were famed for often changing their territories, and therefore found in other places. 4. Next to these were the Juones, or inhabitants of Juliers, between the Maese and the Rhine. 5. The Catti, another ancient and warlike nation, inhabited Hesse and Thuringia, from the Haartzian mountains to the Rhine and Weser; among whom were comprehended the Mattiaci, whose capital is by some thought to be Marpurg, by others Baden. 6. Next to these were the Seducii bordering upon Suabia; Narisci, or the ancient inhabitants of Northgow, whose capital was Nuremberg; and the Marcomanni, whose country anciently reached from the Rhine to the head of the Danube and to the Neckar. The Marcomanni afterwards went and settled in Bohemia and Moravia, under their general or king Maroboduus: and some of them in Gaul, whence they drove the Boii, who had seated themselves there. 7. On the other side of the Danube, and between the Rhine and it, were the Hermunduri, who possessed the country now called Misnia in Upper Saxony; though some make their territories to have extended much farther, and to have reached to, or even beyond, Bohemia, then the seat of the Boii, whence its name. 8. Beyond them, on the north of the Danube, was another seat of the Marcomanni along the river Albis, or Elbe. 9. Next to Bohemia were situated the Quadi, whose territories extended from the Danube to Moravia, and the northern part of Austria. These are comprehended under the ancient name of Suevi; part of whom at length forced their way into Spain, and settled a kingdom there. 10. Eastward of the Quadi were situated the Bastarnæ, and parted from them by the Grauna, now Gran, a river that falls into the Danubé; and by the Carpathian mountains, from them called Alpes Bastarnicæ. The country of the Bastarnæ indeed made part of the European Sarmatia, and so was without the limits of Germany properly so called; but we find these people so often in league with the German nations, and joining them for the destruction of the Romans, that we cannot but account them as one people. Between those nations, seated along the other side of the Danube and the Hercynian forest, were several others whose exact situation is uncertain, viz. the Martigni, Buri, Borades, Lygii, or Logiones, and some others, who are placed by our geographers along the forest above-mentioned, between the Danube and the Vistula. On this side the Hercynian forest, were the famed Rætii (now Grisons), seated among the Alps. Their country, which was also called Western Illyricum, was divided into Rætia Prima, or Propria, and Secunda; and was then of much larger extent, spreading itself towards Suabia, Bavaria, and Austria. On the other side of the Hercynian forest were, 1. The Suevi, who spread themselves from the Vistula to the river Elbe. 2. The Longobardi, so called, according to some, on account of their wearing long beards; but according to others, on account of their consisting of two nations, viz. the Bardi and Lingones. These dwelt along the river Elbe, and bordered southward on the Chauci above-mentioned. 3. The Burgundi, of whose original seat we are uncertain. 4. The Semnones, who about the time of Tiberius, were seated on the river Elbe. 5. The Angles, Saxons, and Goths, were probably the descendants of the Cimbri, and inhabited the countries of Denmark, along the Baltic Sea, and the peninsula of Scandinavia, containing Norway, Sweden, and Finmark. 6. The Vandals were a Gothic nation, who, proceeding, from Scandinavia, settled in the countries now called Mecklenburgh and Brandenburg. 7. Of the same race were the Dacians, who settled themselves in the neighbourhood of Palus Mæotis, and extended their territories along the banks of the Danube. Germany contains mines of gold, silver, lead, tin, copper, iron, quicksilver, cinnabar, ochre, loadstone, coals, &c. with quarries of marble, alabaster, and various other stones. And in many places are found diamonds, rubies, emeralds, amethysts, cornellians, agates, as well as sulphur, alum, saltpetre, vitriol, &c. The German mines, though early explored, still continue great sources of wealth. Of quicksilver, one mine alone yields 50,000lb. weight a-year. They furnish the finest sort of clay for porcelain, and have excellent and extensive salt-works.

GERMANY, MODERN BOUNDARIES, EXTENT, AND DIVISIONS OF. Germany is bounded on the north by the German Ocean, Denmark, and the Baltic Sea; on the east by Prussia, Poland, and Hungary; on the south by Italy, Switzerland, and the Alps; and on the west by France and Batavia or Holland; the French now claiming the Rhine as their eastern boundary. Before the present war its western boundary was old France and the Netherlands, and its extent was estimated at 640 miles in length, and 550 in breadth. The German empire was formerly divided into ten circles, afterwards it consisted only of nine; viz. Upper, and Lower Saxony, Westphalia, Upper, and Lower Rhine, Franconia, Swabia, Bavaria, and Austria, which see. But owing to the late very great successes of the French over this part of Europe the Germanic constitution is now almost totally annihilated, the circles of Westphalia, Saxony, and Bavaria, and the duchy of Wirtemberg, having been erected into the dignity of kingdoms.

i. **GERMANY, HIGH**, comprehends the Palatinate of the Rhine, Franconia, Suabia, Bohemia, Moravia, Austria, Carinthia, Carniola, and Stiria: and formerly included Switzerland and the Grison's country.

ii. **GERMANY, LOW**, comprehends part of the Low Country of the Rhine, Cologne, and Mentz; Westphalia, Hesse, Brunswick, Misnia, Lusatia, Upper and Lower Saxony, Mecklenburg, Lunenburg, Brandenburg, and Pomerania. From the central situation of Germany, its commerce with the rest of Europe is very extensive. Its minerals are decidedly the first native articles for trade; after which are medicinal waters, salt, hemp, flax, linen, silk, wines, fruits, corn, cattle, stuffs, cloths, timber, porcelain, wrought iron and steel, drugs, oils and colours, are the principal. The French artisans, exiled by the revocation of the edict of Nantz, enabled Germany to stand in no need of the wrought silks of other countries. Great commercial fairs still exist in Germany. There are thirty-eight universities in Germany; nineteen Protestant, seventeen Catholic, and two which partake of both; besides a number of literary societies and academic institutions: and education in general is particularly attended to even in the very lowest ranks.

GERME, among shipping, a kind of bark used in the shallows on the coast of Egypt, as drawing but little water. They are strong and well built, but have no decks.

GERMEN, the SEED-BUD. See BOTANY.

GERMEN, by Pliny and the ancient botanists is used to signify a bud containing the rudiments of the leaves.

GERMINATION, among botanists, comprehends the precise time which seeds take to rise after they have been committed to the soil. The different species of seeds are longer or shorter in rising, according to the degree of heat which is proper to each. Millet, wheat, and several of the grasses, rise in one day; blite, spinach, beans, mustard, kidney-beans, turnips, and rocket, in three days; lettuce and dill, in four; cucumber, gourd, melon, and cress, in five; radish and beet, in six; barley, in seven; orach, in eight; purslane, in nine; cabbage, in ten; hyssop, in thirty; parsley, in forty or fifty days; peach, almond, walnut, chesnut, pæony, horned poppy, hyecoum, and ranunculus falcatus, in one year; rose-bush, cornel-tree, hawthorn, medlar, and hazel-nut, in two. The seeds of some species of orchis, and of some liliaceous plants never rise at all. Some seeds require to be sowed almost as soon as they are ripe, otherwise they will not sprout or germinate. Of this kind are the seeds of coffee and fraxinella. Others, particularly those of the pea-bloom flowers, preserve their germinating faculty for a series of years. Mr. Adanson asserts, that the sensitive plant retains that virtue for thirty or forty years. Air and water are the agents of germination. The humidity of the air alone makes several seeds to rise that are exposed to it. Seeds too are observed to rise in water, without the intervention of earth; but water without air is insufficient. Mr. Homberg's experiments on this head are decisive. He puts several seeds under the exhausted receiver of an air-pump, with a view to establish something certain on the causes of germination. Some of them did not rise at all; and the greatest part of those which did, made very weak and feeble productions. Thus it is for want of air that seeds, which are buried at a very great depth in the earth, either thrive but indifferently, or do not rise at all. They frequently preserve, however, their germinating virtue for many years within the bowels of the earth; and it is not unusual, upon a piece of ground being newly dug to a considerable depth, to observe it soon after covered with several plants, which had not been seen

seen there in the memory of man. Were this frequently repeated, it would doubtless be the means of recovering certain species of plants which are regarded as lost; or which perhaps have never come to the knowledge of botanists. Some seeds require a greater quantity of air than others. Thus purslane which does not rise till after lettuce in the free air, rises before it in vacuo; and both prosper but little, or perish altogether, while cresses vegetate as freely as in the open air. The late discoveries in chemistry, have thrown much light on this subject. In 1793, M. Humboldt discovered, that simple metallic substances are not favourable to the germination of plants, but that metallic oxides favour it in proportion to their degree of oxidation. This led him to search for a substance with which oxygen might be so weakly combined as to be easily separated, and he tried oxygenated muriatic acid gas mixed with water. Cresses in this acid shewed germs at the end of six hours, and in common water at the end of thirty-two hours. The action of the acid on vegetable fibres was announced by a great number of air-bubbles covering the seeds, which did not take place with water till the end of fifty or forty-five minutes. These experiments, published in Humboldt's "Flora Subterranea Fribergensis," and in his "Aphorisms on the Chemical Physiology of Plants," have been repeated by Messrs. Uslar, Plenck, Villdenow, and others. See "Dictionnaire de Physique, par Gehler." They were made at a temperature of from twelve to fifteen of Reaumur. In 1796, Humboldt made some new experiments, and found that, by joining caloric to oxygen, vegetation was still more accelerated. He threw equal quantities of the seeds of garden-cresses into pure water and oxygenated muriatic acid, at a temperature of 58° F. Cresses germinated in the acid in three hours, but in the water not till the end of twenty-six hours. In the muriatic, nitric, or sulphuric acid, there was no germ at all: though according to the experiments of M. Candolle, the nitric acid accelerates germination also, when greatly diluted with water. Professor Pohl at Dresden caused the seed of a new species of Euphorbia to germinate in oxygenated muriatic acid, though taken from Bocconi's collection of dried plants, 110 or 120 years old. Jacquin and Vander Schort at Vienna threw into oxygenated muriatic acid all the old seeds, which had been kept twenty or thirty years at the botanical garden, every attempt to produce vegetation in which had proved fruitless, and the greater part of them, even the hardest seeds, germinated. Among these were the yellow bonduc, or nickar-tree, the pigeon-pea, the *Dodonaea Angustifolia*, the climbing mimosa, and some new species of *Hopaea*. There are now shewn at Vienna very valuable plants, which are entirely raised by the oxygenated muriatic acid, and are from five to eight inches high. Humboldt made the *elusia rosea* to germinate, the seeds of which had been brought from the Bahama islands by Boose, and had resisted every previous effort to make them vegetate. For this purpose he used a new process, which will be easier for gardeners who cannot procure the oxygenated muriatic acid. He formed a paste by mixing the seeds with the black oxide of manganese, and then poured over it the muriatic acid diluted with water, in the proportion of half a cubic inch of the acid to three of water. The vessel containing this mixture must be covered, but not shut close, lest it should burst. At the temperature of 93°, the muriatic acid becomes strongly oxidated, the oxygenated muriatic gas which is disengaged passes through the seeds; and during this passage the irritation of the vegetable fibres takes place. Philos. Mag.

GERNOI, a fort of Russian Siberia, in Kolivan.
GERON, or **GERON POINT**, a cape of Ireland, in Antrim county, 15 miles N. E. of Antrim, and 32 N. of Belfast.

GERONA, **GIRONA**, or **GIRONNA**, an ancient town of Spain, in Catalonia, 47 miles N. E. of Barcelona. Lon. 2. 52. E. Lat. 42. 10. N.

GERONTES, [from *geron*,] in antiquity, a kind of judges, or magistrates, in ancient Sparta, answering to what the Areopagites were at Athens. See **AREOPAGUS**.

GEROPOGON, in botany, a genus of the polygamia aequalis order, and syngenesia class of plants; natural order, Compositæ. Calyx simple; receptacle with bristle-shaped chaffs; seeds of the disk with a feathered down of the ray, with five awns. There are three species.

GERRI, a town of Nubia, on the Nile, 130 miles N. N. E. of Senaar. Lon. 30. 34. E. Lat. 16. 15. N.
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TERS, a department of France, bounded on the N. by those of Landes, and Lot and Garonne. Auch is the capital.

GERSPACH, a town of Suabia, on the Murg, 2 miles S. E. of Baden.

GERTRUDENBURG, **GERTRUYDENBERG**, or **GERTRUYDENBURG**, an ancient and strong town of Batavia or Holland, in the department of Dommel and Scheldt, and late province of Dutch Brabant. It lies 7 miles N. E. of Breda.

GERUND, [*gerundium*, Latin,] in the Latin grammar, a kind of verbal noun, which governs cases like a verb.

GERUNDS are substantive nouns of the second declension and neuter-gender, partaking of the nature of a participle, declinable only in the singular number, through all the cases except the vocative, as *legendum*, *legendi*, &c. They express not only the time, but the manner, of an action; as, "he fell *in running* post." They differ from participles, in that they express the time, which participles do not, though they always imply some time; and they differ from tenses properly so called, in that they express the manner, which the tenses do not.

GERUNDA, in ancient geography, a town of the Ausetani, in Hispania Citerior, on the S. or right side of the Sambroca; now called Gerona.

GERYON, or **GERYONES**, in fabulous history, a king of Gades, in Iberia, who had three bodies, and fed his cattle with human flesh. This monster was slain by Hercules, who carried off his cattle.

GESNER, **SOLOMON**, the celebrated author of the "Death of Abel," was the son of John Conrad Gesner, bookseller and member of the Great Council, and was born at Zurich in 1730. In his early years he shewed no signs of superior abilities; and his progress in education was so slow, that his master gave him up as incapable of any greater attainments than writing and the four first rules of arithmetic. Upon this he was placed under a clergyman, a relation of his father's, who shewed himself better acquainted with the art of discovering the natural inclinations of his pupils. He often carried young Gesner with him into the fields, to survey the beauties of nature; and finding that he took pleasure in such lessons, and listened to them with peculiar attention, he repeated some of the most striking passages of ancient authors, who have written on these subjects, in the most agreeable manner. By this ingenious artifice, young Gesner's mind began to open, and its powers to expand; and it is, perhaps, owing to this circumstance, that he became so fond of the language of Virgil and Theocritus. When he arrived at a proper age, he chose his father's profession. Of five printing-houses at Zurich, two were occupied by Gesners. The house in which our poet's father had a share, was known by the firm of Orel, Gesner, and Company, and was famed for the elegance of the works which it published. But Mr. Gesner did not damp his genius, by the drudgery of business. He indulged himself freely in pursuing his favourite object, and his partners never grudged him that time which he devoted to study. In 1752, he made a tour through Germany, not so much to extend his commerce, as to see and be acquainted with those authors who have done honour to their country. The following anecdote is strikingly characteristic of that timidity which often accompanies true genius. When Mr. Gesner was at Berlin, he was admitted into a literary society, of which Gleim and Lessing were members. Every member read in turn some pieces of his own composition, and Gesner was very desirous of submitting to these able critics a small work, which was his first attempt. As each member had done reading, Gesner was observed to move his hand with a kind of tremor towards his pocket, and to draw it back again without producing any thing. Having not yet published any work, none of the company could guess the cause of a motion which his modesty prevented him from explaining. The piece which he wished, but had not the courage, to shew, was his poem, entitled "Night," which he published on his return to Zurich in 1753. It was considered as an original, of which no model is to be found among the moderns; but in Gesner's opinion, it was only a piece of imaginary painting, or, to use his own words, in one of his letters to Mr. Huber who translated his works, "a caricature composed in the moments of folly or intoxication." In this little poem he has introduced a short episode on the origin of the glow-worm, containing a poetical explanation of this natural phosphorus, which has all the beauty of Ovid's *Metamorphoses* without their prolixity.

lixity. The success of this essay emboldened him to publish a pastoral romance, called "Daphnis," in three cantos. The applause deservedly bestowed upon this performance induced him to publish his "Idylls," and other rural poems in imitation of Theocritus. Pastoral poetry, which was then little known in Germany but by translations, began to be preferred to every other kind. His "Death of Abel," was first published in 1758. It is written, like the rest of his pieces, in poetical prose; and went through three editions in one year. The French edition was followed by others, in Italian, Dutch, Danish, and, lastly, two in English, one in prose and the other in verse. He next published his "First Navigator," a poem in three cantos, which many consider as his masterpiece. He produced likewise, in the dramatic stile "Evander and Alcimne," in three acts; and "Erastus," in one act, which was represented with applause at Leipsic and Vienna. In 1765 he published ten landscapes, engraved by himself from his own designs. These were followed by others. He was also the author of a Letter on Landscape Painting, Poems, &c. He died in 1781.

GESNERIA, in botany, a genus of the angiospermia order, and didynamia class of plants; natural order, Personate. Calyx five-cleft, sitting on the germ; corolla incurved and recurved; capsule inferior, two-celled. There are twelve species.

GESTRICIA, or **GESTRICKLAND**, a province of Sweden, bounded by Helsingia on the N. by the gulf of Bothnia on the E. by Upland, Westmanland, and Dalecarlia, on the S. and by Dalecarlia on the W. It abounds with mines, forests, lakes, and rivers; and is 17 miles long and 10 broad. Gefle is the capital. The Dahl, the finest river in Sweden, meanders through it.

GESTURE, in rhetoric, consists principally in the action of the hands and face; and may be defined, a suitable conformity of the motions of the countenance, and of several parts of the body, in speaking to the subject of discourse. See **ORATORY**.

GETÆ, an ancient nation of Thrace, who dwelt on both sides of the Ister, near Scythia, supposed to be the ancestors of the Dacians and Goths; or according to others, of the Walachians or Moldavians.

GE-TCHAO, a town of China, in the province of Chang-tong, 27 miles E. S. E. of Lu.

GETHSEME, [גֶּתְשֶׁמֶנִּי, Heb. *i. e.* the valley of fat, or fertility,] in ancient geography, a village at the foot of Mount Olivet, whither Jesus Christ sometimes retired in the night-time. It was in a garden belonging to this village that he suffered the agony in which he sweated blood; and was arrested by Judas and his band. The place is described by Maundrel as an even plot of ground, not above 57 yards square, lying between the foot of Mount Olivet and the brook Cedron.

GETHYLLIS, in botany, a genus of the monogynia order, and diodecandria class of plants; natural order, Spathaceæ. Calyx none; corolla six-parted; berry club-shaped, radicle, one-celled. There are four species.

GEUM, **AVENS**, or **HERB BENNET**, a genus of the polygamia order, and icosaandria class of plants: natural order, Senticosæ. Calyx ten-cleft; petals five; seeds with a kneed awn. There are nine species, natives of Europe and North America.

GEX, a late territory of France, in the province of Bresse; bounded by Mount Jura, the Rhone, the lake of Geneva, and Switzerland. It now forms the department of Ain.

GEX, a town of France, in the department of Ain, 10 miles N. N. W. of Geneva.

GEZIRA, a town of Asiatic Turkey, in the province of Diarbekir, 70 miles N. W. of Mousul.

GEZULA, or **GAZULA**, a country of Africa, S. of Morocco, the inhabitants of which are allies of the emperor.

GHENT, or **GAUNT**, a city of France, capital of the department of the Scheldt, and late capital of the province of Austrian Flanders. It is seated on four navigable rivers, the Scheldt, the Lys, the Lieve, and the Moeze. It is 26 miles N. W. of Brussels. Lon. 3. 49. E. Lat. 51. 3. N.

GHERIAH, or **GHERLAH**, a town of Hindostan, in Concan, on the W. or pirate coast, 80 miles N. N. W. of Goa. Lon. 73. 8. E. Lat. 16. 45. N.

GHEYSSIQUAS, a nation of Hottentots, who inhabit a district of South Africa, near Caffraria, from which, as well as from

the country of the Bremas and Briquas, it is separated by a chain of mountains.

GHINIA, in botany, a genus of the diandria monogynia class and order. Natural order, Personatæ. Calyx five-toothed, teeth acuminate; corolla two-lipped; drupe containing a nut, four or five-celled. It has two species.

GHIRGONG, or **GHERGONG**, a city of Hindostan, the capital of Assam, seated on the Burrampooter, 448 miles E. of Patna.

GHISLAIN, **St.** or **St. GHILAN**, a town of France, in the department of the North, and late province of French Hainault, five miles W. of Mons.

GHIZNI, or **GAZNA**. See **GAZNA**.

GHOUMEL, a town of Africa, in the kingdom of Pholey, on the Joto. Lon. 11. 15. W. Lat. 16. 12. N.

GHOWRI, a town of Asia, in the kingdom of Balk. Lon. 66. 56. E. Lat. 35. 40. N.

GIAGH, in chronology, a cycle of 12 years, in use among the Turks and Cathayans. Each year of the giagh bears a name of some animal; the first that of a mouse; the second that of a bullock; the third a lynx or leopard; the fourth a hare; the fifth a crocodile; the sixth a serpent; the seventh a horse; the eighth a sheep; the ninth a monkey; the tenth a hen; the eleventh a dog; and the twelfth a hog. They also divide the day into twelve parts, called giaghs, and distinguish them by the names of animals. Each giagh contains two of our hours, and is divided into eight kehs; so that a keh is a quarter of our hour.

GIANT, [*geant*, French; *gigas*, Latin,] a man of size above the ordinary rate of men; a man unnaturally large. It is observable, that the idea of a giant is always associated with pride, brutality, and wickedness. The tradition of all ages have furnished us with so many extravagant accounts of giants of incredible bulk and strength, that the existence of such people is now generally disbelieved. It is commonly thought, that the stature of man has been the same in all ages; and some have even pretended to demonstrate the impossibility of the existence of giants mathematically. Of these our countryman M'Laurin has been the most explicit. But his arguments and comparisons, drawn from the disproportion between the cohesion of parts in small models and large works, of human workmanship, are by no means conclusive; because, along with an increase of stature in any animal, we must always suppose a proportional increase in the cohesion of the parts of its body. Large works sometimes fail when constructed on the plan of models, because the cohesion of the materials whereof the model is made, and of the large work, are the same; but a difference in this respect will produce a very remarkable difference in the ultimate result. Thus, suppose a model is made of fir-wood, the model may be firm and strong enough; but a large work made also of fir, when executed according to the plan of the model, may be so weak that it will fall to pieces from its own weight. If, however, we make use of iron for the large work instead of fir, the whole will be sufficiently strong, even though made exactly according to the plan of the model. The like may be said with regard to large and small animals. If we could find an animal whose bones exceeded in hardness and strength the bones of other animals as much as iron exceeds fir, such an animal might be of a monstrous size, and yet be exceedingly strong. In like manner, if we suppose the flesh and bones of a giant to be greatly superior in hardness and strength to those of other men, the great size of his body will be no objection at all to his strength. The whole controversy, therefore, concerning the existence of giants, must rest on the credibility of the accounts given by those who profess to have seen them, and not on any arguments drawn *a priori*. In the scripture we are told of giants, who were produced from the marriages of the sons of God with the daughters of men. This passage indeed has been differently interpreted, so as to render it doubtful whether the word translated giants does there imply any extraordinary stature. In other parts of scripture, however, giants, with their dimensions, are mentioned in such a manner that we cannot possibly doubt; as in the case of Og king of Bashan, Goliath, and his brethren. 1 Chron. xx. 4—8. The Rev. Mr. Gun minister of Latheron, in Caithness, mentions William Sutherland the last proprietor of Berrydale castle, who lived in the end of the 15th century, and measured nine feet five inches high.

GIANT'S CAUSEWAY, in geography and natural history, a vast collection

collection of Basaltic pillars in the county of Antrim in Ireland. See BASALTES. The principal or grand causeway (for there are several less considerable and scattered fragments of them,) consists of a most irregular arrangement of many hundred thousands of columns of a black kind of rock, hard as marble: almost all of them are of a pentagonal figure, but so closely and compactly situated on their sides, though perfectly distinct from top to bottom, that scarce any thing can be introduced between them. The columns are of an unequal height and breadth; some of the highest, visible above the surface of the strand, and at the foot of the impending angular precipice, may be about 20 feet; they do not exceed this height, at least none of the principal arrangement. How deep they are fixed in the strand, was never yet discovered. This grand arrangement extends nearly 200 yards, visible at low water; how far beyond is uncertain: from its declining appearance, however, at low water, it is probable it does not extend under water to a distance any thing equal to what is seen above. The breadth of the principal causeway, which runs out in one continued range of columns, is, in general, from 20 to 30 feet; at one place or two it may be nearly 40 for a few yards. In this account are excluded the broken and scattered pieces of the same kind of construction, that are detached from the sides of the grand causeway, as they do not appear to have ever been contiguous to the principal arrangement, though they have frequently been taken into the width: which has been the cause why many very dissimilar representations of this causeway have been given. The highest part is the narrowest, at the very foot of the impending cliff from whence the whole projects, where, for four or five yards, it is not above 12 or 15 feet wide. The columns of this narrow-part incline from a perpendicular a little to the westward, and form a slope on their tops, by the very unequal height of the columns on the two sides, by which an ascent is made at the foot of the cliff, from the head of one column to the next above, gradually, to the top of the great causeway, which, at the distance of six yards from the cliff, obtains a perpendicular position; and lowering in its general height, widens to about 20 or between 20 and 30 feet, and for 100 yards nearly is always above water. The tops of the columns for this length being nearly of an equal height, they form a grand and singular parade, that may be easily walked on, rather inclining to the water's edge. But from high-water-mark, as it is perpetually washed by the beating surges on every return of the tide, the platform lowers considerably, and becomes more and more uneven, so as not to be walked on but with the greatest care. At the distance of 150 yards from the cliff, it turns a little to the east for 20 or 30 yards, and then sinks into the sea. The figure of these columns is almost unexceptionally pentagonal, or composed of five sides; there are very few of any other figure: some few are of three, four, and six sides, but the generality of them are five-sided, and the spectator must look very nicely to find any of a different construction: yet what is very extraordinary, there are not two columns in ten thousand to be found, that either have their sides equal among themselves, or whose figures are exactly alike. Nor is the composition of these columns less deserving attention. They are not of one solid stone in an upright position; but composed of several short lengths, curiously joined, not with flat surfaces, but articulated into each other like ball and socket, or like the joints in the vertebrae of some of the larger kinds of fish, the one end at the joint having a cavity, into which the convex end of the opposite one is exactly fitted. This is not observable but by disjoining the two stones. The depth of the concavity or convexity is generally about three or four inches. And the convexity, and the correspondent concavity, are not conformed to the external angular figure of the column, but exactly round, and as large as the size or diameter of the column will admit. Consequently, as the angles of these columns are in general extremely unequal, the circular edges of the joint are seldom coincident with more than two or three sides of the pentagonal, and from the edge of the circular part of the joint to the exterior sides and angles they are quite plain. It is still farther very remarkable, that the articulations of these joints are frequently inverted; in some the concavity is upwards, in others the reverse. This occasions that variety and mixture of concavities and convexities on the tops of the columns, which is observable throughout the platform of this causeway, yet without any discoverable regularity with respect to the number of either. The length of these particular stones, from joint to joint, is various:

in general, from 18 to 24 inches, and, for the most part, longer toward the bottom of the columns than nearer the top, and the articulation of the joints something deeper. The size or diameter of the columns is as different as their length and figure; in general, they are from 15 to 20 inches. There are no traces of uniformity discovered throughout the whole combination, except in the form of the joint, which is invariably by an articulation of the convex into the concave of the piece next above or below it; nor are there any traces of a finishing in any part, either in height, length, or breadth, of this curious causeway. If there is here and there a smooth top to any of the columns above water, there are others just by, of equal height, that are more or less convex or concave, which shew them to have been joined to pieces that have been washed or by other means taken off. And undoubtedly those parts that are always above water have, from time to time, been made even; and the remaining surfaces of the joints must naturally have been worn smoother, by the constant friction of the weather and walking, than where the sea, at every tide, is beating upon it, and continually removing some of the upper stones, and exposing fresh joints. As these columns preserve their diameters from top to bottom, in all the exterior ones, which have two or three sides exposed to view, the same may be with reason inferred of the interior columns whose tops only are visible. Yet what is very extraordinary, and equally curious, is, that notwithstanding the universal dissimilitude of the columns, both as to their figure and diameter, and though perfectly distinct from top to bottom, yet is the whole arrangement so closely combined at all points, that hardly a knife can be introduced between them either on the sides or angles. It is really a most curious piece of entertainment, to examine the close texture and nice insertion of such an infinite variety of angular figures, as are exhibited on the surface of this grand parade. From the infinite dissimilarity of the figures of these columns, this will appear a most surprising circumstance to the curious spectator, and would incline him to believe it a work of human art, were it not inconceivable, that the invention of man should construct and combine such an infinite number of columns, which should have a general apparent likeness, and yet be so universally dissimilar in their figure, as that, from the minutest examination, not two in ten or twenty thousand should be found, whose angles and sides are equal among themselves, or of the one column to those of the other. That this is the production of nature, the attentive spectator cannot doubt, who carefully surveys the general form and situation, with the infinitely various figuration of the several parts of this causeway. There are no traces of regularity or design in the outlines of this curious phenomenon; which, including the broken and detached pieces of the same kind, are extremely scattered and confused, and, whatever they might originally, do not at present appear to have any connection with the principal causeway, as to any supposable design or use in its first construction; and as little design can be inferred from the figure or situation of the several constituent parts. The whole is, indeed, extremely confused, disuniform, and destitute of every appearance of use or design in its original construction. But what, beyond dispute, determines its original to be natural, is, that the very cliffs, at a great distance from the causeway, especially in the bay to the eastward, exhibit at many places the same kind of columns, figured and jointed in all respects like those of the grand causeway. Some of them are seen near to the top of the cliff, which in general, in these bays to the E. and W. of the causeway, is near 300 feet in height; others again are seen about midway, and at different elevations from the strand. A very considerable exposure of them is seen in the very bottom of the bay to the eastward, near 100 rods from the causeway, where the earth has evidently fallen away from them upon the strand; and exhibits a most curious arrangement of many of these pentagonal columns, in a perpendicular position, supporting, in appearance, a cliff of different strata of earth, clay, rock, &c. to the height of 150 feet or more, above. Some of these columns are between 30 and 40 feet high, from the top of the sloping bank below them; and, being longest in the middle of the arrangement, shortening on either hand in view, they have obtained the appellation of organs, from a rude likeness in this particular to the frontal tubes of that instrument; and as there are few broken pieces on the strand near it, probably the outside range of columns that now appear is really the original exterior line, toward the sea, of this collection. But

how far they extend internally into the bowels of the incumbent cliff, is unknown. The very substance, indeed, of that part of the cliff which projects to a point, between the two bays on the E. and W. of the causeway, seems composed of this kind of materials; for besides the many pieces that are seen on the sides of the cliff that circulate to the bottom of the bays, particularly the E. side, there is, at the very point of the cliff, and just above the narrow and highest part of the causeway, a long collection of them seen, whose heads or tops just appearing without the sloping bank, plainly shew them to be in an oblique position, and about half-way between the perpendicular and horizontal. The heads of these, likewise, are of mixed surfaces, convex and concave; and the columns evidently appear to have been removed from their original upright, to their present inclining or oblique position, by the sinking of the cliff.

GIANT'S GRAVE, a village of Ireland, near Sligo, where there are some massive ancient monuments of stone resembling those of Stonehenge.

GIBBET, or **GIBET**. See **GALLOWES**. The Fr. *gibet*, a gallows, is supposed to be derived from the Arabic *gibel*, "mount or elevation of ground;" as gibbets are usually placed on hills or eminences.

GIBBIO, **CASTELLO DI MONTE**, a town of the late Cisalpine republic, in the department of Crostolo, and late duchy of Modena.

GIBBON, **EDWARD**, Esq. a late celebrated English historian, born at Putney, in Surrey, April 27, 1737. He was the eldest son of Edward Gibbon, Esq. In 1745 he was sent to the grammar-school at Kingston; in January 1749, to that of Westminster, and in April 1752, to that of Oxford, where he matriculated in Magdalen college; the professors of which he blames greatly for their remissness and inattention to his moral conduct and religious principles. In consequence of this he became a convert to the Roman Catholic faith in his 16th year. To cure the young catholic of his errors, and bring him back to the Protestant faith, his father, within three weeks after his conversion, (June 30, 1753,) sent him to Switzerland, and entrusted him to the tutorage of Mr. Pavilliard, a Calvinist minister at Lausanne, whom Mr. Gibbon mentions with gratitude, as a most excellent preceptor. Under his tuition, he made rapid progress in the Latin, Greek, and French classics; in history, geography, logic, and metaphysics; and was also soon reclaimed from the errors of Popery: so that on Christmas 1754, he received the sacrament in the church of Lausanne. Thus had he communication with three different churches before he was 18 years old. These jarring opinions, however, successively adopted and rejected, and the repeated changes so rapidly made from the one to the other, perhaps contributed to weaken our author's faith in revelation, and to lead to his final change to Deism, as much as his perusal of M. Voltaire's writings, or his conversation with that author, to whom he introduced himself in 1757. In spring 1758, he was recalled to England, and was agreeably received by his father; at whose house at Beriton in Hampshire, he finished a work he had begun at Lausanne, entitled "Essai sur l'Etude de la Littérature," which he published in 1761, 12mo. with a dedication to his father. Previously to this period, he had been appointed a captain in the South Hampshire Militia, in which he served two years, and which was of use to him, by making him better acquainted with English manners, principles, and parties, than perhaps he might otherwise have been. After the peace in 1763, he went abroad; and after visiting Paris, where he was introduced to Messrs. D'Alembert and Diderot, returned to his favourite residence at Lausanne. Having spent some time there, he made the tour of Italy; and at Rome, on the 15th October 1764, while musing amidst the ruins of the capitol, the idea of his great work first started into his mind. Upon his return to Hampshire in June 1765, he found his father involved in pecuniary difficulties, and to relieve him, consented to the sale of part of the estate. After commencing a history of the revolutions of Switzerland, which he suppressed, he engaged in a Journal entitled, "Memoires Littéraires de la Grande Bretagne," and published 2 vols. for 1767 and 1768; but his partner in this undertaking, a native of Switzerland, going abroad, when the third volume was nearly finished, the work was discontinued. Bishop Warburton having about this time published an interpretation of the 6th book of Virgil's *Æneid*, he criticised it with equal asperity

and success. But it is thought, that if the bishop had then possessed his former mental vigour, he would have chastised Mr. Gibbon in such a manner, as to have made him afterwards somewhat more modest in his great work; in which, with all his petulant confidence, he often shews great inaccuracy in his quotations. Nor could it well be otherwise, as he himself acknowledges, that he often contented himself with borrowing his quotations, not from the original authors, but at second hand. But the taste of the times favouring the spirit of scepticism that appeared in his work, errors of this kind, which in a defender of Christianity would have been reckoned unpardonable, as so many pious frauds intended to deceive the reader, were either entirely overlooked, or considered as very venial faults, in his "History of the Decline and Fall of the Roman Empire." Of this work the first volume was published in 1776, and met with extraordinary success; the second and third volumes appeared in 1781; and the fourth, fifth, and sixth, in 1787, established Mr. Gibbon's fame as a historian. Encomiums were lavished on him from all quarters, to such a pitch indeed, that some of them, particularly those of Mr. Hume and Dr. Robertson, have even been reckoned false. That Mr. Hume should have been highly delighted with a work tending strongly to enforce his own principles, is not surprising; but the high panegyric bestowed by a Minister of the Gospel, upon a work, one main object of which is to prove that Christianity is not of divine original, is certainly quite out of character. But others, while they give our author full credit for acuteness of penetration, fertility of genius, luxuriance of fancy, elegance of style, harmony of language, and beauty of epithets, &c. object, that, "the uniform stateliness of his diction sometimes imparts to his narrative a degree of obscurity, unless he descends to the miserable expedient of a note to explain the minuter circumstances;" and that, "his style on the whole is much too artificial; and this gives a degree of monotony to his periods, which extends almost to the turn of his thoughts." "But a more serious objection (they justly add,) is his attack upon Christianity; the loose and disrespectful manner in which he mentions many points of morality, regarded as important on the principles of natural religion; and the indecent allusions and expressions, which too often occur in the work. An attack upon Christianity is not censurable merely as such; but in that case, the attack will never be carried on in an insidious manner, and with improper weapons; and Christianity itself, so far from dreading, will invite every mode of fair and candid discussion. Our historian often makes, when he cannot readily find, an opportunity to insult the Christian religion. Such indeed is his eagerness in the cause, that he stoops to the most despicable pun, or to the most awkward perversion of language, for the pleasure of turning the scripture into ribaldry, or calling Jesus an impostor. Yet of the Christian religion has Mr. Gibbon himself observed, that 'it contains a pure, benevolent, and universal system of ethics, adapted to every duty and every condition of life.' Such an acknowledgement, and from such a writer, too, ought to have due weight with a certain class of readers, and of authors likewise; and lead them seriously to consider, how far it is consistent with the character of good citizens, to endeavour by sly insinuations, oblique hints, indecent sneers, and profane ridicule, to weaken the influence of so pure and benevolent a system as that of Christianity, acknowledged to be admirably calculated for promoting the happiness of individuals and the welfare of society." (Supplement to the Encyc. Brit. Vol. I. p. 707.) Various answers to Mr. Gibbon's attack on Christianity, were published by Dr. Chelsum, Dr. Randolph, Lord Hailes, Dr. Watson bishop of Llandaff, Dr. White, Mr. Aphorpe, Mr. Davis, Mr. Taylor, Dr. Priestley, and others. To most of these our author made no reply, though his posthumous memoirs shew he felt the weight of these answers, particularly those of Lord Hailes, Dr. White, and Mr. Taylor. His constitution had suffered much from repeated attacks of the gout, and a swelling of his ancles; and after having been often tapped for a hydrocele, he died at London, of the gout in his stomach, on the 16th Jan. 1794, in the 57th year of his age.

GIBBOSITY, in surgery, denotes any protuberance or convexity of the body, as a person hump-backed. Infants are much more subject to gibbosity than adults, and it oftener proceeds from external than internal causes. A fall, blow, or the like, frequently thus distorts the tender bones of infants. When it pro-

ceeds from an internal cause, it is generally from a relaxation of the ligaments that sustain the spine, or a caries of its vertebrae; though the spine may be inflected forward, and the vertebrae thrown out by a too strong and repeated action of the abdominal muscles. This, if not timely redressed, grows up and fixes as the bones harden, till in adults it is totally irremediable: but when the disorder is recent, and the person young, there are hopes of a cure. The common method is by a machine of pasteboard, wood, or steel, which is made to press principally on the gibbous part; and this by long wearing may set all right.

GIBBOUS, in astronomy, is used in respect to the enlightened parts of the moon, whilst she is moving from the first quarter to the full, and from the full to the last quarter: for all that time the dark part appears horned or falcated; and the light one hunched out, convex, or gibbous.

GIBEON, a city seated on an eminence about 40 furlongs N. of Jerusalem, and not far from Gibeah.

GIBEONITES, an ancient nation of Canaan, who, hearing of Joshua's great conquests, saved their lives at the expence of their liberty by a representation of their belonging to a very remote country, and their desire of making an alliance with the Hebrews. See Joshua, ix. 3—27. The Gibeonites were descended from the Hivites, and possessed four cities; viz. Chephirah, Beeroth, Kirjathjearim, and Gibeon; which were afterwards given to the Benjaminites, except the last, which fell to the tribe of Judah. The Gibeonites continued subject to those burdens which Joshua had imposed on them, and were very faithful to the Israelites, till the dispersion of that nation.

GIBRALEON, a town of Spain, 44 miles W. of Seville.

GIBRALTAR, a famous promontory, or rather peninsula, of Spain, in Andalusia, but belonging to Great Britain. By the ancients it was named Calpe, and was also called one of the Pillars of Hercules; by the Arabians it is called Gebel Tarek, that is, "the mount of Tarek," from Tarek, the name of the Saracen general who conquered Spain in the beginning of the 8th century. The whole is an immense rock, rising perpendicularly about 440 yards, measuring from N. to S. about two English miles, but not above one in breadth, from E. to W. The longitude of this promontory is 5° 4' 0" W. of Greenwich, and its latitude 36° 4' 44" N. The time of high water at the time of the full and change of the moon, happens here precisely at noonday.

GIBRALTAR, a town on the above promontory, which lies along the bay on the W. side of the mountain on a decline; by which the rains pass through it, and keep it clean. The old town was considerably larger than the new, which at present consists of between 400 and 500 houses. It lies 16 miles N. of Ceuta, 45 S. E. of Cadiz. Lon. 5. 17. W. Lat. 36. 8. N. The bay is very beautiful and capacious, being in breadth about five miles, and in length eight or nine, with several small rivers running into it. It is very advantageous to the place. There is no ground to be found in the middle of it at 100 fathoms depth, so that a squadron may lie there in great safety; the breezes from it are very refreshing; and it contributes likewise to the subsistence of the inhabitants, by supplying them with plenty of fish. Gibraltar is esteemed of very great consequence to Britain. It not only gives the command of the Straits, and their navigation, but affords refreshment and accommodation to our fleets in time of war, and to our merchantmen at all times. It hinders a ready communication by sea between the different ports of France and Spain, and of course, hinders the junction of their fleets and squadrons, or at least renders it so difficult as to be a perpetual check upon the ambition of these powers. It awes also the piratical states of Barbary, and the emperor of Morocco; inasmuch, that our commerce is more safe than that of any other European power, which gives us great advantages in point of freight. It is otherwise highly favourable to our trade in the Mediterranean and Levant. It procures us the respect of the Italian and other powers; who, though far distant from Britain, consider this as an instance of her power to hurt or assist them. It also saves us the expence of squadrons and convoys, upon any disputes or disturbances that may happen among those powers, and which would otherwise be necessary for the protection of our navigation. The inhabitants, exclusive of the British subjects dependent on the garrison, or who reside there from other motives, consist of some Spaniards, a few Portuguese, a considerable number of Genoese, and about as many Jews; making in the whole, according to Dr. Campbell, between 2 and

3,000, without reckoning the garrison, which usually consists of between 3 and 4,000 men; but during the last siege was double that number.

GIBRALTAR, STRAITS OF, a narrow sea, which forms the communication between the Atlantic Ocean and the Mediterranean, thereby dividing Europe from Africa; and runs from W. to E. about 13 leagues. In this strait there are three remarkable promontories or capes on the Spanish side, and as many opposite to them on the Barbary side. The first of these, on the side of Spain, is Cape Trafalgar, opposite to which is Cape Spartel; and in the neighbourhood of this stood the fortress of Tangier, once in the possession of the British. The next on the Spanish side is Tarisa; and over against it lies Malabata, near the town of Alcazar, where the straits are about five leagues broad. Lastly, Gibraltar, facing the mountain of Abyla, near the fortress and town of Ceuta, now in our possession, which, make the eastern entry of the straits.

GIBSON, Dr. EDMUND, bishop of London, was born at Knipe in Westmoreland, in 1669. He early displayed his knowledge in several writings and translations, which recommended him to the patronage of Archbishop Tension, who appointed him his domestic chaplain; and soon after rector of Lambeth, and archdeacon of Surrey. Becoming thus a member of the convocation, he defended his patron's rights, as president, in eleven pamphlets; he then completed his scheme of the legal duties and rights of the English clergy, under the title of "Codex Juris Ecclesiastici Anglicani," in folio. In 1720 he was promoted to the bishopric of London, and spent the latter part of his life in publishing letters, charges, occasional sermons, and tracts against the prevailing immoralities of the age. His pastoral letters are justly esteemed masterly productions against infidelity and enthusiasm. His other publications are, 1. An edition of Drummond's Polemo-Middinia, and James V.'s Cantilena Rustica, with notes. 2. The Chronicon Saxonum, with a Latin translation, and notes. 3. Reliquiae Spelmanianae, the posthumous works of Sir Henry Spelman, relating to the laws and antiquities of England. 4. An edition of Quintilian de Arte Oratoria, with notes. 5. An English translation of Camden's Britannia, with additions, 2 vols. folio: and, 6. A number of small pieces, that have been collected and printed in three volumes folio. He died, aged 79, in September 1748. With regard to his character, he was a true friend to the established church and government, and as great an enemy to persecution. He was usually consulted by the most learned and exalted personages in church and state, and the greatest deference was paid to his judgement. He possessed the social virtues in an eminent degree; his beneficence was very extensive; and he had so much justice as well as generosity, that he freely gave 2,500l. left him by Dr. Crow, who was once his chaplain, to Crow's own relations, who were very poor.

GIDEON, [גִּדְּוֹן, Heb. i. e. a destroyer,] the son of Joash, a Manassite, who had a very extraordinary call to deliver the Israelites from the oppression of the Midianites. Having effected their deliverance by supernatural aid, he was chosen judge of Israel, A. M. 2759, and died in 2798.

GIEN, a town of France, in the department of Loiret, and late province of Orleans, 33 miles S. E. of Orleans.

GIENGEN, an imperial town of Suabia, on the Brentz, 20 miles W. of Donauwert.

GIERACE, an episcopal town of Naples, in Calabria Ultra, 34 miles N. of Reggio.

GIessen, a strong town of Hesse Cassel, on the Lahn, 36 miles N. E. of Mentz.

GIFT, [*donum*, Lat.] in law, a conveyance which passeth either in lands or goods; and is of a larger extent than a grant, being applied to things moveable and immoveable; yet as to things immoveable, it is properly applicable only to lands and tenements given in tail; but gift and grant are too often confounded.

GIGG, or **JIG**, in music or dancing, a gay, brisk, sprightly composition, and yet in full measure, as well as the allemande, which is more serious. Menage takes the word to arise from the Italian *giga*, a musical instrument mentioned by Dante.

GIGGLEWICK, a town in the West Riding of Yorkshire, half a mile from Settle, on the Ribble; where, at the foot of a mountain, is a spring, the most noted in England for ebbing and flowing sometimes thrice in an hour, and the water subsides three quarters of a yard at the reflux, though the sea is thirty miles off. At this town is an eminent free grammar-school;

and near it is a quarry of flags, slate, and stone, with a good lime-kiln.

GIGHA, GIGA, or GIGO, an island of Scotland, on the W. coast of Kintyre, in Argyleshire, 11 miles E. S. E. of Ilay; 7 miles long, from N. E. to S. W. and $2\frac{1}{2}$ broad. The greater part of it is arable.

GIGLIO, an island on the coast of Sienna in Tuscany, 33 miles S. S. E. of Elva. Lon. 11. 16. E. Lat. 42. 23. N.

GIGNAC, a town of France, in the department of Herault, seated on the Herault, $13\frac{1}{2}$ miles W. of Montpellier.

GIHON, in ancient geography, one of the rivers of Paradise; according to Wells, the eastern branch of the Euphrates, into which it divides after its junction with the Tigris.

GIJON, a sea-port of Spain, in Asturia, with an ancient castle; formerly the residence of K. Pelagius and his successors. It is 18 miles N. of Oviedo.

GILAN, or GHILAN, a considerable province of Persia, lying on the S. W. side of the Caspian sea. It is supposed to be the Hyrcania of the ancients. Resht is the capital.

GILBERD, or GILBERT, WILLIAM, a physician, born at Colchester, in 1540, the eldest son of the recorder of that borough. Having spent some time in both universities, he went abroad; and at his return settled in London, where he practised with considerable reputation. He became a member of the college of physicians, and physician in ordinary to Q. Elizabeth, who gave him a pension. He was also physician to K. James I. He died in 1603, aged 63; in Colchester, where a handsome monument was erected to his memory. His books, globes, instruments, and fossils, he bequeathed to the college of physicians, and his picture to the school-gallery at Oxford. He wrote, 1. *De Magnete, mag-*

neticisque Corporibus, et de magno Magnete Tellure, Physiologia nova; Lond. 1600, fol. 2. *De Mundo nostro sublunari, Philosophia nova*; Amsterdam, 1651, 4to. He also invented two mathematical instruments for finding the latitude at sea without the help of sun, moon, or stars. A description of these instruments was afterwards published by Thomas Blondville in his *Theoriques of the planets*.

GILBERTIA, in botany, a genus of the monogynia order, and decandria class. Calyx five-toothed; corolla deeply five-parted; nectary ten-parted, with lanceolate segments; fruit six-celled. It has but one species.

GILBERTINES, an order of religious, thus called from St. Gilbert of Sempringham, in Lincolnshire who founded it about 1148. The monks observed the rule of St. Augustine; and were accounted canons; and the nuns that of St. Benedict.

GILBERT'S ISLAND, an island near the S. W. coast of Terra del Fuego. Lon. 71. 7. W. Lat. 55. 13. S.

GILBOA, in ancient geography, mountains of Samaria, stretching from W. to E. on the confines of the half-tribe of Manasseh, and of the tribe of Issachar.

GILDAS, surnamed **THE WISE**, a celebrated British monk born in Wales in 511. Where he was educated is uncertain. Some say he went over to Ireland; others, that he visited France and Italy. All agree, that after his return to England he became a most assiduous preacher of the gospel. Du Pin says he founded a monastery at Venetia in Britain. Gildas is the only British author of the sixth century whose works are printed. His history of Britain is valuable on account of its antiquity, and as containing the only information we have concerning the times of which he wrote; though his style is inelegant.

GILDING.

GILDING, the art of spreading or covering a thing over with gold, either in leaf or liquid. This art was known among the ancients, though it never arrived among them at the perfection to which the moderns have carried it. Pliny assures us, that the first gilding seen at Rome was after the destruction of Carthage, under the censorship of Lucius Mummius, when they began to gild the ceilings of their temples and palaces; the Capitol being the first place on which this enrichment was bestowed. The lustre and beauty of gold have occasioned several inquiries, and discoveries concerning the different methods of applying it to different substances. Hence the art of gilding is very extensive, and contains many particular operations and various management.

OF GOLD-LEAF. There are three kinds of gold-leaf in common use. Pure gold-leaf, which is made by hammering gold till it is sufficiently thin (see **GOLD-BEATING**). Pale leaf-gold, which has a greenish colour, and is made in the same way of gold alloyed with silver. Dutch gold, which is brought from Holland, and is in fact only copper-leaf coloured by the fumes of zinc. It is much cheaper than true leaf-gold, and is very useful where large quantities of gilding are wanted, which can be defended from the weather, and where great nicety is not required; but it changes its colour entirely when exposed to moisture; and indeed, in all cases, its beauty is soon impaired, unless well secured by varnish. It is therefore only a cheap substitute for true gold-leaf, which may be useful where durability is not an object.

OF THE INSTRUMENTS NECESSARY FOR GILDING.

The first instrument is the **CUSHION**, for receiving the leaves of gold from the books in which they are bought. It is made by covering a board of about eight inches square, with a double thickness of flannel: and over that a piece of buff-leather, and fastening it tight round the edges.

The **KNIFE** for cutting the leaves into the requisite sizes should be made like a pallet-knife, and should not have its edge too sharp.

The **TIP** is a tool made by fastening the long hairs of a squirrel's tail between two cards; and is used for taking up the gold-leaf after it is cut, and applying it to the article to be gilded.

A **FITCH-PENCIL** is used for the same purpose as the last, in

taking up very small bits of gold-leaf. A ball of cotton is necessary for pressing down the leaf, after it is laid on. A large camel's-hair-brush is used for dusting the work, and clearing away the superfluous gold.

OF THE DIFFERENT KINDS AND METHODS OF GILDING.

OIL-GILDING. First prime your work with boiled linseed-oil and white-lead; and when that is dry, cover it over with a thin coat of gold-size, made of stone-ochre ground in fat oil. When that is so dry as to feel clammy to the fingers, or to be what the gilders call tacky, it is fit for gilding. Having spread your leaves upon the cushion, cut them into slips of the proper width for covering your work. Then breathe upon your tip, which, by moistening it, will cause it to take up the leaves from the cushion. Having applied them by the tip on the proper parts of your work, press them down by the ball of cotton. Observe to repair, by putting small pieces of gold on any parts which you have omitted to cover. When all your work is sufficiently covered, let it dry, and clean it off with the brush. This sort of gilding is the easiest, least expensive, and stands the weather best, and may be cleaned with a little water at any time; but wants the lustre of burnished gilding.

BURNISHED GILDING. This is the sort of gilding generally used for picture-frames, looking-glasses, &c. The wood intended to be gilt in this manner, should first be well sized, and then covered with seven or eight coats of size and whiting, so as to form a body of considerable thickness. Having got a sufficient quantity of whiting upon the work, it must be carefully cleaned, taking care to free all the cavities and hollows from the whiting that may have choked them up, and by proper moulds and tools restoring the sharpness of the mouldings intended to be shewn. It is then to receive a coat of size, which is made by boiling Armenian bole with parchment-size. This must also remain till it is sufficiently dry for gold. It must not be quite dry, therefore it would not be prudent to lay on more at a time than can be gilt before it becomes too dry. The work being thus prepared, place it a little declining from you; and having ready a cup of clean water, and some hair-pencils, moisten a part of the work, and then apply the gold by the tip to the moistened part. The gold will immediately,

diately adhere close to the work: proceed to wet the next part, and apply the gold as before, repeating this operation till the whole is completed; taking care not to let any drops of water come upon any part of the gold already laid on. Care should therefore be taken that no part be missed in going over it at first as it is not so easily mended as the oil-gilding. The work being thus gilt, it is suffered to remain about 24 hours; when the parts that are designed to be burnished, are polished with a dog's tooth, or, what is better, with an agate burnisher. The gilding must not be quite dry when burnished; there is a state proper for the purpose, which is only to be known by experience.

JAPANNER'S GILDING. The gilding of japanned work consists in drawing with a hair-pencil, in gold size, the intended ornaments, and afterwards applying gold-leaf, or gold-powder. The gold-size may be prepared in the following manner: Take of linseed-oil, and of gum animi, four ounces. Set the oil to boil in a proper vessel, and then add the gum animi gradually in powder, stirring each quantity about in the oil till it appears to be dissolved, and then putting in another, till the whole is mixed with the oil. Let the mixture continue to boil, till, on taking a small quantity out, it appears of a thicker consistence than tar, and then strain the whole through a coarse cloth, and keep it for use; but it must, when applied, be mixed with vermilion and oil of turpentine. Having laid on the gold-size, and suffered it to dry, the gold-leaf is applied in the usual way; or if it be not wanted to shine so much, gold-powder is applied, which is made by grinding gold-leaf upon a stone with honey, and afterwards washing the honey away with water. If the gilding is, to be varnished over, Dutch gold may be used, or *aureum musivum* may be used instead of real gold-powder.

TO WRITE ON PAPER WITH LETTERS OF GOLD. Put some gum-arabic into common writing-ink, and write with it in the usual way. When the writing is dry, breathe on it; the warmth and moisture soften the gum, and will cause it to fasten on the gold-leaf; which may be laid on in the usual way, and the superfluous part brushed off. Or instead of this, any japanners' size may be used.

TO LAY GOLD UPON WHITE EARTHENWARE, OR GLASS. Procure some japanners' gold-size, and with it draw your design upon the vessel to be gilt, moistening the gold-size, as you find necessary, with oil of turpentine. Set your work in a clean place to dry, for about an hour, and then place it so near the fire, that you could but just bear the heat of it with your hand for a few seconds. Let it remain there till it feels quite tacky or clammy; then, having procured a cushion, and some leaf-gold, cut it into slips of the proper size, and lay it on with the little cotton ball. When the gold is all on, put the ware into an oven to be baked for two or three hours. Glasses, &c. may also be gilt, by drawing the figures with shell-gold mixed with gum-arabic, and a little borax. Then apply sufficient heat to it; and, lastly, burnish it.

GILDING ON GLASS OR PORCELAIN, BY BURNING IN. Dissolve gold in aqua regia, and evaporate the acid by heat, you will obtain a gold powder: or precipitate the gold from the solution by pieces of copper. Lay this gold on with a strong solution of borax and gum-water, and it will be ready for burning in.

GILDING METALS. One method of applying gold upon metals is by first cleaning the metal to be gilt; then gold-leaf is laid on it, which, by means of rubbing with a polished blood-stone, and a certain degree of heat, are made to adhere perfectly well. In this manner silver-leaf is fixed and burnished upon brass, in the making of what is called French plate; and sometimes also gold-leaf is burnished upon copper and iron.

GILDING BY AMALGAMATION. A better method is, by previously forming the gold into paste, or amalgam, with mercury. In order to obtain an amalgam of gold and mercury, the gold is first to be reduced into thin plates or grains, which are heated red-hot, and thrown into mercury previously heated, till it begins to smoke. Upon stirring the mercury with an iron rod, the gold totally disappears. The proportion of mercury to gold is generally as six or eight to one. The method of gilding by amalgamation is chiefly used for gilding copper, or an alloy of copper, with a small portion of zinc, which more readily receives the amalgam, and is also preferable on account of its colour, which more resembles that of gold than the colour of copper. When the metal to be gilt is

wrought or chased, it ought to be previously covered with quicksilver before the amalgam is applied, that this may be easier spread; but when the surface of the metal is plane, the amalgam may be directly applied to it. The metal required to be gilt is first rubbed over with a little aquafortis, by which the surfaces cleaned from any rust or tarnish that might prevent the union of the two metals. The amalgam being then equally spread over the surface by means of a brush, the mercury is evaporated by a heat just sufficient for that purpose: for if it be too great, part of the gold may also be expelled, and part of it will run together, and leave some of the surface of the metal bare. While the mercury is evaporating the piece is to be, from time to time, taken from the fire, that it may be examined; that the amalgam may be spread more equally by means of a brush; that any defective parts of it may be again covered, and that the heat may not be too suddenly applied to it. When the mercury is evaporated, which is known by the surface becoming entirely of a dull-yellow colour, the metal must then undergo other operations, by which the fine gold-colour is given to it. First, the gilded piece of metal is rubbed with a scratch-brush (which is a brush composed of brass wire) till its surface is made smooth; then it is covered over with a composition called gilding-wax, and is again exposed to the fire till the wax is burnt off. This wax is composed of bee's-wax, frequently mixed with some of the following substances: red ochre, verdigris, copper scales, alum, vitriol, borax; but, according to Dr. Lewis, the saline substances are sufficient, without any wax. By this operation the colour of the gilding is heightened; and the effect seems to be produced by a perfect dissipation of some mercury remaining after the former operation. The gilt surface is then covered over with a saline composition, consisting of nitre, alum, and vitriolic salt, ground together, and mixed up into a paste with water or urine. The piece of metal thus covered is exposed to a certain degree of heat, and then quenched in water. By this method its colour is further improved, and brought nearer to that of gold. This effect seems to be produced by the acid of the nitre (which is disengaged by the sulphuric acid of the alum, during the exposure to heat) acting upon any particles of copper which may happen to lie upon the gilded surface. Lastly, some artists think that they give an additional lustre to their gilt work, by dipping it in a liquor prepared by boiling some yellow materials, as sulphur, orpiment, or turmeric. The only advantage of this operation is, that part of the yellow matter remains in some of the hollows of the carved work, in which the gilding is apt to be more imperfect, and to which it gives a rich and solid appearance. It may here be noticed, that the use of the aquafortis or nitric acid, mentioned in the beginning of the process, is not, as is generally supposed, confined merely to cleansing the surface of the metal to be gilt from rust or tarnish; but it also greatly facilitates the application of the amalgam to the surface of that metal, probably in the following manner: It first dissolves part of the mercury of the amalgam; and when the solution is applied to the copper, this latter metal, having a stronger disposition to unite with the nitrous acid than the mercury has, precipitates the mercury upon its surface, in the same manner as a polished piece of iron precipitates upon its surface copper from a solution of blue vitriol. When the metal to be gilt is thus covered with a thin coat of precipitated mercury, it readily receives the amalgam. On the subject of gilding by amalgamation, Dr. Lewis has the following remarks: "There are two principal inconveniences in this business; one, that the workmen are exposed to the fumes of the mercury, and generally, sooner or later, have their health greatly impaired by them; the other, the loss of the mercury; for though part of it is said to be detained in the cavities made in the chimneys for that purpose, yet the greatest part of it is lost. From some trials I have made, it appeared that both these inconveniences, particularly the first and most considerable one, might be in a good measure avoided, by means of a furnace of a due construction. If the communication of a furnace with its chimney, instead of being over the fire, is made under the grate, the ash-pit door, or other apertures beneath the grate, closed, and the mouth of the furnace left open, the current of air, which otherwise would have entered beneath, enters now at the top, and passing down through the grate to the chimney, carries with it completely both the vapour of the fuel, and the fumes of such matters as are placed upon it. The back part of the furnace should be raised a little higher above the fire than the fore-

part, and an iron plate laid over it, that the air may enter only at the front, where the workmen stands, who will be thus effectually secured from the fumes, and from being incommoded by the heat, and at the same time have full liberty of introducing, inspecting, and removing, the work. If such a furnace is made of strong forged (not milled) iron plate, it will be sufficiently durable. The upper end of the chimney may reach above a foot and a half higher than the level of the fire; over this is to be placed a larger tube, leaving an interval of an inch, or more, all round between it and the chimney, and reaching to the height of ten or twelve feet; the higher the better. The external air, passing up between the chimney and the outer pipe, prevents the latter from being much heated, so that the mercurial fumes will condense against its sides into running quicksilver, which falling down to the bottom, is there caught in a hollow rim, formed by turning inwards a portion of the lower part, and conveyed by a pipe at one side into a proper receiver.

GILDING IRON OR STEEL. In gilding iron or steel by means of an amalgam, as the metal has no affinity for the mercury, an agent must be employed to dispose the surface to receive the gilding. For this purpose a solution of mercury in nitrous acid (aqua fortis), or what the workmen call quicksilver-water, is applied to the parts intended to be gilded; the acid, by a stronger affinity, seizes on a portion of the iron, and deposits in the place of it a thin coating of mercury, which will not refuse an union afterwards with the gold amalgam that may be applied; but by this process the surface of the metal is injured by the nitrous acid, and the union of the mercury is very slight, so that a bright and durable gilding cannot be obtained.—*Another method.* Sometimes a solution of blue vitriol is applied, with a camel's-hair pencil, to the parts of the steel intended to be gilt. By a chemical action, exactly similar to what we have described as taking place when a solution of nitrate of mercury is employed, a thin coating of copper is precipitated on the metal. Copper having an affinity for mercury, a kind of union may by this means be effected between the amalgam and the iron or steel, as the case may be. In whichever of these methods the amalgam is brought into union with the steel, the surface is injured by the action of the acid employed, and still a heat sufficient to volatilize the mercury must be afterwards used.

GILDING OF IRON BY HEAT. When the surface is polished bright, it must be heated till it becomes blue. Gold leaf is then applied to its surface, and burnished down. It is then heated again, and another layer of gold burnished on it. In this manner three or four coats are given, according to the strength of the gilding intended. This is a more laborious process than the two last, but it is not attended with so much risk.

GILDING IRON OR STEEL, AN IMPROVED PROCESS FOR. This process, which is less known among artists than it deserves to be, may prove useful to those who have occasion to gild iron or steel. The first part of the process consists in pouring over a solution of gold in nitro-muriatic acid (aqua regia) about twice as much ether, which must be done with caution, and in a large vessel. These liquids must then be shaken together; as soon as the mixture is at rest, the ether will be seen to separate itself from the nitro-muriatic acid, and to float on the surface. The nitro-muriatic acid becomes more transparent, and the other darker than they were before; the reason of which is, that the ether has taken the gold from the acid. The whole mixture is then to be poured into a glass-funnel, the lower aperture of which is small; but this aperture must not be opened till the fluids have completely separated themselves from each other. It is then to be opened; by which means the liquid which has taken the lowest place by its greater

gravity, viz. the nitro-muriatic acid, will run off; after which, the aperture is to be shut, and the funnel will then be found to contain nothing but ether mixed with the gold, which is to be put into well-closed bottles, and preserved for use. In order to gild iron or steel, the metal must be first well polished with the finest emery, or rather with the finest crocus martis or colcothar of vitriol, and common brandy. The auriferous ether is then to be applied with a small brush; the ether soon evaporates, and the gold remains on the surface of the metal. The metal may then be put into the fire, and afterwards polished. By means of this auriferous ether, all kinds of figures may be delineated on iron, by employing a pen, or fine brush. It is in this manner, we believe, that the Solinger sabre-blades are gilded. Instead of ether, the essential oils may be used, such as oil of turpentine, or oil of lavender, which will also take gold from its solution.

GILDING OF SILVER. Dissolve gold in the nitro-muriatic acid, and dip some linen rags in the solution; then burn them, and carefully preserve the ashes, which will be very black, and heavier than common. When any thing is to be gilded, it must be previously well burnished; a piece of cork is then to be dipped, first into a solution of salt in water, and afterwards into the black powder; and the piece, after being rubbed with it, must be burnished. This powder is frequently used for gilding delicate articles of silver.

GILDING OF BRASS AND COPPER. Fine instruments of brass, in order that their surface may be kept longer clean, may be gilded in the following manner. Provide a saturated solution of gold, and having evaporated it to the consistence of oil, suffer it to shoot into crystals. These crystals must then be dissolved in pure water, and the articles to be gilded being immersed in it, are then to be washed in pure water, and afterwards burnished. This process may be repeated several times, till the articles have been well gilt. A solution of gold-crystals is preferred to a mere solution of gold, because in the latter there is always a portion of free acid, which will not fail to exercise more or less action on the surface of the brass or copper, and injure its polish.

GRECIAN GILDING. Dissolve some mercury in muriatic acid (spirit of salt), which will give a muriate of mercury. Mix equal parts of this and sal ammoniac, and dissolve them in aqua fortis. Put some gold into this, and it will dissolve. When this is applied to silver, it becomes black; but by heating, it assumes the appearance of gilding.

GOLD, TO MAKE SHELL. Grind up gold-leaf with honey in a mortar; then wash away the honey with water, and mix the gold-powder with gum-water. This may be applied to any article with a camel's-hair pencil, in the same way as any other colour.

GLASS, TO GILD. Take an equal quantity of chalk and red-lead, grind them together, and temper with lint-seed-oil; lay it on, and when almost dry, lay the gold-leaf on, let it dry, and then polish it.

TO GILD PAPER. Grind bole-armoniac with rain-water, and give one laying of it; when it is dry, take glair of eggs, and add to it a little sugar-candy and gum-water, which lay over the former, and upon this, when it is dry enough, lay leaf-silver, or leaf-gold.

TO GILD THE LEAVES OF BOOKS. Take bole-armoniac, eight penny-weights; sugar-candy, two penny-weights: mix and grind them with glair of eggs; then on a bound book (while it is in the press, after it hath been smeared with glair of eggs, and is dried) smear the said composition, let it dry, then rub it well and polish it; then with fair water wet the edges of the book, and suddenly lay on the gold, press it down gently with cotton, let it dry, and then polish it with a tooth.

GILES, Sr. the tutelar saint of Edinburgh, a native of Greece, who flourished in the sixth century, and was descended of an illustrious family. On the death of his parents he gave all his estate to the poor; and travelled into France, where he retired into a wilderness near the conflux of the Rhone with the sea, and con-

tinued there three years. Having obtained the reputation of extraordinary sanctity, various miracles were attributed to him; and he founded a monastery in Languedec, known long after by the name of St. Giles's. In the reign of James II. Mr. Preston of Gorton, whose descendants still possess an estate in the country of Edinburgh,

Edinburgh, got possession of an arm of this saint; which relic he bequeathed to the church of Edinburgh. In gratitude for this donation, the magistrates granted a charter in favour of Mr. Preston's heirs, by which the nearest heir of the name of Preston was entitled to carry it in all processions. They also obliged themselves to found an altar in the church of St. Giles's, and appoint a chaplain for celebrating an annual mass for the soul of Mr. Preston; and likewise, that a tablet containing his arms, and an account of his pious donation, should be put up in the chapel.

GILGAL, in ancient geography, a place between Jericho and Jordan, noted for the first encampment of the Israelites on this side Jordan, about a mile from Jericho. It sometimes also denotes Galilee. Joshua xii. 23.

GILL, JOHN, D. D. a Protestant dissenting minister of the Baptist denomination, the son of Edward Gill, a deacon of the Baptist church at Kettering, in Northamptonshire, was born at Kettering, Nov. 23, 1697. He was early sent to a grammar-school in the neighbourhood; where he very soon surpassed boys much his seniors. Besides going through the common school-books, he read most of the Latin classics, and made great proficiency in the Greek language. He was put to the business of his father, but so far improved his leisure-hours, as to be able, before he was 19, to read all the Greek and Latin authors that fell in his way. He studied logic, rhetoric, moral and natural philosophy; and learnt the Hebrew language so as to read it with ease, without any other assistance than Buxtorf's grammar and lexicon. Neither the pursuit of learning, however, nor his other necessary avocations, could eradicate those religious impressions received in early life. About 1716 he became a preacher, and officiated to a congregation of Higham Ferrers, from whence in 1719 he removed to London, where he was chosen pastor of the Baptist congregation in Southwark. He died in 1721. The university of Aberdeen conferred on him the degree of doctor in divinity. In his sentiments, he was a Calvinist of the most rigid cast. His works are, 1. A Commentary on the Old and New Testament, in 9 vols. fol. 2. A Body of Divinity in 3 vols. 4to. 3. The Cause of God and Truth, 4 vols. 8vo. 4. A Treatise concerning the Prophecies of the Old Testament respecting the Messiah. 5. A Dissertation on the Antiquity of the Hebrew Language, Letters, Vowel-Points, and Accents. 6. Sermons on the Canticles, folio; besides a great number of sermons and controversial pieces on different subjects.

GILL, a measure of capacity, containing a quarter of a pint.

GILLYFLOWER. See **DIANTHUS**.

GILOLO, a large island of the Pacific Ocean, one of the Moluccas, lying between 1° Lat. S. and 2° Lat. N. and between 125° and 128° Lon. E.

GILPIN, BERNARD, an eminent English divine, descended from an ancient and honourable family in Westmoreland, and born in 1517. Being bred in the Roman Catholic religion, he for some time defended it, and at Oxford held a disputation with Hooper, afterwards bishop of Worcester, and martyr for the Protestant faith; but was engaged in another disputation with Peter Martyr, and began seriously to examine the contested points. Being presented to the vicarage of Norton in Durham, he resigned it, and went abroad to consult eminent professors on both sides: and after three years absence returned a little before the death of Queen Mary I. satisfied in the doctrines of the reformation. He was kindly received by his uncle Dr. Tonstall, bishop of Durham; who soon after gave him the archdeaconry of Durham, and rectory of Effington. Though the persecution was then at its height, he boldly preached against the vices, errors, and corruptions, of the times, especially in the clergy; on which a charge consisting of 13 articles was drawn up against him, and presented in form to the bishop. But Dr. Tonstall dismissed the cause in such a manner as to protect his nephew, without endangering himself, and soon after presented him to the rich living of Houghton le Spring. He was again accused to the bishop, and again protected; when his enemies, enraged at this second defeat, laid their complaint before Dr. Bonner, bishop of London; who immediately gave orders to apprehend him. Upon which Mr. Gilpin bravely prepared for martyrdom; and ordering his steward to provide him a long garment that he might make a decent appearance at the stake, set out for London. Providentially, however, he broke his leg on the journey; which protracted his arrival until the queen's death. Being im-

mediately set at liberty, he returned to Houghton, where he was received by his parishioners with the sincerest joy. Upon the deprivation of the Popish bishops, he was offered the see of Carlisle, which he declined; and confining his attention to his rectory, discharged all the duties of his function in the most exemplary manner. He was not satisfied with the advice he gave in public, but used to instruct in private; and made his parishioners come to him with their difficulties. His kindness towards the poor was extraordinary, and he was most forward to assist those who had large families. In the distant parishes where he preached, as well as in his own neighbourhood, his generosity and benevolence were continually exercised: particularly in the desolate parts of Northumberland. "When he began his journey," says an old MS. life of him, "he would have 10l. in his purse; and, at his coming home, he would be 20 nobles in debt, which he would always pay within a fortnight after." In the gaols he visited, he was not only careful to give the prisoners proper instructions, but used to purchase for them likewise what necessities they wanted. Even upon the public road, he never let slip an opportunity of doing good. He has often been known to take off his cloak, and give it to an half-naked traveller; and when he has had scarce money enough in his pocket to provide himself a dinner, yet would he give away part of that little, or the whole, if he found any who seemed to stand in need of it. This excellent divine, who deservedly obtained the glorious titles of the Father of the Poor, and the Apostle of the North, died in 1583, in the 66th year of his age.

GILT VARNISH. See **VARNISH**.

GIMBALS, in sea-affairs, the brass-rings by which a sea-compass is suspended in its box, so as to counteract the effect of the ship's motion, and keep the card horizontal.

GIMBETING, a term applied to the anchor to denote the action of turning it round by the stock, so that the motion of the stock appears similar to that of the handle of a gimblet when it is employed.

GIN, in mechanics, a machine for driving piles, fitted with a windlass and winches at each end, where eight or nine men heave; and round which a rope is reeved that goes over the wheel at the top; one end of this rope is seized to an iron-monkey, that hooks to a beetle of different weights, according to the piles they are to drive, from being eight to thirteen hundred weight; and when hove up to the cross-piece, near the wheel, it unhooks the monkey, and lets the beetle fall on the upper end of the pile, and forces the same into the ground: then the monkey's own weight overhauls the windlass, in order for its being hooked again to the beetle.

GIN. See **GENEVA**.

GINANNIA, in botany, a genus of the enneandria monogynia class and order. Natural order, Lomentaceæ. Calyx double, both one-leaved; petals three, fringed, spreading; germ pedicelled, with a membranaceous wing at top; legume. There is but one species, viz. *G. guianensis*, a shrub about fifteen feet high; a native of the forests of Guiana.

GINGEN, an imperial town of Suabia, 16 miles of Ulm. Lon. 10. 13. E. Lat. 48. 39. N.

GINGER. See **AMOMUM**.

GINGER-WINE is made as follows: take three gallons of water, two ounces of rance-ginger, and three pounds of sugar; boil them for an hour, and then put into it three lemons, and a little good yeast; close up the vessel, and let it stand five days: if it has so worked as to be clear in that time, it may be bottled; if not, let it stand longer, until it has worked sufficiently; and in ten days after it may be drank.

GINORA, in botany, a genus of the monogynia order, and decandria class of plants. Calyx cleft into six parts; petals six capsule unilocular, quadrivalved, coloured, and polyspermous.

GINSENG, in botany. See **PANAX**.

GIODDA, or **GEDDAH**, a sea-port of Arabia, on the E. coast of the Red Sea. Lon. 39. 27. E. Lat. 21. 30. N.

GIOVENAZZO, a town and fort of Naples, in the province of Bari, 11 miles E. S. E. of Trani.

GIRDERS, in architecture, some of the largest pieces of timber in a floor. Their ends are usually fastened into summers and breast-summers, and joists are framed in at one end to the girders. The size of girders and summers, upon the rebuilding of London, were ordained by act of parliament, to be in length from ten to

twenty-six feet, in breadth from eleven to seventeen inches, and in depth from eight to fourteen inches.

GIRDING-GIRT, in the sea-language. A ship is girt, or hath a girding-girt, when her cable being so tight, or strained, upon the turning of the tide, she cannot get over it, but lies across the tide.

GIRDLE, [*cingulus* or *zona*, Lat.] in antiquity, a belt or band of leather, or other matter, tied about the reins to keep that part more firm and tight. It was anciently the custom for bankrupts and other insolvent debtors to put off and surrender their girdle in open court. The reason was, that our ancestors used to carry all their necessary utensils, as purse, keys, &c. tied to the girdle; whence the girdle became a symbol of the estate.

GIRGE, a town of Egypt, capital of Said.

GIRGENTI, a town of Sicily, which occupies part of the site of the ancient Agrigentum, 47 miles S. of Palermo.

GIRON, St. a town of France, on the Sarat, in the department of Arriege, and late province of Couserans, three miles S. of St. Liser.

GIRONDE, a department of France, containing part of the late province of Guienne. Bourdeaux is the capital.

GIRONDE, a river of France, which is formed by the union of the Garonne and Dordogne, three miles N. of Bourdeaux, and runs through the above department into the Atlantic, after a course of twenty-seven miles N. N. W.

GIRONDE, a town of France, in the department of the same name, four miles and a half W. of Reolle.

GIRONNE, or **GIRONNY**, in heraldry, a coat of arms divided into girones, or triangular figures, meeting in the centre of the shield, and alternately colour and metal.

GISBORN, a town in the West Riding of Yorkshire, thirty-seven miles S. E. of Manchester.

GISBOROUGH, a town of England, in the N. Riding of Yorkshire, eleven miles E. of Stockton.

GISEXIA, in botany, a genus of the pentandria pentagynia class and order. Natural order, Succulentæ. Calyx five-leaved; corolla none; capsule five, approximating, roundish, one-seeded. There is but one species, viz. *G. pharnacioides*, trailing *Gisekia*, an annual plant, and a native of the East Indies.

GITI, a town of Asia, in Thibet, 234 miles N. N. E. of Delhi. Lon. 79. 36. E. Lat. 32. 10. N.

GITTITH, a Hebrew word occurring frequently in the Psalms, and generally translated wine-presses. Some think it signifies a sort of musical instrument; others, that the psalms with this title were sung after the vintage; and others, that the hymns of this kind were invented in the city of Gath.

GIVEN, among mathematicians and philosophers, the same with data. If a magnitude be known, or we can find another equal to it, it is said to be given in magnitude. Or when the position of any thing is known, it is said to be given in position: when the diameter or radius of a circle is known, the circle is given in magnitude. The circle is given in position, when the position of the centre is given. See DATA.

GIULA, a strong town of Upper Hungary, near Transylvania, thirty miles N. W. of Arad.

GIUSTANDEL, or **GIUSTENDIL**, a large and strong town of European Turkey, in Macedonia, sixty miles S. E. of Durazzo.

GLABRARIA, in botany, a genus of the polyadelphia polyanthia class and order. Calyx five-cleft; petals five; nectary composed of bristles the length of the calyx; stamens thirty, always in sixes; pericarpium a drupe. There is but one species, viz. *G. tersa*, a large tree resembling the camphor-tree, the wood of which is very light and pale-coloured, and not being liable to rot, or to be injured by insects, it is much used for building both houses and ships. It is a native of the East-Indies.

GLACIERS, a name given to some very extensive fields of ice among the Alps. Mr Coxé says, that these mountains, in general, are composed of many parallel chains, the highest of which occupy the centre, and the others gradually diminish as we recede from thence. The central chain appears covered with pointed rocks; all parts of which, that are not absolutely perpendicular, lie hid under perpetual snow and ice. On each side of this ridge are fertile and cultivated valleys, interspersed with numerous villages, and watered by numerous streams. The elevated peaks of the central chain are covered with snow: but their declivities, excepting

those that are extremely steep, have all a covering of ice as well as snow; the intermediate parts being filled with vast fields of ice, terminating in the cultivated valleys. The same phenomena, though on a smaller scale, occur in those chains that are at a distance from the principal one: in those which are most remote, no ice, and scarcely any snow, is observed, unless upon some of the most elevated summits; and the mountains diminishing in height and ruggedness, appear covered with verdure, until at last they terminate in small hills and plains. Thus the glaciers may be divided into two sorts; the first occupying the deep valleys in the bosom of the Alps, called ice-valleys; the second covering the declivities and sides of the mountains. These are called by Mr. Coxé, the Upper and Lower Glaciers.

GLACIS, in building, an easy insensible slope or declivity. The descent of the glacis is less steep than that of the talus. In gardening, a descent sometimes begins in talus, and ends in glacis. The glacis of the corniche is an easy imperceptible slope in the cymatium, to promote the descent and for draining off the rain-water.

GLACIS, in fortification, that mass of earth which serves as a parapet to the covered way, sloping easily towards the champaign, or field. See FORTIFICATION.

GLADIATORS, in antiquity, were persons who fought, generally in the arena at Rome, for the entertainment of the people. They were usually slaves, and fought out of necessity; though sometimes freemen adopted the profession, like our prize-fighters, for a livelihood. The Romans borrowed this cruel diversion from the Asiatics: some suppose out of policy, the frequent combats of gladiators tending to accustom the people to despise dangers and death. From the earliest times with which we have any acquaintance in profane history, it had been the custom to sacrifice captives or prisoners of war, to the manes of the great men who had died in the engagement: thus Achilles, in the Iliad, lib. xxiii. sacrifices twelve young Trojans to the manes of Patroclus; and in Virgil, lib. xi. ver. 81, Æneas sends captives to Evander, to be sacrificed at the funeral of his son Pallas. In course of time they came also to sacrifice slaves at the funerals of all persons of condition: this was even esteemed a necessary part of the ceremony: but as it would have appeared barbarous to have massacred them like beasts, they were appointed to fight with each other, and endeavoured to save their own lives by killing their adversary. This seemed somewhat less inhuman, because there was a possibility of avoiding death, by an exertion of skill and courage. This occasioned the profession of gladiator to become an art: hence arose masters of the art, and men learned to fight and exercise it. These masters, whom the Latins called Lanistæ, bought young slaves to be trained up to this cruel trade, whom they afterwards sold to such as had occasion to present the people with so horrible a show. These exhibitions were at first performed near the sepulchre of the deceased, or about the funeral-pile; but were afterwards removed to the circus and amphitheatres, and became ordinary amusements. The first show of gladiators, called munus gladiatorum, was exhibited at Rome, according to Valerius Maximus, by M. and D. Brutus, upon the death of their father, A. U. C. 490. On this occasion there were probably only three pair of gladiators. In 537, the three sons of M. Æmilius Lepidus the augur, who had been three times consul, entertained the people with the cruel pleasure of seeing twenty-two gladiators fight in the forum. The ædiles, prætors, consuls, and, above all, the candidates for offices, made their court to the people, by entertaining them frequently with these fights; and the priests were sometimes the exhibitors of the barbarous shows. Suetonius mentions the ludi pontificales, August, cap. 44, and Pliny, the ludi sacerdotales, Epist. lib. vii. As for the emperors, to ingratiate themselves with the populace, they humoured them with combats of gladiators almost upon all occasions; and as these increased, the number of combatants increased likewise. Accordingly, Julius Cæsar, in his ædileship, diverted the people with 320 couple. These sports were become so common, and their consequences in a variety of respects so dangerous, that Cicero preferred a law, that no person should exhibit a show of gladiators within two years before he appeared candidate for any office. Julius Cæsar ordered, that only a certain number of men of this profession should be in Rome at a time; Augustus decreed, that only two shows of gladiators should be presented in a year, and never above sixty couple of combatants in a show; and Tiberius provided by an order of the senate, that no person should

have

have the privilege of gratifying the people with such a solemnity, unless he was worth 400,000 sesterces. They were also considerably regulated by Nerva. Claudius restrained them to certain occasions; but he soon after annulled his decree, and private persons began to exhibit them at pleasure as usual. Some carried the brutal satisfaction so far as to have them at their ordinary feasts. And not slaves only, but other persons, would hire themselves to this infamous office. The master of the gladiators made them all first swear that they would fight to death; and if they failed, they were put to death either by fire, or swords, clubs, whips, or the like. It was a crime for the wretches to complain when they were wounded, or to ask for death or seek to avoid it when overcome; but it was usual for the emperor to grant them life when they gave no signs of fear, but waited the fatal stroke with courage and intrepidity. Augustus even decreed that it should always be granted them. From slaves and freed men the inhuman sport at length spread to people of rank and condition; so that Augustus was obliged to issue a public edict that none of the senatorian order should become gladiators; and soon after he laid the same restraint on the knights: nevertheless, Nero is said to have brought upwards of 400 senators and 600 Roman knights upon the arena; though Lipsius takes both these numbers to be falsified, and reduces them to forty senators and sixty knights: yet Domitian, that other monster of cruelty, refined upon Nero, exhibiting combats of women in the night-time. Constantine the Great is said to have first prohibited the combats of gladiators in the East. Some time before the day of combat, the person who presented the people with the shows gave them notice thereof by programmes or bills, containing the names of the gladiators, and the marks whereby they were to be distinguished: for each had his several badge; which was most commonly a peacock's feather, as appears from the scholiast of Juvenal on the 158th verse of the third satire, and Turnebus *Advers. lib. ii. cap. 8*. They also gave notice how long the shows would last, and how many couples of gladiators there were; and it appears, from the fifty-second verse of the seventh satire of the second book of Horace, that they sometimes made representations of these things in painting, as is practised among us by those who have any thing to shew at fairs. The day being come, they began the entertainment by bringing two kinds of weapons; the first were staves or wooden files, called *rudes*; and the second were effective weapons, as swords, poniards, &c. The first were called *arma lusoria*, or *exercitoria*; the second *decretoria*, as being given by decree or sentence of the prætor, or of him at whose expence the spectacle was exhibited. They began to fence or skirmish with the first, which was to be the prelude to the battle; and from these, when well warmed, at the sound of the trumpets they advanced to the second with which they fought naked. Then they were said *vertere arma*. The terms of striking were *petere et repetere*; of avoiding a blow, *exire*; and when one of the combatants received a remarkable wound, his adversary or the people cried out, *Habet* or *Hoc habet*. The first part of the engagement was called *ventilare*, *præludere*; and the second, *dimicare ad certum*, or *versis armis pugnare*: and some authors think, with much probability, that it is to these two kinds of combat that St. Paul alludes in the passage, 1 Cor. ix. 26, 27, "I fight, not as one that beateth the air; but I keep my body under, and bring it into subjection." If the vanquished surrendered his arms, it was not in the victor's power to grant him life. The people during the time of the republic, and the prince or people during the time of the empire, were alone empowered to grant it. The reward of the conqueror was a branch of palm-tree, and a sum of money, probably collected among the spectators: sometimes they gave him his congé, or dismissed him by putting one of the wooden files or *rudes* in his hand; and sometimes they even gave him his freedom, putting the pileus on his head. The sign or indication, whereby, the spectators shewed that they granted the favour, was *premere pollicem*, which M. Dacier takes to be a clenching of the fingers of both hands between one another, and so holding the two thumbs upright close together; and, when they would have the combat finished, and the vanquished slain, *verterunt pollicem*, they bent back the thumb; which we learn from Juvenal, *Sat. iii. ver. 36*. The gladiators challenged or defied each other, by shewing the little finger; and, by extending this, or some other, during the combat, they owned themselves vanquished, and begged mercy from the people: *Victi ostensam digiti veniam a populo postulabant*, says the old scholiast on Per-

sus. There were various kinds of gladiators, distinguished by their weapons, manner, and time of fighting, &c. as, the *andabata*, mentioned under *Andabata*: the *estervarii*, who always fought in troops or companies, number against number; or, according to others, who fought promiscuously, without any certain order: the *dimacha*, who fought armed with two poniards or swords, or with sword and dagger: the *essedarii*, who fought in cars: the *fiscales*, or *Casariani*, who belonged to the emperor's company; and who, being more robust and dexterous than the rest, were frequently called for; and therefore named also *postulatii*. Several other kinds are mentioned in the ancient authors.

GLADIATORS' WAR, [*bellum Gladiatorum*, or *Spartacum*,] called also the *Servile War*, was a war which the Romans sustained about A. U. C. 680. Spartacus, Crinus, and Oenomaus, having escaped, with other gladiators to the number of seventy-four, out of the place where they had been kept at Capua, gathered together a body of slaves, put themselves at their head, rendered themselves masters of all Campania, and gained several victories over the Roman prætors. At length they were defeated in 682, at the extremity of Italy; having, in vain, attempted to pass over into Sicily. Thus war proved very formidable to the Romans. Cassius was not able to finish it: Pompey the Great was forced to be sent as general.

GLADIATOR, THE DYING, a most valuable monument of ancient sculpture, long preserved in the palace of Chigi, but carried to Paris with the *Laocoon*, &c. in 1796. This gladiator after having received the mortal stroke, appears particularly careful at procumbat honeste, "that he might fall honourably." He is seated in a reclining posture on the ground, and seems to have just strength sufficient to support himself on his right arm; and in his expiring moments he does not abandon himself to grief and dejection; but is solicitous to maintain that firmness of aspect and attitude, which the gladiators valued themselves on preserving in this last scene of distress. He betrays no tokens of fear by his countenance, nor sheds one tear. *Quis mediocris gladiator ingemuit? quis vultum mutavit unquam? Quis non modo stetit, verum etiam decubuit turpiter?* says Cicero, in that part of his *Tusculan*, where he is describing the astonishing firmness of those persons. He appears, notwithstanding his remaining strength, to have but a few moments to live. Thus the ancients knew how to animate marble, and to give it almost every expression of life.

GLADIOLUS, CORN-FLAG: a genus of the monogynia order, and triandria class of plants; natural order, *Ensateæ*. Corolla sex-partite, ringent; stamina ascending and bending upwards. There are thirty species. The plants are very hardy, and will thrive in any soil or situation. They are propagated by offsets from the roots.

GLAIRE, [*glær*, Saxon, amber; *glar*, Danish, glass; *glairé*, Fr. *glareux*, Lat.] the white of an egg. It is used as a varnish for preserving paintings. For this purpose it is beat to an unctuous consistence, and commonly mixed with a little brandy or spirit of wine, to make it work more freely, and with a lump of sugar to give it body and prevent its cracking: and then spread over the picture or painting with a brush.

GLAMORGANSHIRE, a county of South Wales, said to have derived its name from a contraction of the Welsh words *Gwalld Morgan*, "the country of Morgan," and supposed to have been thus called from a prince of this part of the country, said to have been killed eight hundred years before the birth of our Saviour. Others derive the name from the British word *mor*, which signifies the sea; this being a maritime county. It is bounded on the south and part of the west by the Bristol channel; on the north-west by Caermarthenshire; on the north by Brecknockshire; and on the east by Monmouthshire. It is 48 miles long from E. to W. 27 broad from N. to S. and 116 in circumference. The principal rivers of this county are the Rhymny, the Taff, the Ogmore, the Avon, the Cleddagh, and the Tawe. The air, in the south part, towards the sea, is temperate; but the north part, which is mountainous, is cold and piercing, full of thick woods, extremely barren, and thin of inhabitants. The mountains, however, feed herds of cattle, and send forth streams which add greatly to the fertility of the other parts of the county: they have likewise coal and lead ore. The south part is remarkably fertile.

GLAMOUR, or **GLAMER**, an old term of popular superstition in Scotland, denoting a kind of magical mist believed to be raised

raised by sorcerers, and which deluded their spectators with visions of things which had no real existence, altered the appearance of those which really did exist, &c.

GLANCE, in mineralogy, one of the ores of cobalt, found in beds of mica, in Sweden: its colour is tin-white; it is massive in various forms, and crystallized in cubes and octahedrons; the surface of the crystals is smooth and splendid: it is brittle, and the specific gravity is 6.45.

GLANDS. See **ANATOMY**.

GLANDERS. See **FARRIERY**.

GLANDORE, a town of Ireland, in Cork, with an excellent harbour, 3 miles W. of Ross.

GLANS. See **ANATOMY**.

GLANVIL, **JOSEPH**, a learned and ingenious, but fanciful and credulous, writer, in the seventeenth century born at Plymouth in 1636, and bred at Oxford. He was a great admirer of Mr. Baxter, and zealous for a commonwealth. After the restoration, he published *The Vanity of Dogmatizing*; was chosen F. R. S. and, taking orders in 1662, was present to the vicarage of Frome-Selwood in Somersetshire. In 1662, he published his *Lux Orientalis*; in 1665, his *Scep sis Scientifica*; and in 1666, *Some Philosophical Considerations touching the Being of Witches and Witchcraft*. In 1668, he published *Plus Ultra*; or, *The progress and Advancement of Knowledge since the Days of Aristotle*. He likewise published *A seasonable Recommendation and Defence of Reason*; and *Philosophia Pia*, or *A Discourse of the Religious Temper and Tendencies of Experimental Philosophy*. In 1678 he was made a prebendary of Worcester, and died in 1680.

GLAREOLA, the **PRATINCOLE**, a genus of birds of the order grallæ. Bill strong, straight, short, hooked at the end; nostrils at the base linear and oblique: feet four-toed; toes long, slender, connected at the base by a membrane: tail forked, consisting of twelve feathers. There are three species, of which the principal is *P. austriaca*; this is about as large as a blackbird, lives on water-insects and on worms; is found in great numbers on the banks of the Rhine. See **PLATE LVIII**.

GLARIS, or **GLARUS**, one of the cantons of Switzerland,

bounded on the E. by the country of the Grisons, and partly by that of Sargans. It is a mountainous country, almost entirely surrounded by the Alps.

GLARIS, or **GLARUS**, a city of the Helvetic republic, capital of the above canton, thirty-two miles E. of Lucerne.

GLASGOW, a large and beautiful city of Scotland in Lanarkshire, on the N. bank of the Clyde, justly esteemed the second in that part of the united kingdom. Glasgow lies ten miles S. E. of Dunbarton, and forty-four W. of Edinburgh.

GLASS, a solid, transparent, brittle, substance, produced by melting together sand, flint, alkaline salts, &c. It is derived by some from the Latin word *glastum*, the name of a plant called by the Greeks *λαστις*, by the Romans *vitrum*; by the ancient Britons *guadum*, and by the English *wood*. We find frequent mention of this plant in ancient writers, particularly Cæsar, Vitruvius, Pliny, &c. who relate, that the ancient Britons painted or dyed their bodies with *glastum*, *guadum*, *vitrum*, &c. i. e. with the blue colour procured from this plant. And hence, the name glass, which has always somewhat of this bluishness in it. Good glass is very transparent, and when cold very brittle; but at a red heat it is one of the most ductile bodies known, and may be drawn into threads so very delicate, as to become almost invisible to the human eye. It is extremely elastic, and one of the most sonorous of bodies. See **HARMONICA**. There are but few chemical agents which have any action upon it. Fluoric acid has a great power over it, and dissolves it very quickly (see **FLUORIC ACID**); so also have the fixed alkalies when assisted by heat. The continued action of hot water is said to be capable of decomposing glass, which it is thought will fully explain how the siliceous earth was obtained by Boyle and others, when they subjected water to very tedious distillations in glass-vessels. It has also been supposed, that the deflagration of the oxygen and hydrogen gases, in the formation of water, has decomposed the glass, which will account for an acid as part of the result. Flint-glass melts at the temperature of 10° Wedgewood; crown-glass at 30°; and bottle-glass at 47°. The specific gravity varies between 2.48 and 3.33.

GLASSMAKING.

GLASSMAKING, the art of making glass; or the manufacture of that commodity from its original materials, into any form. Under this article we shall give a brief description, not only of the materials and art of glassmaking, but also of several branches connected with it; such as the grinding, polishing, and colouring of glass. At what period the art of glassmaking was first invented, is altogether uncertain. Some suppose it was invented before the flood; and Neri traces its antiquity at least to the time of Job. But these are mere conjectures; for the word *Zechuchib*, translated crystal, (Job. xxviii. 17.) admits of various significations, and from the context evidently means some precious stone. The Egyptians boast, that this art was taught them by Hermes. Aristophanes, Aristotle, Alexander Aphrodisæus, Lucretius, and St. John the divine, put it out of all doubt that glass was used in their days. Pliny relates, that it was first discovered accidentally in Syria, at the mouth of the river Belus, by certain merchants driven thither by a storm at sea; who being obliged to continue there, and dress their victuals by making a fire on the ground, where there was great plenty of the herb kali; that plant, burning to ashes; its salts mixed and incorporated with the sand, or stones fit for vitrification, and thus produced glass; and that, this accident being known, the people of Sidon in that neighbourhood essayed the work, and brought glass into use; since which time the art has been continually improving. Be this as it may, the first glass-houses mentioned in history were erected in Tyre, where the only staple of the manufacture was for many ages. The sand which lay on the shore for about half a mile round the mouth of the Belus was peculiarly adapted to the making of glass; and the wide range of the Tyrian commerce gave an ample vent for the productions of the furnace. The first time we hear of glass made among the Romans was in the reign of Tiberius, when Pliny relates that an artist had his

house demolished for making glass malleable, or rather flexible; though Petronius Arbitr and others assure us, that the emperor ordered the artist to be beheaded for his invention. It is certain that a plate of glass was found at Herculaneum, which was destroyed, A. D. 80; and that glass-vessels were made at Rome under Nero. The earliest mention made of glass-windows, is by Lactantius in the third century. Before the conquest of Britain by the Romans, glass-houses had been erected in this island, as well as in Gaul, Spain, and Italy. Hence, in many parts of the country are to be found annulets of glass, having a narrow perforation and thick rim, denominated by the remaining Britons *gleineu naid-reedh*, or glass-adders, and which were probably in former times used as amulets by the druids. It can scarcely be doubted, that the Britons were sufficiently well versed in the manufacture of glass, to form out of it many more useful instruments than glass-beads. According to Bede, artificers skilled in making glass for windows were brought over into England in 674, by abbot Benedict, who were employed in glazing the church and monastery of Weremouth. According to others, they were first brought over by Wilfrid, bishop of Worcester, about the same time. Till this time the art of making glass for windows was unknown in Britain; and glass-windows did not begin to be common before 1180. Italy had them first; next France, from whence they came to England. Venice, for many years, excelled all Europe in the fineness of its glasses; and in the thirteenth century, the Venetians were the only people that had the secret of making crystal looking-glasses. The glass-manufacture was first begun in England in 1557; the finer sort was made at Crutched Friars, in London; the fine flint-glass, little inferior to that of Venice, was first made in the Savoy House, in the Strand, London. This manufacture appears to have been much improved in 1635, when it was carried on with pit-coal instead of wood;

wood; and a monopoly was granted to Sir Robert Mansell, who was allowed to import the fine Venetian flint-glasses for drinking, the art of making which was not brought to perfection before the reign of William III. The first glass-plates, for looking-glasses and coach-windows, were made in 1673, at Lambeth, by the encouragement of the duke of Buckingham; who, in 1670, introduced the manufacture of fine glass into England, by Venetian artists, with amazing success. So that within the last century, the French and English have not only equalled, but even excelled, the Venetians, and are now no longer supplied from abroad. The French made a considerable improvement in the art of glass, by the invention of a method to cast very large plates, till then unknown, and scarce practised yet by any but themselves and the English. This branch was established in Lancashire in 1773, and is now very flourishing.

OF THE MATERIALS FOR MAKING GLASS.

The materials, whereof glass is made, are salt and sand, or stones.

I. The salt is procured from a sort of ashes brought from the *Levant*, called *polverine*, or *rochetta*. They are the ashes of a water-plant named *kali*, see *SALSOLA*, cut down in summer, dried in the sun, and burnt in heaps, either on the ground, or on iron-grates; the ashes falling into a pit, grow into a hard mass, or stone, fit for use. It may also be procured from common kelp, or the ashes of the *fucus vesiculosus*. See *FUCUS*. To extract the salt, these ashes are powdered and sifted, then put into boiling water, and there kept till one-third of the water be consumed; the whole being stirred up from time to time, that the ashes may incorporate with the fluid, and all its salts be extracted: then the vessel is filled up with new water, and boiled over again, till one-half be consumed; what remains is a sort of ley, strongly impregnated with salt. This ley, boiled over again in fresh coppers, thickens in about twenty-four hours, and shoots its salt; which is to be ladled out, as it shoots, into earthen pans, and thence into wooden vats to drain and dry. This done, it is grossly pounded, and thus put into a sort of oven, called *calcar*, to dry. There are also other plants which yield a salt fit for glass; such as the common thistle, bramble, hops, wormwood, woad, tobacco, fern, and the whole leguminous tribe, as pease, beans, &c. Pearl-ashes form a leading flux in the manufacture of glass, and mostly supply the place of the *Levant* ashes, the *barillas* of Spain, and other kinds, formerly imported for making both glass and soap. There are other fluxes used for different kinds of glass, and for various purposes, as calcined lead, nitre, sea-salt, borax, arsenic, smiths-clinkers, and wood-ashes, containing the earth and lixivate salts as produced by incineration. With regard to these several fluxes, we may observe, in general, that the more calx of lead, or other metallic earth, that enters into the composition of any glass, so much the more fusible, soft, coloured, and dense; this glass is, and reciprocally. The colours given to glass, by calxes of lead, are shades of yellow: on the other hand, glasses that contain only saline fluxes partake of the properties of salts; they are less heavy, less dense, harder, whiter, more brilliant, and more brittle, than the former; and glasses containing both saline and metallic fluxes also partake of the properties of both these substances. Glasses too saline are easily susceptible of alteration by the action of air and water: especially those in which alkali prevail; and these are also liable to be injured by acids. Those that contain too much borax and arsenic, though at first they appear very beautiful, quickly tarnish and become opaque when exposed to air. By attending to these properties of different fluxes, the artist may adjust the proportions of these to sand, or powdered flints, for the various kinds of glass.

II. The sand or stone, called by the artists *tarso*, is the second ingredient in glass, and that which gives it the body and firmness. These stones, *Agricola* observes, must be such as will fuse; and of these such as are white and transparent are best; so that crystal has the precedency of all others. At Venice they chiefly use a sort of pebble, found in the *Tesino*, resembling white marble, and called *cuogolo*. Indeed *Ant. Neri* assures us, that all stones, which will strike fire with steel, are fit to vitrify: but *Dr. Morret* shews, that there are some exceptions from this rule. Flints are admirable; and when calcined, powdered, and searced, make a pure white crystalline metal: but the expence of preparing them makes the masters of our glass-houses sparing of their use. Where proper stones cannot be so conveniently had, sand is used. The

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best for this purpose is that which is white, small, and shining; examined by the microscope, it appears to be small fragments of rock-crystal. For green glass, that which is of a soft texture, and more gritty; it is to be well washed, which is all the preparation it needs. Our glass-houses are furnished with white sand, for their crystal-glasses, from *Lynn* in Norfolk, and *Maidstone* in Kent, and with the coarser, for green glass, from *Woolwich*.

OF THE FURNACES AND IMPLEMENTS USED IN GLASSMAKING.

In this manufacture there are three sorts of furnaces; the first, called *calcar*, is for the frit; second for working the glass; the third, for annealing it, is called the *leer*. See Plate LXXXIV.

I. The *CALCAR* is an oven ten feet long, seven feet broad, and two deep: the fuel, which in Britain is sea-coal, is put into a trench on one side of the furnace; and the flame, reverberating from the roof upon the frit, calcines it.

II. The *GLASS-FURNACE*, or *WORKING-FURNACE*, is round, of three yards diameter, and two high, or in that proportion. It is divided into three parts, each of which is vaulted. The lower part is properly called the crown, and is made in that form. Its use is to keep a brisk fire, which is never put out. The mouth is called the *bocca*. There are several holes in the arch of this crown, through which the flame passes into the second partition, and reverberates into the pots filled with the materials. Round the insides there are eight or more pots placed, and piling pots on them. The number of pots is always double that of the boccas or mouths, or of the number of workmen, that each may have one pot refined to work out of, and another for metal to refine in, while he works out of the other. Through the working-holes the metal is taken out of the pots, and the pots are put into the furnace; and these holes are stopped with moveable covers made of lute and brick, to screen the workman's eyes from the scorching flames. On each side of the *boeca* or mouth is a *boccarella* or little hole, out of which coloured glass or finer metal is taken from the piling-pot.

III. Above this oven there is the third oven, called the *LEER*, about five or six yards long, and four feet wide, where the vessels of glass are annealed or cooled. This part consists of a tower, besides the leer, into which the flame ascends from the furnace. The tower has two mouths, through which the glasses are put in with a fork, and set on the floor or bottom: but they are drawn out on iron pans, called *fraches*, through the leer, to cool by degrees; so that they are quite cool by the time they reach the mouth of the leer, which enters the *sarosel* or room where the glasses are to be stowed.

IV. The *FURNACE FOR THE GREEN GLASS* is square; and at each angle it has an arch for annealing or cooling glasses. The metal is wrought on two opposite sides, and on the other two they have their colours, into which are made linnen-holes for the fire to come from the furnace to bake the frit, and to discharge the smoke. Fires are made in the arches to anneal the work, so that the whole process is done in one furnace. These furnaces must not be of brick, but of hard sandy stones. In France, they build the outside of brick; and the inner, to bear the fire, is made of a sort of fullers earth, or tobacco-pipe clay, of which they also make the melting-pots. In Britain the pots are made of *Sturbridge* clay. *Mr. Blancourt* observes, that the worst and roughest work in this art is the changing the pots when they are worn out or cracked. In this case, the great working-hole must be uncovered; the faulty pot must be taken out with iron hooks and forks, and a new one must be speedily put in its place, through the flames, by the hands only. For this work, the man guards himself with a garment made of skins, in the shape of a pantaloon, that covers him all but his eyes, and is made as wet as possible: the eyes are defended with a proper sort of glass. The principal implements used by the glass-blower are, a blowing-pipe, fig. 3, which is an iron pipe about two feet long, with rope-yarn wrapped round it at A, where the workman takes hold of it; two or three iron rods, fig. 4, of the same length; a pair of blunt shears, fig. 5; and several different sized ladles, shovels, pokers, &c.

OF THE DIFFERENT KINDS OF GLASS.

The manufactured glass now in use may be divided into three general kinds; 1. white transparent glass; 2. coloured glass; and 3. common green, or bottle-glass. Of the first kind there is a great

great variety; as the flint-glass, and the German crystal-glass, which are applied to the same uses: the glass for plates, for mirrors, or looking-glasses; the glass for windows and other lights; and the glass for phials and small vessels. And these, again differ in the substances employed as fluxes in forming them, as well as in the coarseness or fineness of such as are used for their body. The flint and crystal, mirror and best, window-glass, not only require such purity in the fluxes, as may render it practicable to free the glass perfectly from all colour; but, for the same reason, either the white Lynn sand, calcined flints, or white pebbles, should be used. The others do not demand the same nicety in the choice of the materials; though the second kind of window-glass, and the best kind of phial, will not be so clear as they ought, if either too brown sand, or impure salts, be suffered to enter into their composition. Of coloured glass there is also a great variety of sorts, differing in their colour or other properties according to the occasions for which they are wanted: These differences depend on the preparation and management of the artists by whom they are manufactured. Glass is also distinguished into three principal kinds, by the form or manner of working it; viz. 1. Round glass, as that of our bottles, vessels, phials, drinking-glasses, &c. 2. Table or window-glass, of which there are divers kinds: as crown-glass, jealous-glass, &c. And 3. Plate-glass, or mirror-glass.

OF THE COMPOSITIONS FOR MAKING BOTTLE AND PHIAL-GLASS.

I. THE COMMON-BOTTLE, or GREEN GLASS, is formed of sand of any kind, fluxed by the ashes of burnt wood, or of any parts of vegetables; to which may be added the scorie or clinkers of forges. When the softest sand is used, 200lb. of wood-ashes will suffice for 100lb. of sand, which are to be ground and mixed together. The composition with the clinkers consists of 170lb. of wood-ashes, 100lb. of sand, and 50 of clinkers, which are to be ground and mixed together. If the clinkers cannot be ground, they must be broken into small pieces, and mixed with the other matter without grinding.

II. PHIAL-GLASS is a kind betwixt the flint-glass and the bottle-glass. The best kind may be prepared with 120lb. of white sand, 50lb. of unpurified pearl-ashes, 10lb. of common salt, 5lb. of arsenic, and 5 oz. of magnesia. The composition for green or common phial-glass consists of 120lb. of the cheapest white sand, 80lb. of wood-ashes well burnt and sifted, 20lb. of pearl-ashes, 15lb. of common salt, and 1lb. of arsenic.

OF THE COMPOSITIONS FOR MAKING WHITE GLASS AND CRYSTAL.

Take of the whitest tarso, pounded small, and seared as fine as flour, 200lb. of the salt of polverine 130lb. mix them, and put them into the calcar, first heating it. For an hour keep a moderate fire, and keep stirring the materials with a proper rake, that they may incorporate and calcine together; then increase the fire for five hours; after which take out the matter; which being now sufficiently calcined, is called FRIT, or BOLLITO. See these articles. From the calcar put the frit in a dry place, and cover it up from the dust for three or four months. To make the white glass or crystal, take of the crystal frit, set it in pots in the furnace, adding to it a due quantity of manganese: when the two are fused, cast the fluor into fair water, to clear it of the salt called sandiver; which would otherwise make the crystal obscure and cloudy. This lotion must be repeated again and again, as often as needful, till the crystal be fully purged; or the scum may be taken off by proper ladles. Then set it to boil four, five, or six days; which done, see whether it have manganese enough; and if it be yet greenish, add more by little and little at a time, taking care not to overdose it, because the manganese inclines it to a blackish hue. Then let the metal clarify, till it becomes of a clear and shining colour; which done, it is fit to be blown or formed into vessels.

FLINT-GLASS, as it is called by us, is of the same general kind with that which in other places is called crystal-glass. It has this name from being originally made with calcined flints, before the use of the white sand was understood; and retains the name, though no flints are now used in the composition of it. This flint-glass differs from the other, in having lead for its flux, and white sand for its body; whereas the fluxes used for the crystal-glass are salts or arsenic, and the body consists of calcined flints or white river-pebbles, tarso, or such stones. To the white sand and lead a pro-

per proportion of nitre is added, and a small quantity of magnesia, or manganese. In some works they use a proportional quantity of arsenic to aid the fluxing ingredients. The most perfect kind of flint-glass may be made, by fusing with a very strong fire 120lb. of the white sand, 50lb. of red lead, 40lb. of the best pearl-ashes, 20lb. of nitre, and 5oz. of magnesia. Another composition of flint-glass, which is said to come nearer to the kind now made, is the following: 130lb. of sand, 54lb. of the best pearl-ashes, 36lb. of red-lead, 12lb. of nitre, and 6oz. of magnesia. To either of these a pound or two of arsenic may be added, to increase the flux of the composition. A cheaper composition may be made with 120lb. of white sand, 35lb. of the best pearl-ashes, 40lb. of red lead, 13lb. of nitre, 6lb. of arsenic, and 4oz. of magnesia; or instead of the arsenic may be substituted 15lb. of common salt; but this will be more brittle. The cheapest composition for the worst kind of flint-glass consists of 120lb. of white sand, 30lb. of red lead, 20lb. of the best pearl-ashes, 10lb. of nitre, 15lb. of common salt, and 6lb. of arsenic. The best German crystal is made of 120lb. of calcined flints or white sand, 70lb. of the best pearl-ashes, 10lb. of saltpetre, 2lb. of arsenic, and 5oz. of magnesia. And a cheaper composition is formed of 120lb. of calcined flints or white sand, 46lb. of pearl-ashes, 7lb. of nitre, 6lb. of arsenic, and 5oz. of magnesia. A glass much harder than any prepared in the common way, may be made by means of borax, thus: Take 4oz. of borax, and one of fine sand; reduce both to a subtil powder, and melt them together in a large close crucible set in a wind-furnace, keeping up a strong fire for half an hour; then take out the crucible, and when cold break it, and there will be found at the bottom a pure hard glass, capable of cutting common-glass like a diamond. This experiment, duly varied, says Dr. Shaw, may lead to several useful improvements in making glass-enamels, and factitious gems; and shews an expeditious method of making glass, without any fixed alkali, which has been generally thought an essential ingredient in glass; and perhaps calcined crystal, or other substances, added to this salt instead of sand, might make a glass approaching to the nature of a diamond.

OF THE COMPOSITIONS FOR MAKING PLATE OR MIRROR-GLASS.

The materials of which this glass is made are much the same as those of other works of glass, viz. an alkaline salt and sand. The salt, however, should not be that extracted from the ashes of the Syrian kali, but that from barilla, growing about Alicante in Spain. It is very rare that we have the barilla pure; the Spaniards in burning the herb mix another herb with it, which alters its quality; or add sand to it to increase the weight, which is easily discovered, if the addition be only made after the boiling of the ashes, but next to impossible if made in the boiling. From this adulteration threads and other defects in plate-glass arise. To prepare the salt, clean it well of all foreign matters; pound or grind it with a kind of mill, and finally sift it pretty fine. Pearl-ashes properly purified, will furnish the alkaline salt requisite for this purpose; but it will be necessary to add borax or common salt, to facilitate the fusion, and prevent the glass from stiffening in that degree of heat in which it is to be wrought into plates. To purify the pearl-ashes, dissolve them in four times their weight of boiling water, in a pot of cast iron, kept clean from rust. Let the solution be removed into a clean tub, and remain there 24 hours or longer. Having decanted the clear part of the fluid from the sediment, put it again in the iron pot, and evaporate the water till the salts are left perfectly dry. Preserve them in stone-jars, well secured from air and moisture. Pearl-ashes may also be purified in the highest degree, so as to be proper for the manufacture of the most transparent glass, by pulverizing 3lb. of the best kind with 6oz. of saltpetre in a glass or marble mortar, till they are well mixed; and then putting part of the mixture into a large crucible, and exposing it in a furnace to a strong heat. When this is red-hot, throw in the rest gradually; and when the whole is red-hot, pour it out on a moistened stone or marble, and put it into an earthen or clean iron pot, with ten pints of water; heat it over the fire till the salts be entirely melted; let it then stand to cool, and filter it through paper in a pewter cullender. When filtered, put the fluid again into the pot, and evaporate the salt to dryness, which will then be as white as snow. As to the sand, sift and wash it till the water come off very clear; and when it is well dried, mix it with the salt, passing the mixture through another sieve. This done, lay them in the annealing furnace for about two hours; in which time the matter be-

comes

comes very light and white. In this state they are called frit, and are laid up in a dry clean place, for at least a year, to give them time to incorporate. When they employ this frit, they lay it for some hours in the furnace, adding to some the fragments of old and ill made glasses; taking care first to calcine them by heating them red-hot in the furnace, and thus casting them into cold water. To the mixture must likewise be added manganese, to promote the fusion and purification. The best composition for looking-glass-plates consists of 60lb. of white sand cleansed, 25lb. of purified pearl-ashes, 15lb. of saltpetre, and 7lb. of borax. If a yellow tinge should affect the glass, a small portion of magnesia, mixed with an equal quantity of arsenic, should be added. An ounce of the magnesia may be first tried; and if this prove insufficient, the quantity should be increased. A cheaper composition consists of 60lb. of white sand, 20lb. of pearl-ashes, 10lb. of common salt, 7lb. of nitre, 2lb. of arsenic, and 1lb. of borax.

METHOD OF WORKING OR BLOWING GLASS.

The working-furnace for round glass, fig. 1, has six boccas or apertures: at one of these called the great bocca, the furnace is heated, and the pots of frit are at this set in the furnace; two other smaller holes, called boccarellas, serve to lade or take out the melted metal, at the end of an iron, to work the glass. For explaining the operation, we shall describe the method of making a goblet. The workman dips the end D of his blowing-pipe, fig. 3, which is hot, through the working-hole of the furnace, fig. 1, into the melting-pot, which contains the glass in a state of fusion; and by turning it about, a small quantity of the glass, which is called metal, sticks to the iron: this he repeats three or four times (between each dip rolling it on an iron plate, fixed on the stool, fig. 8, to bring it into form) till he has got metal enough: he then blows at the end B of the pipe, which expands the metal into a hollow globular form; and then by swinging it round his head, it lengthens out in the shape of a bladder. The workman then sits down on the stool, fig. 7, between the two bars H and I, across which he lays the blowing-iron, and rolls it along under his left hand, following it at the same time with the shears, fig. 5, in his right hand, the blades *nn* of which embrace it, and by gently putting them in the proper place, he brings the glass into the form shewn in fig. 11; meanwhile, the boy who attends him brings a lump of metal from the furnace on the end of one of the iron rods fig. 4, which he sticks on the bottom, or part *a*, fig. 11, and by twisting the rod round, he separates the metal from the rod, and leaves it on the glass-vessel; the workman then rolls the rod and vessel as before, and with his shears, as shewn in fig. 10, brings the lump of glass into the form of a stem and foot, as there described. The boy then holds the tool, fig. 6, against the bottom of the foot, *b*, while it is turning, to flatten it. The boy next takes another iron-rod, fig. 4, and gets a very small piece of metal on its end: this he applies to the centre of the bottom of the foot, so as to connect it to the rod; when the workman, by touching it at the neck *a* with a wet iron, cracks the glass, so that a slight blow upon the rod with the hand will separate it at *d*, from the blowing-pipe M. The glass has by this time become too cold to work without heating again, which is done at the furnace; the workman then returns to the stool, fig. 7, and again rolls the rod round with his left hand as before, and with the point of one of the blades *n* of the shears opens the end *d*, fig. 9, of the glass; after which he inserts both points, and finally works it into the form of fig. 14. It is now separated from the rod N, and is carried on a shovel like a baker's peel by the boy to the annealing furnace, or oven in the upper part of the furnace, where it remains in a low red-heat for many hours, by which its former extreme brittleness is removed. Window-glass is made in a similar manner, except that the liquid mass at the end of the tube is formed into a cylindrical shape, which being cut longitudinally by scissors or shears, is gradually bent back until it becomes a flat plate.

CASTING OR RUNNING OF LARGE MIRROR-GLASS-PLATES.

The furnace is of a very large dimension, environed with several ovens, or annealing furnaces, called carquoises, besides others for the making of frit and calcining of old pieces of glass. Fig. 2, A represents the bocca, or mouth of the furnace; B the cistern that conveys the liquid glass it receives out of the melting-pots in the furnace to the casting-table. These cisterns are filled in the fur-

nace, and remain therein six hours after they are filled; and then are hooked out by a large iron chain, guided by a pulley, placed upon a carriage with four wheels, (marked C,) by two men. This carriage has no middle-piece; so that when it has brought the cistern to the casting-table, D, they slip off the bottom of the cistern, and out rushes a torrent of flaming matter upon the table: this matter is confined to certain dimensions by the iron rulers EE, which are moveable, and retain it, and determine the width of the glass; while a man, with the roller F, resting on the edge of the iron rulers, reduces it as it cools to an equal thickness, which is done in the space of a minute. This table is supported on a wooden frame, with trustles for the convenience of moving to the annealing-furnace; into which, strewed with sand, the new plate is shoved, where it will harden in about ten days. What is most surprising throughout the whole of this operation, is the quickness and address wherewith such massy cisterns, filled with a flaming matter, are taken out of the furnace, conveyed to the table, and poured therein, the glass spread, &c. The whole is inconceivable to such as have not been eye-witnesses of that surprising manufacture. As fast as the cisterns are emptied, they carry them back to the furnace and take fresh ones, which they empty as before. This they continue to do so long as there are any full cisterns; laying as many plates in each carquoise as it will hold, and stopping them up with doors of baked earth, and every chink with cement, as soon as they are full, to let them anneal, and cool again, which requires about 14 days.

OF THE ORNAMENTING, GRINDING, AND POLISHING, OF GLASS.

Good glass-ware is often ornamented by the glass-cutter before it is offered for sale (see fig. 13:) this is generally performed by a machine, fig. 15, wherein AA is a large wheel to be turned by a man at the winch B. The band of this wheel passes round a pulley *a* on the axle of a wheel or cutter C, and thereby turns it with a great velocity: beneath the cutter a cistern D is placed, and above it a small cask E to contain water, the cock *b* of which is so placed and adjusted as to drop very slowly on the circumference of the cutter. The glass-grinder sits down on the stool F, and after dressing the edge of the cutter with emery paste, he applies successively the parts of the glass which are to be cut, as shewn in fig. 12, and dexterously moves the glass, as the parts intended to be cut are sufficiently ground away: after this another similar cutter is applied instead of C, or the same is dressed with finer emery paste, or mixture of tripoli and other polishing powders, in order to polish the parts which have been cut; such parts as are intended to have a white appearance are left rough. The cutters C are formed of hard wood or soft metal, and the workman is provided with several, of different sizes and thicknesses, particularly at the edge, according to the device which is to be cut on the glass. It is by the fine edge of these cutters that letters, flowers, &c. are cut on glasses by dexterous workmen. Plate or mirror-glass is ground, and polished, in order to give it the fine lustre which is requisite for mirrors. The workmen lay it horizontally upon a flat stone-table made of a fine-grained free-stone; and for its greater security they plaster it down with lime or stucco; else the force of the workmen, or the motion of the wheel with which they grind it, would move it about. This stone-table is supported by a strong frame A, fig. 16, made of wood; with a ledge quite round its edges, rising about two inches higher than the glass. Upon this glass to be ground is laid another rough glass not above half so big, and so loose as to slide upon it; but cemented to a wooden plank, to guard it from the injury it must otherwise receive from the scraping of the wheel to which this plank is fastened, and from the weights laid upon it to promote the grinding or triture of the glasses. The whole is covered with a wheel, B, made of hard light wood, about six inches in diameter, by the pulling of which backwards and forwards alternately, and sometimes turning it round, the workmen, who always stand opposite to each other, produce a constant attrition between the two glasses, and bring them to what degree of smoothness they please, by first pouring in water and coarse sand; after that, a finer sort of sand, as the work advances, till at last they pour in the powder of smalt. As the upper or incumbent glass polishes and grows smoother, it is taken away, and another from time to time put in its place. This engine is called a mill by the artists, and is used only for the largest glasses; for in the grinding of the less

less glasses, they work without a wheel, and have only four wooden handles fastened to the four corners of the stone that loads the upper plank, by which they work it about. When the grinder, (who finds it very difficult to bring the glass to an exact plainness,) has done his utmost, it is turned over to the polisher; who with the fine powder, of tripoli stone, or emery, brings it to a perfect evenness and lustre. The instrument used in this branch is a board, *c c*, furnished with a felt, and a small roller, which the workman moves by means of a double handle at both ends. The artist, in working this roller, is assisted with a wooden hoop or spring to the end of which it is fixed: for the spring, by constantly bringing the roller back to the same points, facilitates the action of the workman's arm.

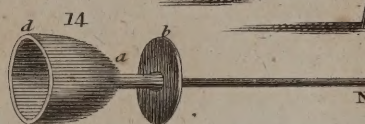
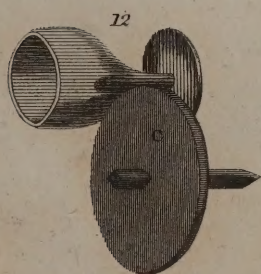
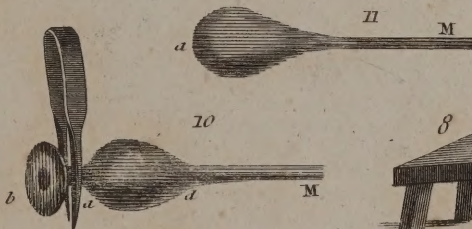
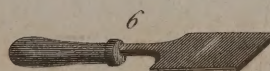
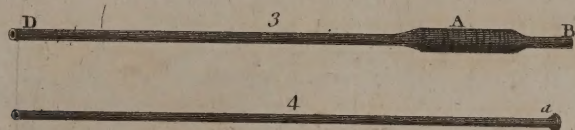
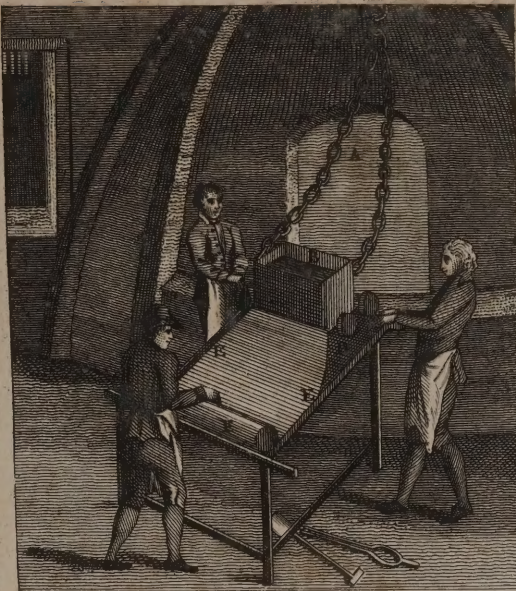
COLOURING OF GLASS.

Glass is often tinged of various colours, which is performed by mixing with it, while in fusion, some one of the metallic oxides. Thus blue glass is formed by the oxide of cobalt; green by the oxide of iron, or copper; violet by the oxide of manganese; red by a mixture of the oxides of copper and iron; purple by the oxide of gold; white by the oxide of arsenic and zinc; and yellow by the oxide of silver, and by combustible bodies.

PAINTING ON GLASS.

A few years since, Mr. Farrant obtained a patent for painting, spangling, gilding, and silvering glass, which was performed on the back of the crystal or glass, so as when finished to appear on the front: the colours prepared in oil or varnish as in other works. The parts of ornament which are gold must be first shadowed on the glass, and when dry the gold-leaf must be laid on. Silver-ornament is to be done in the same manner. For the spangling, leave the parts to be spangled to the last: then shadow them, and when dry varnish the parts with copal varnish, and strew the spangles on while it is wet; when they are dry, varnish them two or three times. The ancient manner of painting in glass was very simple, and consequently very easy: it consisted in the mere arrangement of pieces of glass of different colours in some sort of symmetry, and constituted what is now called mosaic work. In process of time they came to attempt more regular designs, and also to represent figures heightened with all their shades: yet they proceeded no farther than the contours of the figures in black with water-colours, and hatching the draperies after the same manner on glasses of the colour of the object they designed to paint. For the carnation, they used glass of a bright-red colour, and upon this they drew the principal lineaments of the face, &c. with black. But in time, the taste for this sort of painting improving considerably, and the art being found applicable to the adorning of churches, &c. they found out means of incorporating the colours in the glass itself, by heating them in the fire to a proper degree, having first laid on the colours. The colours used in the painting or staining of glass are very different from those in painting either in water or oil colours. For black, take scales of iron one ounce, scales of copper one ounce, jet half an ounce; reduce them to powder, and mix them. For blue, take powder of blue one pound, sal nitri half a pound; mix them, and grind them well together. For carnation, take red chalk eight ounces, iron scales and litharge of silver of each two ounces, gum-arabic half an ounce; dissolve in water; grind all together for half an hour as stiff as you can; then put it in a glass and stir it well, and let it stand to settle fourteen days. For green, take red lead one pound, scales of copper one pound, and flint five pounds; divide them into three parts, and add to them as much nitre; put them into a crucible, and melt them with a strong fire; and when it is cold, powder it, and grind it to a porphyry. For gold-colour, take silver an ounce, antimony half an ounce; melt them in a crucible; then pound the mass to powder, and grind it on a copper-plate; add to it yellow ochre, or brick-dust calcined again, 15 ounces, and grind them well together with water. For purple, take minium one pound, brown stone one pound, white flint five pounds; divide them into three parts, and add to them as much nitre as one of these parts; calcine, melt, and grind, it as you did the green. For red, jet four ounces, litharge of silver two ounces, red chalk one ounce; powder them fine, and mix them. For white, take jet two parts, white flint, ground on glass very fine, one part, mix them. For yellow, take Spanish brown ten parts, leaf-silver one part, antimony half a part; put all into a crucible,

and calcine them well. In the windows of ancient churches, &c. there are to be seen the most beautiful and vivid colours imaginable, which far exceed any of those used by the moderns, not so much because the secret of making those colours is entirely lost, as that the moderns will not go to the charge of them, nor be at the necessary pains. Those beautiful works which were made in the glass-houses were of two kinds. In some, the colour was diffused through the whole substance of the glass. In others, which were the more common, the colour was only on one side, scarcely penetrating within the substance above one-third of a line; though this was more or less according to the nature of the colour, the yellow being always found to enter the deepest. These last, though not so strong and beautiful as the former, were of more advantage to the workmen, since on the same glass, though already coloured, they could shew other kind of colours where there was occasion to embroider draperies, enrich them with foliage, or represent other ornaments of gold, silver, &c. In order to this, they made use of emery, grinding or wearing down the surface of the glass, till they were got through the colour to the clear glass. This done, they applied the proper colours on the other side of the glass. By this means, the new colours were hindered from running and mixing with the former, when they exposed the glasses to the fire, as will appear hereafter. When, indeed, the ornaments were to appear white, the glass was only bared of its colour with emery, without tinging the place with any colour at all; and this was the manner by which they wrought their lights and heightenings on all kinds of colour. The first thing to be done in order to paint or stain glass in the modern way, is to design and even colour the whole subject on paper. They then choose such pieces of glass as are clear, even, and smooth, and proper to receive the several parts, and proceed to distribute the design itself, or papers it is drawn on, into pieces suitable to those of the glass; always taking care that the glasses may join in the contours of the figures and the folds of the draperies, that the carnations and other finer parts may not be impaired by the lead with which the pieces are to be joined together. The distribution being made, they mark all the glasses as well as papers, that they may be known again; which done, applying every part of the design upon the glass intended for it, they copy or transfer the design upon this glass with the black colour diluted in gum-water, by tracing and following all the lines and strokes as they appear through the glass with the point of a pencil. When these strokes are well dried, which will happen in about two days, the work being only in black and white, they give a slight wash over with urine, gum-arabic, and a little black, and repeat it several times, according as the shades are desired to be heightened, with this precaution, never to apply a new wash till the former is sufficiently dried. This done, the lights and risings are given by rubbing off the colour in the places with a wooden point, or the handle of the pencil. As to the other colours above-mentioned, they are used with gum-water, much as in painting in miniature, taking care to apply them lightly for fear of effacing the outlines of the design; or even, for the greater security, to apply them on the other side; especially yellow, which is very pernicious to the other colours, by blending with them. And here too, as in pieces of black and white, particular regard must always be had not to lay colour on colour, or lay on a new lay till such times as the former are well dried. It may be added, that the yellow is the only colour that penetrates through the glass, and incorporates with it by the fire; the rest, and particularly the blue, which is very difficult to use, remaining on the surface, or at least entering very little. When the painting of all the pieces is finished, they are carried to the furnace or oven, to anneal or bake the colours. The furnace here used is small, built of brick, from 18 to 30 inches square; at six inches from the bottom is an aperture to put in the fuel, and maintain the fire. Over this aperture is a grate, made of three square bars of iron, which traverse the furnace, and divide it into two parts. Two inches above this partition is another little aperture, through which they take out pieces to examine how the coction goes forward. On the grate is placed a square earthen pan, six or seven inches deep, and five or six inches less every way than the perimeter of the furnace. On the one side is a little aperture, through which to make trials, placed directly opposite to that of the furnaces destined for the same end. In this pan are the pieces of glass to be placed in the following manner: First, the bottom of the pan is covered with three strata or layers, of quick-lime pulverized;



pulverized; those strata being separated by two others of old broken glass, the design of which is to secure the painted glass from the too intense heat of the fire. This done, the glasses are laid horizontally on the last or uppermost layer of lime. The first row of glass they cover over with a layer of the same powder, an inch deep; and over this they lay another range of glasses, and thus alternately till the pan is quite full, taking care that the whole heap always end with a layer of the lime-powder. The pan being thus prepared, they cover up the furnace with tiles, on a square table of earthenware, closely luted all round, only leaving five little apertures, one at each corner, and another in the middle, to serve as chimneys. Things thus disposed, there remains nothing but to give the fire to the work. The fire for the first two hours must be very moderate, and must be increased in proportion as the

coction advances, for the space of ten or twelve hours, in which time it is usually completed. At last the fire, which at first was charcoal, is to be of dry-wood, so that the flame covers the whole pan, and even issues out at the chimneys. During the last hours, they make essays, from time to time, by taking out pieces laid for the purpose through the little aperture of the furnace and pan, to see whether the yellow is perfect, and the other colours in good order. When the annealing is thought sufficient, they proceed with great haste to extinguish the fire, which otherwise would soon burn the colours, and break the glasses. By several statutes, regulations are made for making, importing, and exporting glass, which is to be under the management of the officers of the customs and excise. See Complete Abridgement of the Excise Laws.

GLASSES OPTICAL. See OPTICS.

GLASSWORT, in botany. See SALSOLA.

GLASTONBURY, a town of England, in Somersetshire, anciently called Avalonia. It is noted for a famous abbey, some magnificent ruins of which still remain. It is five miles S. S. W. of Wells.

GLASTONBURY THORN. See CRATÆGUS.

GLATZ, a county of Bohemia. It has mines of coal, silver, and iron; stone and marble quarries, plenty of cattle, and fine springs of mineral water. Jaspers, topazes, &c. are found in it.

GLATZ, the capital of the above county, 88 miles E. of Prague.

GLAUBER, JOHN RODOLPHUS, a celebrated German chemist, who flourished about 1646. He wrote a great number of treatises on chemistry, some of which have been translated into French. All his works have been collected into a volume, intitled, *Glauberus concentratus*, which has been translated into English, and printed at London in folio, in 1689.

GLAUBER'S-SALT, a chemical composition, which is usually prepared by adding to sea-salt an equal quantity of sulphuric acid diluted with water, distilling off the marine acid, and dissolving and crystallizing the remainder. These salts may also be obtained by mixing four ounces of borax with one ounce and one drachm of oil of vitriol; the whole of which when sublimed, affords what is by chemists called Sedative Salt; and if the remainder be exposed to a strong fire, it will yield Glauber's-salts. They were first prepared by John Rodolphus Glauber; and are of considerable use in medicine as cooling purgatives, when taken in doses from six to twelve drachms. See SODA.

GLAUCOPIS, or the WATTLE-BIRD, a genus of birds of the order Pica. Bill incurvate and arched; lower mandible shorter than the upper, and carunculate beneath at the base; nostrils depressed, half covered with a cartilaginous membrane; tongue cartilaginous, split and ciliated at the end; legs carinated at the back; feet formed for walking.

G. CINEREA, or CINEREUS WATTLE-BIRD, is about the size of a jay; it is a native of New Zealand.

GLAUCOMA, [from *γλαυκος*, sea-green, or sky-colour,] is a disease of the eyes, wherein the crystalline humour is turned of a bluish or greenish colour, and its transparency hereby diminished. To those whom this disorder is forming, all objects appear as through a cloud or mist; when entirely formed, the visual rays are all intercepted and nothing is seen at all. It is incurable, when inveterate, and in aged persons; and is always very difficult of cure, externals proving of little service. The internals best suited to it, are those used in the gutta serena.

GLAUCUS, in ancient mythology, a deity of the sea, who, before his deification, was a fisherman of Anthedon. Having one day taken a considerable number of fishes, which he laid upon the bank, he perceived that as soon as they touched an herb that grew on the shore, they received new strength, and leaped again into the sea; upon which he was tempted to taste of the herb himself, and instantly leaped into the sea after them, where he was metamorphosed into a Triton, and became one of the sea-gods.

GLAUX, in botany, a genus of the monogynia order, and penicillata class of plants; natural order, Calycanthemæ. Calyx mono-

nophyllous; no corolla; capsule unilocular, quinquevalved, and pentaspermous.

GLAZING, the crusting over of earthenware by a vitreous substance, the basis of which is commonly lead. The Romans had a method of glazing their earthen vessels, which in many respects appears to have been superior to ours. The common brown glazing easily scales off, cracks, and in a short time becomes disagreeable to the eye. Besides, it is very easily destroyed by acids; nor can vessels glazed in this manner be even employed to hold water, without part of it oozing through their pores. Lead is also destructive to the human body; and if acids are unwarily put into vessels glazed with lead, the liquors will receive a very dangerous impregnation from the metal. The Roman glazing, which is yet to be seen upon urns dug up in several places, appears to have been made of some kind of varnish; and Pliny gives us a hint that it was made of bitumen. He tells us, that it never lost its beauty, and that at length it became customary to glaze statutes in this manner. As this varnish sunk deep into the substance of the ware, it was not subject to those cracks and flaws which disfigure our vessels; and as it was not liable to be corroded by acids, it could not be subject to any of the accidents which may ensue from the use of vessels glazed with lead. The usual composition for glazing earthenware is formed of white sand 40lb. of red-lead 20lb. of pearl-ashes 20lb. and of common salt 12lb. Powder the sand by grinding it; then add it to the other ingredients, and grind them together: after which calcine them for some time with a moderate heat, and when the mixture is cold, pound it to powder. When it is to be used, temper it with water. The proportion of these ingredients may be occasionally varied. The ware, after being turned on the wheel and dried in the open air, is covered over with the above composition by a brush; and when set in the furnace the violent heat soon reduces it to a perfect glass, covering the whole internal and external surface of the vessel. Lead, however, ought to be excluded from the composition of glazings, and other fluxes substituted in its stead. A transparent glazing may be prepared without lead, by calcining 40lb. of white sand, 25lb. of pearl-ashes, and 15lb. of common salt; and proceeding as before: and a more perfect transparent glazing may be made of sand, 40lb. of wood-ashes perfectly burnt 50lb. of pearl-ashes 10lb. and of common salt 12lb. The following receipts are mostly from Kunckel, who says, they are the true glazings used at Delft, and the other Dutch manufactories.

1. GLAZING, BLACK. Take eight parts of red-lead, iron-slings three, copper-ashes three, and zaffer two measures. This when melted will make a brown black; and if wanted blacker, add more zaffer to it.

2. GLAZING, BLUE. Take lead-ashes or red lead 1lb. clear sand or powdered flints, 2lb. common salt 2lb. white calcined tartar 1lb. Venice or other glass $\frac{1}{2}$ lb. zaffer $\frac{1}{2}$ lb.; mix them well, and melt them several times, quenching them always in cold water. To have it fine and good, put the mixture into a glass-furnace for a day or two. Another blue glazing may be formed of 1lb. of tartar, $\frac{1}{2}$ lb. of red lead, $\frac{1}{2}$ oz. of zaffer, and $\frac{1}{2}$ lb. of powdered flints, fused or managed as above. Or take 2lb. of calcined lead and tin, and 5lb. of common salt, 5lb. of powdered flints, and

of zaffer, tartar, and Venetian glass, each 1lb. Calcine and fuse the mixture as before. Or, take of red lead one part, of sand three parts, and of zaffer one. For a violet blue glazing, take 4 oz. of tartar, 2 oz. of red lead, 5 oz. of powdered flints, and half a drachm of manganese.

3. **GLAZING, BROWN.** Take red lead and flints, of each 14 parts, and of manganese two parts fused; or, of red lead 12 parts, and manganese one part fused. A brown glazing to be laid on a white ground, may be made of manganese two parts, and of red lead and white glass, of each one part twice fused.

4. **GLAZING, FLESH-COLOURED.** Take 12 parts of lead-ashes, and one of white glass.

5. **GLAZING, GOLD-COLOURED.** Take of litharge three parts, of sand or calcined flint one part; pound and mix these very well together, then run them into a yellow glass with a strong fire. Pound this glass, and grind it into a subtile powder, which moisten with a well saturated solution of silver; make it into a paste, which put into a crucible, and cover it with a cover. Give at first a gentle degree of fire; then increase it, and continue it till you have a glass, which will be green. Pound this glass again, and grind it to a fine powder; moisten this powder with beer, so that it may be applied by a hair-pencil upon the vessels of earthenware. These vessels when covered with this glazing must be first well heated, then put under a muffle; and, as soon as the glass runs, smoked by holding them over burning vegetables; then take out the vessels. Phil. Trans. No. 465. § 6. Kunckel gives several preparations for a gold-coloured yellow glazing. This may be produced by fusing a mixture of three parts of red lead, two of antimony, and one of saffron of Mars; by again melting the powdered mass, and repeating the operation four times, or by fusing four or five times a composition of red lead and antimony of each an ounce, and of scales of iron half an ounce; or by calcining and fusing together eight parts of red lead, and six parts of flints, one part of yellow ochre, one part of antimony, and one part of glass. A transparent gold-coloured glazing may be obtained by twice fusing red lead and white flints, of each 12 parts, and of filings of iron one part.

6. **GLAZING, GREEN.** Take eight parts of litharge or red lead, eight of Venice glass, four of brass-dust or filings of copper; or 10 parts of litharge, 12 of flint or pebble, and one of *as ustum* or copper-ashes. A fine green glazing may be produced by fusing Bohemian granite, filings of copper, red lead, and Venetian glass, in equal proportions; or by fusing white glass, red lead, and filings of copper, one part each; powdering the mass, and adding one part of Bohemian granite to two parts of this powder. A fine green may also be obtained, by mixing and grinding together any of the yellow glazings with equal quantities of the blue glazings; and all the shades and tints of green will be had by varying the proportions of the one to the other, and by the choice of the kind of yellow and blue. For **SEA GREEN**, take 5lb. of lead-ashes, 1lb. of tin-ashes, 3lb. of flint, $\frac{3}{4}$ lb. of salt, $\frac{1}{2}$ lb. of tartar, and $\frac{1}{2}$ lb. of copper-dust.

7. **GLAZING, IRON-COLOURED.** Take 15 parts of lead-ashes or red lead, 14 of white sand or flints, and five of calcined copper. Calcine and fuse this mixture.

8. **GLAZING, LIVER-COLOURED.** Take 12 parts of litharge, eight of salt, six of flint, and one of manganese.

9. **GLAZING, PURPLE BROWN.** Take lead-ashes 15 parts, clean sand or powdered flints 18 parts, manganese one part, and white glass 15; to which some add one of zaffer.

10. **GLAZING, RED.** Take antimony 3lb, litharge or red lead three, and rust of iron one; grind them to a fine powder. Or, take 2lb. of antimony, three of red lead, and one of calcined saffron of Mas; and proceed as before.

11. **GLAZING, WHITE.** For common ware, take 40lb. of clear sand, 75lb. of litharge or lead-ashes, 26 of pot-ashes, and 10 of salt: melt these three times into a cake, quenching it each time in clear cold water. Or, take 50lb. of clean sand, 70 of lead-ashes, 30 of wood-ashes, and 11 of salt. For a fine white: take 2lb. of lead and one of tin; calcine them to ashes: of this take two parts, calcined flint, white sand, or broken white glass, one part, and salt one part; mix them well together and melt them into a cake for use. The trouble of calcining the tin and lead may be prevented by procuring them in a proper state. A very fine white glazing may be obtained by calcining two parts of lead and one part of tin

and taking one part of this mass, and of flints and common salt of each one part, and fusing the mixture. A white glazing may be also prepared by mixing 100lb. of masticot, 60 of red lead, 20 of calcined tin or putty, and 10 of common salt; calcining and powdering the mixture several times.

12. **GLAZING, YELLOW.** Take red lead 3lb. calcined antimony and tin of each 2lb.; or, according to some, equal quantities of the three ingredients. These must be melted into a cake, then ground fine; and this operation repeated several times. Or, take 15 parts of lead ore, three of litharge of silver, and 15 of sand. A fine yellow glazing may be procured by mixing five parts of red lead, two of powdered brick, one of sand, one of white glazing, and two of antimony; calcining the mixture, and then fusing it. Or, take four parts of white glass, one of antimony, three of red lead, and one of iron-scales, and fuse the mixture: or fuse 16 parts of flint, one of iron-filings, and 24 of litharge. A light yellow glazing may be produced with 10 parts of red lead, three of antimony, three of glass, and two of calcined tin. A citron yellow is made of six parts of red lead, seven of fine red brick-dust, and two of antimony. This mixture must be calcined day and night for four days, in the ash-hole of a glass-house furnace, and at last fused.

GLAZING OF DELFT-WARE, PORCELAIN, STONE-WARE, &c. See DELFT, PORCELAIN, and POTTERY.

GLEBE, among miners, signifies a piece of earth in which is contained some mineral ore.

GLEBE, in law, the land belonging to a parish-church, besides the tithes. When a parson or vicar has caused any of his glebelands to be manured and sown, at his own charge, with corn or grain, he may by will devise all the profits and corn growing upon the said glebe; and in case he dies without disposing thereof, his executors shall have the same.

GLECHOMA, **GROUND IVY**; a genus of the gymnospermia order, and didynamia class of plants; natural order, Verticillatae. Calyx five-cleft; each pair of anthers converging in form of a cross. There is but one species, viz. *G. hederacea*, ground-ivy. The leaves are thrown into the vat with ale to clarify it and give it a flavour. Ale thus prepared is often drank as an antiscorbutic. The expressed juice mixed with a little wine, and applied morning and evening, destroys the white specks upon horses eyes. The plants that grow near it do not flourish.

GLEDE, **GLEAD**, or **KITE**. See **FALCO**.

GLEDITSIA, **TRIPLE-THORNED ACACIA**, or **HONEY-LOCUST**; a genus of the dicæa order, and polygamia class of plants; natural order, Lomentaceæ. Hermaphrodite; calyx four-cleft; corolla four-petaled; stamens six; pistil one; legume. There is only one species, with several varieties.

GLEE, in music, a vocal composition in three or more parts, generally consisting of more than one movement, the subject of which may be either gay, tender, or grave; bacchanalian, amatory, or pathetic.

GLEET, in medicine, the flux of thin, limpid humour from the urethra.

GLENDALAGH, an ancient and once celebrated town of Ireland, 5 miles N. W. of Rothdrum, in Wicklow; called also, the Seven Churches.

GLENEGAD HEAD, a cape of Ireland, in Donegal. Lon. 7. 4. W. Lat. 55. 20. N.

GLENSK, a district of Scotland, in Forfarshire, watered by the North Esk.

GLENMORE, [Gael, *i. e.* the great valley,] an extensive district of Murrayshire, in the barony of Kincardine, abounding with wood.

GLINUS, in botany, a genus of the dodecandria pentagynia class and order. Natural order, Coryophyllei. Calyx five-leaved; corolla none; nectaries cloven-bristles; capsule five-cornered, five-celled, five-valved, containing numerous seeds. There are three species.

GLIRES, the name of Linnaeus's fourth order of mammalia. See **ZOOLOGY**.

GLISSON, **FRANCIS**, a learned English physician of the 17th century, who was educated at Cambridge, and was made regius professor of the university. In 1634, he was admitted a fellow of the college of physicians in London. During the civil wars, he practised physic at Colchester, and afterwards settled in London. He greatly improved physic by his anatomical dissections, and made

made several new discoveries of singular use towards establishing a rational practice. He wrote, 1. *De Rachitide*, &c. 2. *De Lympheductis nuper repertis*; with the *Anatomica prolegomena*, & *Anatomia hepatis*. 3. *De Naturæ Substantia energetica*; seu de *Vitæ Naturæ*, ejusque tribus primis Facultatibus, &c. quarto. 4. *Tractatus de Ventrículo & Intestinis*, &c. He discovered the capsule communis, or vagina portæ.

GLOBBA, in botany, a genus of the monogynia order, and monandria class of plants. Corolla equal, trifid; calyx trifid above; capsule trilocular, with many seeds. It has four species.

GLOBE, in geometry. See **MENSURATION**, **GEOMETRY**, and **SPHERE**.

GLOBE, in geography, and astronomy, is particularly used for an artificial sphere of metal, plaster, paper, or other matter; on whose convex surface is drawn a map, or representation either of the earth or heavens, with the several circles conceived thereon. Globes are of two kinds, terrestrial and celestial; each of very considerable use, in astronomy, and geography, for performing many of the operations in these sciences, in any easy obvious manner, so as to be conceived without any knowledge of the mathematical grounds of those arts. The fundamental parts, common to both globes, are an axis, representing that of the world; and a spherical shell, or cover, which makes the body of the globe, on the external surface of which the representation is drawn. See **AXIS**, **POLE**, &c. The description and use of the globes will be found under the article **GEOGRAPHY**, which see.

GLOBES, CONSTRUCTION OF. A wooden axis is provided, somewhat less than the intended diameter of the globe; and into the extremes thereof, two iron-wires are driven for poles: this axis is to be the beam, or basis of the whole structure: On the axis are applied two spherical or rather hemispherical caps, formed on a kind of wooden mould or block. These caps consist of pasteboard, or paper, laid one lay after another, on the mould, to the thickness of a crown-piece; after which, having stood to dry and embody, making an incision along the middle, the two caps thus parted are slipped off the mould. They are next applied on the poles of the axis, as before they were on those of the mould; and to fix them, the two edges are sewed together with pack-thread, &c. The rudiments of the globe thus laid, it must be strengthened and made smooth and regular. In order to this, the two poles are hasped in a metalline semicircle of the size intended; and a kind of plaster, made of whitening, water, and glue, heated, melted, and incorporated together, is daubed all over the paper-surface. In proportion as the plaster is applied, the ball is turned round in the semicircle, the edge whereof pares off whatever is superfluous and beyond the due dimensions, leaving the rest adhering in places that are short of it. After such application of the plaster, the ball stands to dry; which done, it is put again in the semicircle, and fresh matter applied: thus they continue alternately to apply the composition, and dry it, till the ball every where accurately touches the semicircle, in which state it is perfectly smooth, regular, and firm. The ball thus finished, it remains to paste the map, or description thereon; in order to this, the map is projected in several gores, or gussets, all of which join accurately on the spherical surface, and cover the whole ball. To direct the application of these gores, lines are drawn by a semicircle on the surface of the ball, dividing it into a number of equal parts corresponding to those of the gores, and subdividing those again answerably to the lines and divisions of the gores. There remains only to colour and illuminate the globe; and to varnish it, the better to resist dust, moisture, &c. The globe itself thus finished, is hung in a brass-meridian, with an hour-circle, and a quadrant of altitude; and thus fitted into a wooden horizon. In Mr. Chambers's Dictionary, the following method is directed for describing the gores or gussets, "1. From the given diameter of the globe, find a right line AB, fig. 4, Plate LXXV, equal to the circumference of a great circle, and divide it into 12 equal parts. 2. Through the several points of division, 1, 2, 3, 4, &c. with the interval of ten of them, describe arches mutually intersecting each other in D and E; these figures or pieces duly pasted and joined together will make the whole surface of the globe. 3. Divide each part of the right line AB into 30 equal parts, so that the whole line AB, representing the periphery of the equator, may be divided into 360 degrees. 4. From the poles D and E, fig. 5, with the inter-

val of 23 $\frac{1}{2}$ deg. describe arches *ab*; these will be twelfth parts of the polar circles. 5. After the like manner, from the same poles D and E, with the interval of 66 $\frac{1}{2}$ deg. reckoned from the equator, describe arches *cd*; these will be 12th parts of the tropics. 6. Through the degree of the equator *e*, corresponding to the right ascension of any given star, and the poles D and E, draw an arch of a circle; and taking in the compasses the complement of the declination from the pole D, describe an arch intersecting it in *i*; this point *i* will be the place of that star. 7. All the stars of a constellation being thus laid down, the figure of the constellation is to be drawn according to Bayer, Hevelius, or Flamsteed. 8. Lastly, after the same manner are the declinations and right ascensions of each degree of the ecliptic *dg* to be determined. 9. The surface of the globe thus projected on a plane is to be engraven on copper, to save the trouble of doing this over again for each globe. 10. A ball, in the mean time, is to be prepared of paper, plaster, &c. as before directed, and of the intended diameter of the globe; on this, by means of a semicircle and style, is the equator to be drawn; and through every 30th degree a meridian. The ball thus divided into twelve parts, corresponding to the segments before projected, the latter are to be cut from the printed paper, and pasted on the ball. 11. Nothing now remains but to hang the globe as before in a brazen meridian and wooden horizon; to which may be added a quadrant of altitude made of brass, and divided in the same manner as the ecliptic and equator. If the declinations and right ascensions of the stars be not given, but the longitudes and latitudes in lieu thereof, the surface of the globe is to be projected after the same manner as before; except that, in this case, D and E, fig. 5, are the poles of the ecliptic, and *fh* the ecliptic itself; and that the polar circles and tropics, with the equator *g d*, and parallels thereof, are to be determined from their declinations. M. De La Lande, in his *Astronomie*, 1771, Tom. 3. p. 736, relates the following methods: "To construct celestial and terrestrial globes, gores must be engraved, which are a kind of projection, or inclosure of the globe (fig. 6,) similar to what is now to be explained. The length PC of the axis of this curve is equal to a quarter of the circumference of the globe; the intervals of the parallels on the axis PC are all equal, the radii of the circles KDI which represent the parallels are equal to the cotangents of the latitudes, and the arches of each, as DI, are nearly equal to the number of the degrees of the breadth of the gore (which is usually 30°) multiplied by the sine of the latitude: thus, there will be found an intricacy in tracing them; but the difficulty proceeds from the variation found in the trial of the gores when pasting them on the globe, and of the quantity that must be taken from the paper, less on the sides than in the middle; (because the sides are longer) to apply it exactly to the space that it should cover. The method used among workmen to delineate the gores, and which is described by Mr. Bion (*Usage des Globes*, tom. 3,) and by Mr. Robert de Vaugendy in vol. 7th of the *Encyclopædia*, is little geometrical, but yet is sufficient in practice. Draw on the paper a line AC, equal to the chord of 15°, to make the half-breadth of the gore; and a perpendicular PC, equal to three times the chord of 30°, to make the half-length; for these papers, the dimensions of which will be equal to the chords, become equal to the arcs themselves when they are pasted on the globe. Divide the height CP into nine parts, if the parallels are to be drawn in every 10°; divide also the quadrant BE into nine equal parts through each division-point of the quadrant as G; and through the corresponding point D of the right line CP draw the perpendiculars HGF and DF, the meeting of which in F gives one of the points of the curve BEP, which will terminate the circumference of the gore. When a sufficient number of points are thus found, trace the outline RIB with a curved rule. By this construction are given the gore-breadths, which are on the globe, in the ratio of the cosines of the latitudes; supposing these breadths taken perpendicular to CD, which is not very exact, but it is impossible to prescribe a rigid operation sufficient to make a plane which shall cover a curved surface, and that on a right line AB shall make lines PA, PC, PB, equal among themselves, as they ought to be on the globe. To describe the circle KDI which is at 30° from the equator: there must be taken above D a point which shall be distant from it the value of the tangent of 60°, taken out either from the tables, or on a circle equal to the circumference of the globe to be traced; this point will serve as a centre for the parallel

rallel DI, which should pass through the point D, for it is supposed equal to that of a cone circumscribing the globe, and which would touch at the point D. The meridians may be traced to every 10 degrees, by dividing each parallel, as KI, into three parts at the points L and M, and drawing from the pole P, through all these division-points, curves, which represent the intermediate meridians between PA and PB, (as BR and ST, fig. 7.) The ecliptic AF may be described by means of the known declination from different points of the equator that may be found in a table; for 10°, it is 3° 58'; for 20°, 7° 50' as at B; for 30°, 11° 29', &c." It is observed in general, that the paper on which charts are printed, such as the colombier, shortens itself $\frac{1}{2}$ part of a line in six inches upon an average, when it is dried after printing; this inconvenience must therefore be corrected in the engraving of the gores: if notwithstanding that, the gores are found too short, it must be remedied by taking from the surface of the ball a little of the white with which it is covered; thereby making the dimensions suitable to the gore as it was printed. But what is singular is, that in drawing the gore, moistened with the paste to apply it on the globe, the axis GH lengthens, and the side AK shortens, in such a manner, that neither the length of the side ACK, nor that of the axis GEH, of the gore are exactly equal to the quarter of the circumference of the globe, when compared to the figure on the copper, or to the numbered sides shewn in fig. 7. Mr. Bonne having made several experiments on the dimensions that gores take, after they had been parted ready to apply to the globe, and particularly with the paper named *jesus*, that he made use of for a globe of one foot in diameter, found that it was necessary to give to the gores on the copper, the dimensions shewn in fig. 7. Supposing that the radius of the globe contained 720 parts, the half-breadth of the gore is $AG = 188 \frac{1}{5}$, the distance AC for the parallel of 10 degrees taken on the right line IM is 12.81, the small deviation from the parallel of 10 degrees in the middle of the gore ED is 4, the line ABN is right, the radius of the parallel of 10°, or of the circle CEF, is 4083, and so of the others as marked in the figure. The small circular cap which is placed under H, has its radius 253 instead of 247, which it would have if the sine of 26° had been the radius of it.

GLOBES, USES OF THE. See GEOGRAPHY, and ASTRONOMY, with the Plates referred to.

GLOBE-THISTLE. See ECHINOPS.

GLOBULAR CHART, a name given to the representation of the surface, or of some part of the surface of the terrestrial globe upon a plane, wherein the parallels of latitude are circles nearly concentric, the meridian-curves bending towards the poles, and the rhomb-lines are also curves.

GLOBULAR SAILING. See NAVIGATION.

GLOBULARIA, in botany, a genus of the tetrandria monogynia class and order. Natural order, Aggregatae. Calyx common, imbricate; proper, tubular, inferior; corollets the upper lip, two-parted; lower three-parted; receptacle chaffy. There are eight species.

GLOBULE, [*globeule*, French; *globulus*, Latin,] such a small particle of matter as is of a globular or spherical figure; as the red particles of the blood; which swim in a transparent serum, and are easily discovered by the microscope. These will attract one another when they come within a due distance, and unite like the spheres of quicksilver.

GLOGAU, or GLOGAW, a duchy or principality of Silesia, seated on both sides of the Oder, on the borders of Poland.

GLOGAW, GREAT, a strong town of Silesia, the capital of the above duchy, 50 miles N. W. of Breslaw.

GLORIOSA, SUPERB LILY; a genus of the monogynia order, and hexandria class of plants; natural order, Saurmentaceae. Corolla six-petaled, waved, reflex; style oblique. There are two species, viz. *G. superba*, superb lily, and *G. simplex*.

GLOSS, [from the Greek *glossa*, tongue, the office of a gloss being to explain the text, as that of the tongue to discover the mind.] See COMMENTARY.

Gloss is likewise used for a literal translation of a book, into another language word for word.

GLOSSOCOMMON, in mechanics, a name given by Mr. Heron to a machine composed of various dented wheels with pinnions, for raising great weights.

GLOSSOMA, in botany, a genus of the tetrandria monogynia

class and order. Calyx turbinate four-toothed, superior, corolla four-petaled; anthers almost united, with a membranaceous scale at the end; stigmas four, drupe. There is only one species, viz. *G. guianensis*, a native of Guiana.

GLOSSOPETALUM, in botany, a genus of the pentandria pentagynia class and order. Calyx very small, five-toothed; petals five, with a strap at the tip of each; berry. There are two species, both lofty trees, natives of Guiana and Cayenne.

GLOTTIS, in anatomy, the narrow slit at the upper part of the *aspera arteria*, which is covered by the epiglottis when we hold our breath and when we swallow. The glottis, by its dilatation and contraction, modulates the voice. See ANATOMY.

GLOUCESTER, or GLOUCESTERSHIRE, a county of England, bounded on the W. by Monmouthshire, Herefordshire, and the Bristol Channel; on the N. by Worcestershire; on the E. by Oxfordshire and Warwickshire, and on the S. by Wiltshire and Somersetshire. It is 60 miles long from N. E. to S. W. 26 broad, and 160 in circumference. Its manufactures are woollen cloths of various kinds, hats, leather, pens, paper, bar-iron, edge-tools, nails, wire, tinned plates, brass, &c.: and its annual exports, cheese 8000 tons; bacon, grain, cyder, 5000l. worth; perry, fish, 4000l. worth, &c. It lies in the diocese of Gloucester and circuit of Oxford. The air is very wholesome, but the surface is very various. The county is watered by the Severn, Wye, Avon, Isis, Leyden, Frome, Stroud, and Windrush, besides less streams; all abounding with fish. The soil is in general very fertile, though much diversified, yielding plenty of corn, pasture, fruit, and wood.

GLOUCESTER, the capital of the above county, is seated on the E. side of the Severn. It is an ancient city; and by Antoninus is called *Clevum* or *Glevum*, which *Camden* thinks was formed from the British *Caer Glowe*, i. e. a fair city. It was one of the 28 cities built by the Britons before the arrival of the Romans; who made it one of their colonies, and in the eighth century it was esteemed one of the noblest cities in the kingdom. This city sends two members to parliament. It is 34 miles N. N. E. of Bristol.

GLOUCESTER, a fertile and well cultivated county of Virginia.

GLOUCESTER, a town in the above county, 80 miles S. E. of Richmond.

GLOUCESTER ISLAND, OF DUKE OF GLOUCESTER'S ISLAND, an island in the South Sea, six miles long and one broad. The natives are armed with long pikes. Lon. 140. 4. W. Lat. 19. 15. S.

GLOUCESTER ISLANDS, two isles in the South Sea, lying the one in Lon. 146. 0. W. and Lat. 20. 38. S.; the other in Lon. 146. 15. W. and Lat. 20. 34. S.

GLOVES, in commerce, are distinguished into leathern, silk, thread, cotton, worsted, &c. Leathern gloves are made of chamois, kid, lamb, doe, elk, buff, &c. Gloves now pay a duty to the king, which increases according to their value.

GLOW-WORM, in zoology. See LAMPYRIS.

GLOXINIA, in botany, a genus of the didynamia angiospermia class and order; natural order, Personatae. Calyx superior, five-leaved; corolla bell-shaped, with the border oblique; filaments, with the rudiment of a fifth, inserted into the receptacle. There is only one species, viz. *G. maculata*, spotted gloxinia, a native of South America.

GLUCINA, [from *glucina*, to sweeten,] a peculiar earth discovered by Vauquelin in the beryl and emerald, so named from its characteristic property of forming salts of a saccharine taste. Its general properties are these: 1. It is white; 2. insipid; 3. adhesive to the tongue; 4. insoluble in water, and 5. in ammoniac; but, 6. soluble in the fixed alkalis, 7. in the carbonate of ammoniac; and, 8. in almost all the acids, except the carbonic and phosphoric, and forming salts of a saccharine taste; 9. infusible; but, 10. fusible with borax into a transparent glass; 11. it absorbs one-fourth of its carbonic acid; 12. decomposes the aluminous salts; and, 13. is not precipitable by well saturated hydro-sulphurets. Its specific characters, which are not found united in any of the other known earths, are these: 1. Its salts are saccharine, and slightly astringent; 2. It is soluble in the carbonate of ammoniac; 3. It is very soluble in the sulphuric acid by excess; 4. It decomposes the aluminous salts; 5. It is completely precipitated from its solutions by ammoniac; and, 6. Its affinity for

for the acids is intermediate between magnesia and alumina. One hundred parts of beryl contain sixteen of glucina. M. Vauquelin justly remarks, that, "in the sciences, a body, a principle, or a property, formerly unknown, though it may often have been used, or even held in the hands, and referred to other simple species, may, when once discovered, be afterwards found in a great variety of situations, and be applied to many useful purposes. Chemistry affords many recent examples of this truth."

GLUCKSTADT, a considerable town in the duchy of Holstein, 28 miles N. W. of Hamburgh.

GLUE is indifferently denominated according to its preparation and the various uses it is designed for; as common glue, glove-glue, and parchment-glue. But the two last are more properly called size. The common or strong glue is chiefly used by carpenters, joiners, cabinet-makers, &c. It is made of skins of animals, as oxen, cows, calves, sheep, &c. whole skins are rarely used for this purpose, but only the shavings, parings, or scraps of them, or the feet sinews, &c. That made of whole skins, however, is undoubtedly the best; as that made of sinews is the very worst. In making glue of parings, they first steep them two or three days in water; then, washing them well out, they boil them to the consistence of a thick jelly; which they pass, while hot, through ozier-baskets, to separate the impurities; and then let it stand some time to purify it further: when all the filth is settled to the bottom of the vessel, they melt and boil it a second time. They next pour it into flat frames or moulds; whence it is taken out pretty hard and solid, and cut into square pieces or cakes. They afterwards dry it in the wind, in a sort of coarse net; and at last string it to finish its drying. The glue made of sinews, feet, &c. is managed after the same manner; only with this difference, that they bone and scour the feet, and do not lay them to steep. Of this commodity there is a very great exportation from England; the English glue being universally allowed to be the best in Europe, partly from the excellency of the materials, and partly from the skill of the manufacturers. A glue that will hold against fire or water, it is said, may be made thus: Mix a handful of quick-lime with four ounces of linseed-oil; boil them to a good thickness; then spread it on tin-plates in the shade, and it will become exedding hard, but may be easily dissolved over a fire as glue, and will effect the business to admiration.

GLUE, METHOD OF PREPARING AND USING. Set a quart of water on the fire; then put in about half a pound of good glue, and boil them gently together till the glue be entirely dissolved and of a due consistence. When glue is to be used, it must be made thoroughly hot; after which, with a brush dipped in it, besmear the faces of the joints as quick as possible; then clapping them together, rub them lengthwise one upon another, two or three times, to settle them close; and let them stand till they are dry and firm. Mr. Boyle gives the following receipt for preparing a fine strong glue from isinglass: Steep the isinglass for 24 hours in common brandy. When the menstruum has opened and mollified the isinglass, they must be gently boiled together, and kept stirring till they appear well mixed, and till a drop thereof, suffered to cool, turns into a strong jelly. Then strain it, whilst hot, through a clean linen-cloth into a vessel to be kept close stopped. A gentle heat suffices to dissolve this glue into a transparent and almost colourless fluid, but very strong; so that pieces of wood glued together with it will break elsewhere rather than in the place where they are joined.

GLUME. See **BOTANY**.

GLUTA, in botany, a genus of the pentandria monogynia class and order. Calyx bell-shaped, deciduous; petals five, glued at bottom to the column of the germ; filaments inserted into the tip of the column; germ sitting on an oblong column. There is only one species, viz. *G. benghas*, a native of Java.

GLUTEN. If wheat-flour is kneaded into a paste with a little water, it forms a tenacious, elastic, soft, ductile mass. This is to be washed cautiously, by kneading it under a small jet of water till the water no longer carries off any thing, but runs off colourless; what remains behind is called gluten. It was discovered by Beccaria, an Italian philosopher, to whom we are indebted for the first analysis of wheat-flour. 1. Gluten, when thus obtained, is of a grey colour, exceedingly tenacious, ductile, and elastic, and may be extended to twenty times its original length. When very thin, it is of a whitish colour, and has a good deal of resemblance

to animal tendon or membrane. In this state it adheres very tenaciously to other bodies, and has often been used to cement together broken pieces of porcelain. Its smell is peculiar. It has scarcely any taste, and does not lose its tenacity in the mouth. When exposed to the air, it assumes a brown colour, and becomes in a manner covered with a coat of oil. When exposed to the air, it gradually dries; and when completely dry, it is pretty hard, brittle, slightly transparent, of a dark brown colour, and has some resemblance to glue. It breaks like a piece of glass, and the edges of the fracture resemble in smoothness those of broken glass; that is, it breaks with a vitreous fracture. It is insoluble in water, though it imbibes and retains a certain quantity of it with great obstinacy. To this water it owes its elasticity and tenacity. When boiled in water it loses both these properties. Its constituent parts are oxygen, hydrogen, carbon, and azote. It exists most abundantly in wheat, but it is found in large quantities in many other plants. It is gluten that renders wheat so useful in the art of bread-making.

GLYCINE, in botany, a genus of the diadelphia decandria class and order; natural order, Papilionaceæ, or Leguminosæ. Calyx two-lipped; corolla the keel turning back the banner at the tip. There are twenty-five species.

GLYCIRRHIZA, LIQUORICE, a genus of the decandria order, and diadelphia class of plants; natural order, Papilionaceæ. Calyx bilabiate, upper lip tripartite, under one entire; legumen ovate, compressed. There are four species.

G. GLABRA, the COMMON LIQUORICE; has long, thick, creeping roots, striking several feet deep into the ground; upright, firm, annual, herbaceous stalks, three or four feet high, garnished with winged leaves of four or five pair of oval lobes, terminated by an odd one; and from the axillas erect spikes of pale blue flowers in July, succeeded by short smooth pods. The root is the useful part, which is replete with a sweet, balsamic, pectoral juice, much used in compositions for coughs and disorders of the stomach. These plants are very hardy perennials; but this last is the sort commonly cultivated for use, its roots being fuller of juice and sweeter than the others. The roots are perennial; but the stalks rise in spring, and decay in autumn. They are propagated by cuttings of the small roots issuing from the sides of the main ones near the earth, divided into lengths of six or eight inches, each having one or more good buds. The proper season for procuring the sets for planting is in open weather from October to March; but from the middle of February till the middle of March is rather the best season for planting. An open situation is to be preferred. The soil ought to be of a light loose temperature, and three or four feet deep: for the roots of liquorice will arrive at that depth and more, and the longer the roots the more valuable they are. The ground should be trenched three spades deep; then proceed to plant the sets, by line and dibble, a foot distant in each row; putting them perpendicular into the ground, with the tops about an inch under the surface; let the rows be a foot or a foot and a half asunder.

GMELIN, SAMUEL GOTTLIEB, LL. D. professor at Tubingen, and member of the Imperial Academy of Sciences at St. Petersburg, was born at Tubingen in 1745. He was celebrated for his knowledge in natural history, as well as for his travels, which he commenced in June 1768. Having traversed the provinces of Moscow, Veronetz, New Russia, Azot, Casan, and Astracan, he visited, in 1770 and 1771, the harbours of the Caspian, and examined with attention those parts of the Persian provinces which border on that sea, of which he has given a circumstantial account in the three first volumes of his Travels. Anxious to extend his observations, he attempted to pass through the western provinces of Persia, which are infested by numerous banditti; and quitted, in April 1772, Einzille, a small trading-place in Ghilan, upon the southern shore of the Caspian; and, on account of many difficulties and dangers, did not, until Dec. 2, 1773, reach Sallian, a town upon the mouth of the Koor. Thence he proceeded to Baku and Kuba, in Shirvan, where he met with a friendly reception from Ali Feth Khan, the sovereign of that district. After he had been joined by twenty Uralian Cossacks, and when he was only four days journey from the Russian fortress Kislar, he and his companions were, on the 5th of Feb. 1774, arrested by the order of the Usmei Khan, a petty Tartar prince, through whose territories he was obliged to pass. Usmei urged as a pretence for this arrest, that

that thirty years ago several families had escaped from his dominions, and had found an asylum in the Russian territories; adding, that Gmelin should not be released until these families were restored. The professor was removed from prison to prison; and at length, wearied out with continued persecutions, he expired, July 27th, at Achmet-Kent, a village of Mount Caucasus. His death was occasioned partly by vexation for the loss of several papers and collections, and partly by disorders contracted from the fatigues of his long journey. Some of his papers had been sent to Kislar during his imprisonment, and the others were, with great difficulty, rescued from the hands of the barbarian who had detained him. The arrangement of these papers, which now form the fourth volume of his Travels, was at first consigned to the care of Guildenstaedt, but upon his death was completed by Dr. Pallas.

GMELENA, in botany, a genus of the angiospermia order, and didynamia class of plants; natural order, Personate. Calyx slightly four-toothed; corolla four-cleft, bell-shaped; anthers two-parted, two simple; drupe with a two or three-celled nut. There is but one species, viz. *G. asiatica*.

GNAPHALIUM, **CUDWEED**, **GOLDYLOCKS**, **ETERNAL** or **EVERLASTING FLOWER**, &c. a genus of the polygamia superflua order, and syngenesia class of plants; natural order, Compositæ. Calyx imbricate, with the marginal scales rounded, scariose, coloured; down feathered; receptacle naked. There are sixty-six species. The numerous species of this genus are chiefly under shrubs or herbs; the leaves are alternately placed, generally hoary; the flowers usually terminate the stem and branches in globes or corymbs. The calyx is permanent with yellow or white scales.

GNAT, in zoology. See **CULEX**.

GNAT-FLOWER. See **OPHRYS**.

GNIESS, in mineralogy, is composed principally of felspar, quartz, and mica, forming plates, laid on each other, and separated by thin layers of mica. It differs from granite by being shistose; though, like that, it sometimes contains shorl and garnet. The beds of gneiss sometimes alternate with layers of granular limestone, shistose, hornblende, and porphyry. It is rich in ores, almost every metal has been found in gneiss-rocks, either in veins or beds. Mr. Jameson mentions four kinds of gneiss: 1. That which approaches to the granular structure. 2. The waved or undulated. 3. The common; and, 4. The thin slaty.

GNESEN, **GNESNA**, **GNESNO**, or **GNIESNO**, a town of Great Poland, of which it is the capital, in the palatinate of Kalish, 100 miles N. E. of Breslaw.

GNETUM, in botany, a genus of the monadelphia order, and monœcia class of plants. Male ament with scales; no corolla, and but one filament with a pair of antheræ; fruit a monospermous plum.

GNIDIA, in botany, a genus of the monogynia order, and octandria class of plants. Calyx funnel-shaped, quadrifid, with four petals inserted into it; one seed, somewhat resembling a berry. It has eleven species.

GNIEW, or **MEVA**, a town of the Duchy of Warsaw, in Pomerelia, on the Vistula; 22 miles S. of Dantzic.

GNOMES, or **GNOMI**, imaginary beings, who, according to the cabalists, inhabit the inner parts of the earth. They are supposed to be small in stature, and guardians of quarries, mines, &c.

GNOMON. See **DIAL** and **DIALING**. The word γνομων literally implies something that makes a thing known; as the style of a dial makes the hour known.

GNOMON, in geometry. If in a parallelogram ABCD, (Plate LXXV. fig. 8,) the diameter AC be drawn; also two lines EF, HI, parallel to the sides of the parallelogram, and cutting the diameter in one and the same point G, so that the parallelogram is, by these parallels, divided into four parallelograms, then are the two parallelograms DG, BG; through which the diameter does not pass, called complements; those through which the diameter passes, EH, FI, are called the parallelograms about the diameter; and a gnomon consists of the two complements, and either of the parallelograms about the diameter, viz. GD + HE + EI, or GD + FI + GB.

GNOMON, in astronomy, a style erected perpendicular to the horizon, to find the altitude of the sun. Thus, in the right-an-

gled triangle ABC, (Plate LXXV. fig. 10,) are given, AB the length of the style, BC the length of its shadow, and the right angle ABC. Hence, making BC the radius, we have this analogy for finding the angle ACB, the sun's altitude, viz. BC : AB :: radius : tangent of the angle C. By a gnomon, the sun's meridian-altitude, and consequently the latitude of the place, may be found more exactly than with the smaller quadrants. See **QUADRANT**. By this instrument the height of any object GH may be found: for as DE, the distance of the observer's eye from the gnomon, is to DE, the height of the style; so is FH, the distance of the observer's eye from the object, to GH, its height.

GNOMONICS, [γνομωνικη], a science which teaches to find the just proportion of shadows for the construction of all kinds of dials, and for knowing what o'clock it is by means thereof: as also of a gnomon or stile, that throws off the shadow for this purpose. See **DIALING**.

GNOSSOS, or **GNOSSUS**, in ancient geography, a city of Crete. See **CRETE**.

GNOSTICS, [from γνωστικός, knowing,] ancient heretics, famous from the first rise of Christianity, principally in the east. It appears from several passages of Scripture, particularly 1 John ii 18, 1 Tim. vi. 20; and Col. ii. 8, that many persons were infected with the Gnostic heresy in the first century; though the sect did not render itself conspicuous, either for numbers or reputation, before the reign of Adrian, when some writers erroneously date its rise. The name was adopted by this sect, on the presumption that they were the only persons who had the true knowledge of Christianity. Accordingly, they looked on all other Christians as simple, ignorant, and barbarous persons, who explained and interpreted the sacred writings in a low, literal, and unedifying signification. At first the Gnostics were the only philosophers and wits of those times, who formed for themselves a peculiar system of theology, agreeable to the philosophy of Pythagoras and Plato; to which they accommodated all their interpretations of scripture. But

GNOSTICS afterwards became a generical name, comprehending divers sects and parties of heretics, who rose in the first centuries, and who, though they differed among themselves as to circumstances, yet all agreed in some common principles. They corrupted the doctrine of the gospel by a profane mixture of the tenets of the oriental philosophy, concerning the origin of evil and the creation of the world, with its divine truths. Such were the Valentinians, Simonians, Carpocratians, Nicolaitans, &c.

GOA, an island of the Indian Ocean near the west and Malabar coast of Hindostan, separated from the continent by the Mandova. It is twenty-two miles long and six broad. The soil is fertile, and produces excellent fruits, corn, &c. The climate is moderate from October to March; in April and May very sultry, and from June to September almost constant rain.

GOA, a strong city of Asia, the capital of the above island. The chief trade of Goa, is in Arrack. Lon. 73° 58' 39" E. Lat. 15° 28' 20" N.

GOA, a town in the island of Celebes, near the south coast.

GOAR, **ST. ST. GEVER**, or **ST. GOWER**, a town of Germany, now in the department of the Rhine and Moselle, lately in the territory of Hesse Rheinfeldt. It lies 15 miles S.E. of Coblenz.

GOAT, in zoology. See **CAPRA**.

GOAT'S-BEARD. See **TRAGOPOGON**.

GOAVE, **LITTLE**, or **GOAVE**, **PETIT**, a sea-port of Hispaniola, 20 miles W.S.W. of Leogane.

GOBIN, **ST.** a town and castle of France, in the department of Aisne, and late province of Picardy, near Fere.

GOBIUS, in ichthyology, a genus of fishes of the order thoracici. They have two holes between the eyes, four rays in the membrane of the gills, and the belly fins are united in an oval form. There are twenty species, principally distinguished by the number of rays in their fins.

G. NIGER, or the **BLACK GOBY**, is about six inches in length, a native of the Mediterranean and North Seas. It is eaten, but not highly valued.

G. LANCEOLATUS, **LANCE-TAILED GOBY**, is a native of the West Indies, and peculiar in the form of its tail. See Plate LV.

GOBLETS, are ordinarily of a round figure, and without either foot or handle. Budeus deduces the word from the Greek κωπελλον, a sort of cup.

GOCH,

GOCH, a town of France, in the department of the Roer, and late duchy of Cleves, 6 miles S. of Cleves.

GOD, the Supreme Being, the first cause or creator of the universe, and the only true object of religious worship. The Hebrews called him Jehovah; which name they never pronounced, but used instead of it the words Adonai, or Elohim. He is incomprehensible in his nature, and can only be known so far as he reveals himself. The existence and preservation of all beings depend on him, and because of his infinity he can superintend and take care of the whole, and of each individual of created beings, as though there were but one. He has wonderfully displayed his goodness and care over his creatures, as also his wisdom, justice, and truth, in his proceedings towards man, and in the method he took to restore him to that happiness which he had forfeited. See **CHRISTIANITY**, **METAPHYSICS**, **MORAL PHILOSOPHY**, and **THEOLOGY**.

GOD, is also used in speaking of the false deities of the heathens, who were only creatures and imaginary beings to which divine honours and worship were superstitiously paid. The Greeks and Latins did not mean by the name of God an all-perfect being, whereof eternity, infinity, omnipresence, &c. were essential attributes: with them the word only implied an excellent and superior nature; and accordingly they gave the appellation gods to all beings of a rank or class higher and more perfect than that of men, and especially to those who were inferior agents in the divine administration, all subject to the one Supreme. Thus men themselves, according to their system, might become gods after death; inasmuch as their souls might attain to a degree of excellence superior to what they were capable of in life. See **MYTHOLOGY**.

GODAVERY, **GODURY**, or **GONDA**, a river of Hindostan, which rises about 70 miles N.E. of Bombay, and whose waters, at least in the upper part of its course, are esteemed sacred by the Hindoos. Its waters fall into the bay of Bengal by various mouths.

GODDARD, **JONATHAN**, M.D. an eminent physician and chemist, and one of the first promoters of the Royal Society. He was born about 1617; educated and graduated at Oxford; was elected a fellow of the college of physicians in 1646, and appointed reader of the anatomical lecture in 1647. Oliver Cromwell appointed him first physician to the army, a member of the council of state, and warden of Merton college. But he lost his office on the restoration. He was elected professor of physic in Gresham college, in 1655. He prepared all his own medicines; and in published 1668, a treatise recommending that practice to all physicians. He was the inventor of the Gutta Anglicana. He died of an apoplectic fit in 1674. Bishop Seth Ward says, he was the first Englishman who made a telescope.

GODDESSES. The ancients had almost as many goddesses as gods: such were Juno, Minerva, Diana, &c. The virtues, graces, and principal advantages of life; truth, justice, piety, liberty, fortune, victory, &c. were all represented as goddesses; which was paying no small compliment to the fair sex. But to balance this the furies, harpies, &c. were also represented as goddesses.

GODEAU, **ANTHONY**, bishop of Grasse and Vence, in France, was born at Dreux in 1605. He was a very voluminous writer. His principal works are 1. An Ecclesiastical History, in three volumes folio, containing the first eight centuries, as he never finished more. 2. Translation of the Psalms into French Verse, which was so well approved, that even those of the reformed religion preferred it to that of Marot. He died in 1671.

GODFATHERS and **GODMOTHERS**, are persons who at the baptism of infants answer for their future conduct, and solemnly promise that they will renounce the devil and all his works, and follow a life of piety and virtue; and thus lay themselves under an indispensable obligation to instruct them, and watch over their conduct. This custom is of great antiquity in the Christian church, and was probably introduced to prevent children being brought up in idolatry, in case their parents died before they arrived at the years of discretion. The number of godfathers and godmothers was formerly great, but is reduced to two in the church of Rome, and three in the church of England.

GODMAN, an epithet applied to our Saviour, from the divine and human natures being united in his person.

GODMOTHERS. See **GODFATHER**.

GORDA, a circar of Hindostan, in Guzerat.

GORDA, the capital of the above circar, 55 miles E. of Amedabad. Lon. 73. 40. E. Lat. 22. 50. N.

GOES, or **TER-GOES**, a town of Zealand, 10 miles E. of Flushing.

GOEZ, **DAMIAN DE**, a Portuguese author of great repute, born at Alangar, of a noble family, and educated at the court of king Emanuel. He travelled through the chief countries of Europe, and became acquainted with Erasmus, Jo. and Olaus Magnus, cardinals Rembus and Madrucius, Conrad Gloenius, Peter Nannius, and other literati. He married, and spent several years at Louvain; and not only wrote the history of its siege in 1542, but bravely put himself at the head of the soldiers, and contributed much to its defence. After this king John III. recalled him into Portugal, in order to write the history of that kingdom; but the favours with which that monarch loaded him, procured him so much envy, that he was first falsely accused and confined to Lisbon, and afterwards found murdered in his own house. He wrote, 1. Fides, Religio, Moresque Æthiopum. 2. De Imperio et Rebus Lusitanorum. 3. Hispania. 4. Urbis Olissiponensis Descriptio. 5. Chronica do Rey Dom Emanuel. 6. Historia do Principe Dom Joan; and other works which have been often printed, and are esteemed.

GOG and **MAGOG**, two names generally joined together in scripture, Ezek. xxxviii. 2, 3, &c. xxxix. 1, 2, &c. Rev. xx. 8. Moses speaks of Magog the son of Japhet, but says nothing of Gog, Gen. x. 2, 1 Chr. i. 5. Gog was the prince of Magog, according to Ezekiel, Magog being the name of the country or people. The generality of the ancients made Magog the father of the Scythians and Tartars; and several interpreters discovered many footsteps of their name in the provinces of Great Tartary. Others supposed that the Persians were the descendants of Magog. Some have imagined that the Goths were descended from Gog and Magog; and that the wars described by Ezekiel, and undertaken by Gog against the saints, are those which the Goths carried on against the Roman empire, in the fifth century. Bochart has placed Gog in the neighbourhood of Caucasus. He derives the name of this celebrated mountain from the Hebrew *Gogchasan*, "the fortress of Gog." He maintains that Prometheus, said to be chained to Caucasus by Jupiter, is Gog, and no other. There is a province in Iberia, called Gogarene. Most Commentators think that Gog and Magog, mentioned in Ezekiel and the Revelation, are to be taken in an allegorical sense, for such princes as were enemies to the church and saints. Others think that Gog and Magog in the Revelation denote all the enemies of the church, who should be persecutors of it to the consummation of ages. But the most probable opinion appears to be, that the Gog and Magog in Ezekiel, is the future grand confederation of all the apostate Gentile nations against the re-establishment of the Jews in their own land; and that the Gog and Magog in the Revelation is the apostasy that will take place at the close of the Millennium, a little before the consummation of all things.

GOGGLES, in surgery, instruments used for curing squinting, or that distortion of the eyes which occasions this disorder. They are short conical tubes, composed of ivory stained black, with a thin plate of the same ivory fixed in the tubes near their anterior extremities. Through the centre of each of these plates is a small circular hole, about the size of the pupil of the eye, for the transmission of the rays of light. These goggles must be continually worn in the day-time, till the muscles of the eye are brought to act regularly and uniformly, so as to direct the pupil straight forwards; and by these means the cure will be sooner or later effected.

GOGLAND, an island of Russia, in the Gulf of Finland, 80 miles W. of Petersburg.

GOGO, a town of Hindostan, 64 miles N.W. of Surat.

GOGRA, or **SOORJEW**, a large river of Asia, which rises in Thibet, and joins the Ganges above Chuprah in Bahar.

GOHUD, a circar of Hindostan, in Agra.

GOGUD, the capital of the above circar, 55 miles S.S.E. of Agra.

GOJAM, a province of Abyssinia, remarkable for having in it the sources of the Nile. It is about 75 miles long from north to south, and 42 broad from east to west.

GOITO, a town of the late Cisalpine republic, in the department of Mincio, and the late duchy of Mantua, 9 miles N. N. W. of Mantua.

GOLCONDA,

GOLCONDA, a province of Hindostan, in the Deccan, bounded on the north by Berar, on the east by the gulf of Bengal, on the south by Mysore and the Carnatic, and on the west by Dowlatabad and Visiapour. It was anciently called Tellingana, or Tilling, and was an independent kingdom. Hyderabad is the capital.

GOLCONDA, a fortress and town of the above kingdom, which form one of the largest cities in the East-Indies, 5 miles W.N.W. of Hyderabad. Lon. 70. 10. E. Lat. 16. 30. N.

GOLD, [gold, Sax. *golud*, riches, Welsh. It is called gold in our English tongue, either of *geel*, as Scaliger says, which is in Dutch to shine; or of another Dutch word, which is *gellen*, and signifies in Latin *valere*, in English to be of price or value: hence cometh their ordinary word *gelt*, for money. *Peacham on Drawing.*] Gold is one of the heaviest, most dense, most simple, most ductile, and most fixed of all bodies, not to be injured either by air or fire, and seemingly incorruptible. It is soluble by means of sea-salt; but is injured by no other salt. Gold is frequently found native, and very rarely in a state of ore. Pure gold is so fixed, that Boerhaave informs us of an ounce of it set in the eye of a glass-furnace for two months, without losing a single grain. Gold hath these natures, greatness of weight, closeness of parts, fixation, plianthness, immunity from rust, and the colour or tincture of yellow. It is the most valuable of all the metals, is of a bright yellow colour, when pure; but becomes more or less white or high-coloured, in proportion as it is alloyed with silver or copper. It is the heaviest of all known bodies, platina only excepted, its specific gravity being to that of distilled water at 19.640 to 1000. It melts in a low white heat; requiring, according to Mr. Wedgwood's calculation, 5237 degrees of Fahrenheit's, or 32 of his own, thermometer for its fusion; a heat greatly superior to that which melts silver or copper; the former requiring only 4717, and the latter 4587 of Fahrenheit. Other metallurgists, however, assert that copper requires for its fusion a greater degree of heat than either gold or silver; and this is confirmed by the experience of those who work in these metals. The method of extending gold used by the gold-beaters, consists in hammering a number of thin-rolled plates between skins or animal membranes. It is the most ductile, as well as the most malleable, of all metals. According to Cronstedt, one grain of it may be stretched out so as to cover 98 Swedish ells, equal to 63.66 English yards of silver-wire; but Wallerius asserts, that a grain of gold may be stretched in such a manner as to cover 500 ells of wire. At any rate, the extension is prodigious; for according to the least of these calculations, the millionth part of a grain of gold may be made visible to the naked eye. Nor is its malleability inferior to its ductility. Boyle, quoted by Apligny in his Treatise of Colours, says, that one grain and an half of gold may be beaten into 50 leaves of one inch square, which, if intersected by parallel lines drawn at right angles to each other, and distant only the 100th part of an inch from each other, will produce 25 millions of little squares, each very easily discernible by the naked eye. The limits of the ductility and malleability of gold are not known, and its tenacity exceeds that of any other metal. A gold wire of one-tenth of an inch diameter, requires 500lb. weight to break it. Gold-leaf exhibits a fine green colour on being interposed between the eye and the beams of the sun or any other luminous body. When exposed for some time to a strong heat, it becomes ignited, and at last melts, assuming a fine, bluish, green, colour; and, when cold, crystallizes into quadrilateral pyramids. Gold is more generally found native than any other metal; though Bergman says, he does not know an instance of its ever being found perfectly free of alloy. Kirwan says it is seldom found so, being generally alloyed with silver, copper, or iron, and sometimes with all the three. According to Wallerius, native gold is found, 1. In solid masses, in Hungary, Transylvania, and Peru. 2. In grains, in the Spanish West Indies. 3. In a vegetable form, like the branches or twigs of plants. 4. In a drusic figure, as if composed of groups or clusters of small particles united together, found in Hungary. 5. Composed of thin plates, on thin pellicles, covering other bodies, found in Siberia. 6. In a crystalline form in Hungary. Gold is also found in the form of thick solid pieces. It is, in general, more frequently imbedded in quartz, and mixed with it, than with any other stone; and the quartz in which the gold is found in the Hungarian mines, Mr. Magellan tells us, is of a peculiarly mild ap-

pearance. Sometimes, however, it is found in limestone, hornblende, &c. Europe is principally supplied with gold from Chili and Peru in South America. A small quantity is likewise imported from China and the coast of Africa. The principal gold-mines of Europe are those of Hungary, Saltzburg, and Adelfors, in Smaland. Some gold is also extracted from the silver mines of Ostervarberget, in the province of Dalarna. Native gold has been found in Lapland, above Tornea, and in Westmanland. In Peru it is found mixed with a stony matter not well known; from which it is extracted by amalgamation. Gold is also found separate from any matrix, in lumps of visible grains mixed with sands, in the beds of rivers. It is visibly dispersed through masses of sand, of a yellowish-red, or violet colour. In this state it is so universally diffused through every kind of earth, that Mr. Bergman thinks it the most common of all the metals, iron excepted. If 100lb. of sand contain 24 grains of gold, the separation is said to be worth attending to. In Africa 5lb. of sand often yield 63 grains of gold, or even more; and the heaviest sand, which is often black or red, contains the most. The strongest heat of any furnace does not change the metallic properties of gold. Messrs. Boyle and Kunckel kept gold for several months in the fire of a glasshouse without producing any change upon it. It appears, however, that, by the violent heat of the sun-beams, collected in the focus of a burning-glass, some alteration may be produced in it. Homberg observed that gold, when exposed to the lens of Tschirnhausen, formed, was volatilized, and even vitrified; and Macquer found, that the metal, when exposed to the lens of Mr. Trudaine, exhaled a fume which gilded silver, and was therefore gold in a volatile state. No acid acts readily upon gold but the nitro-muriatic acid, called aqua-regia, and the oxygenized muriatic acid. When gold is immersed in aqua-regia, an effervescence takes place with the escape of gas; the solution tinges animal matters of a deep purple, and corrodes them. By careful evaporation, fine crystals of a topaz-colour are obtained. The gold is precipitated from its solvent by a great number of substances. Lime and magnesia precipitate it in the form of a yellowish powder. Alkalies exhibit the same appearance; but an excess of alkali re-dissolves the precipitate. Ammonia precipitates the solution of gold much more readily than fixed alkalies. This precipitate, which is of a brown, yellow, or orange colour, possesses the property of detonating with a very considerable noise, when gently heated. It is known by the name of fulminating gold. The presence of ammonia is necessary to give the fulminating property to the precipitate of gold; and it will be produced by precipitating it with fixed alkali from an aqua-regia previously made by adding sal-ammoniac to nitric acid; or by precipitating the gold from pure aqua-regia, by means of sal-ammoniac, instead of the ammonia alone. The fulminating gold weighs one-fourth more than the gold made use of. A considerable degree of precaution is necessary in preparing this substance. It ought not to be dried but in the open air, at a distance from a fire, because a very gentle heat may cause it to explode. Several fatal accidents have arisen from its explosion, in consequence of the friction of ground-stoppers in bottles containing this substance, of which a small portion remained in the neck. Fulminating gold, according to the results of Berthollet's experiments, consists of oxide of gold combined with ammonia. Sulphurets, and most metals, precipitate gold from aqua-regia. Most metals unite with gold by fusion. With silver it forms a compound, which is paler in proportion to the quantity of silver added. It is remarkable that a certain proportion, for example, a fifth part, renders it greenish. From this circumstance, as well as from that of a considerable proportion of these metals separating from each other by fusion, in consequence of their different specific gravities, when their proportions do not greatly differ, it should seem that their union is little more than a mere mixture without combination; for, as gold-leaf transmits the green rays of light, it will easily follow that particles of silver, enveloped in particles of gold, will reflect a green, instead of a white, light. A strong heat is necessary to combine platina with gold: it greatly alters the colour of the gold if its weight exceed the forty-seventh part of the mass. Mr. Francillon, however, informs us, that six parts of gold and one of malleable platina produce a metal of a beautiful colour, great malleability, susceptible of a fine polish, and more unalterable than gold itself. It does not much affect the ductility. Mercury is strongly disposed to unite with gold, in all proportions

proportions with which it forms an amalgam: this, like other amalgams, is softer, the larger the proportion of mercury. It softens and liquefies by heat, and crystallizes by cooling. Lead unites with gold, and considerably impairs its ductility, one-fourth of a grain to an ounce rendering it completely brittle. Copper renders gold less ductile, harder, more fusible, and of a deeper colour. This is the usual addition in coin, and other articles used in society. Tin renders it brittle in proportion to its quantity. Bismuth renders gold white and brittle; as do likewise nickel, manganese, arsenic, and antimony. Zinc produces the same effect; and, when equal in weight to the gold, a metal of a fine grain is produced, which is said to be well adapted to form the mirrors of reflecting telescopes; being susceptible of a very fine polish, and not subject to rust.

GOLD, PURE, that purged by fire of all its impurities, and all alloy. The moderns frequently call it gold of twenty-four carats, but in reality there is no such thing as gold so very pure, and there is always wanting at least a quarter of a carat. Gold of twenty-two carats has one part of silver and another of copper; that of twenty-three carats has half a part, *i. e.* half a twenty-fourth of each. See **CARAT**.

GOLD, MOSAIC, is gold applied in pannels on a proper ground, distributed into squares, lozenges, and other compartments; part of which is shadowed to raise or heighten the rest. See **MOSAIC**.

GOLD PLATES FOR ENAMELLING are generally made of ducats whose fineness is from $23\frac{1}{2}$ carats to $23\frac{3}{4}$; as the finest gold is the best for this purpose, unless where some parts of the gold are left bare and unpolished, as in watch-cases, snuff-boxes, &c. for which purposes a mixture of alloy is necessary, and silver is preferred to copper, because the latter disposes the plates to tarnish and turn green. See **ENAMEL**.

GOLD, SHELL, is that used by the gilders and illuminers, and with which gold-letters are written. It is made by grinding gold-leaves, or gold-beaters fragments, with a little honey, and afterwards separating the honey from the powdered gold by water. When the honey is washed away, the gold may be put on paper or kept in shells; whence its name. When it is used, it is diluted with gum-water or soap-suds. The German gold-powder, prepared from the Dutch gold-leaf in the same manner, is generally used; and when it is well scoured with varnish, answers the end in japanner's gilding as well as the genuine.

GOLD, SPUN, or GOLD THREAD, is flattened gold-wire wrapped over a thread of silk, by twisting it with a wheel and iron bobbins.

GOLD-WIRE, a cylindrical ingot of silver, gilt, or covered with gold, and afterwards drawn successively through a great number of little round holes, of a drawing iron, each less than the other, till it be sometimes no bigger than a hair. See **WIRE-DRAWING**.

GOLD-WIRE, PLATTED, is the above wire flattened between two rollers of polished steel, to fit it to be spun on a stick, or to be used flat without spinning, as in brocades, laces, embroideries, &c.

GOLD COAST, in geography, a maritime country of Africa, on the coast of Guinea, abounding with gold; and extending 180 miles in length from Gold River to Ponné.

GOLD RIVER, a river of Africa, in Guinea, the sands of which abound with gold-dust.

GOLD RIVER, a river of America, on the Isthmus of Darien, abounding also with gold-dust.

GOLDAPP, a town of Prussian Lithuania, founded in 1564; sixty-eight miles E. S. E. of Königsberg.

GOLDBERG, a town of Silesia, in the duchy of Lignitz, eleven miles W. N. W. of Jauer.

GOLDEN CUPS. See **RANUNCULUS**.

GOLDEN EAGLE. See **FALCO**.

GOLDEN FISH. See **CYPRINUS**.

GOLDEN FLEECE, in the ancient mythology, was the skin and fleece of the ram upon which Phryxus and Helle are said to have swam over the sea to Colchis; and which being sacrificed to Jupiter, was hung upon a tree in the grove of Mars. See **ARGO-NAUTS**.

GOLDEN FLEECE, ORDER OF THE, a military order instituted by Philip the Good, duke of Burgundy, in 1427; thus named from a representation of the golden fleece, borne by the knights on their collars, which consisted of flints and steels.

GOLDEN ISLAND, an island of S. America, in the Gulf of Darien, and province of Terra Firma. Lon. 77. 10. W. Lat. 9. 0. N.

GOLDEN NUMBER, in chronology, a number shewing what year of the moon's cycle any given year is. See **CHRONOLOGY**.

GOLDEN RULE. See **ARITHMETIC**.

GOLDEN THISTLE. See **SCOLYMUS**.

GOLDFINCH, in ornithology. See **FRINGILLA**.

GOLDINGEN, a town of Poland, in the duchy of Courland, forty-eight miles W. N. W. of Mittau.

GOLD-SIZE, FOR BURNISHED GILDING, is prepared of $1\frac{1}{2}$ lb. of tobacco-pipe clay, $\frac{1}{2}$ oz. of red chalk, $\frac{1}{2}$ oz. of black lead, 40 drops of sweet oil, and 3 drachms of pure tallow: grind the clay, chalk, and black lead, separately, very fine in water, then mix them together, add the oil and tallow, and grind the mixture to a due consistence.

GOLD-SIZE, FOR JAPANING, may be made by pulverising gum animi and asphaltum, of each 1 oz. red lead, litharge of gold, and umbre, of each $1\frac{1}{2}$ oz. mixing them with 1 lb. of linseed-oil, and boiling them; stir them till the whole be incorporated, and appears when cold of the consistence of tar: strain the mixture through a flannel, and keep it stopped up in a bottle for use. When used, it must be ground with as much vermilion as will give it an opaque body, and diluted with oil of turpentine, so that it may be worked freely with the pencil. A more simple preparation is made with 1 lb. of linseed-oil, and 4 oz. of gum animi; powder the gum, and mix it gradually with the boiling oil; let it continue to boil till it becomes of the consistence of tar; strain it through a coarse cloth; keep and use it as the other.

GOLDSMITH, OLIVER, an eminent writer, was born, according to one account, in 1731, at Pallas, in the county of Longford, in Ireland, and to another at Elphin, in 1729. His father was a clergyman, who gave him a good education, and sent him to Trinity College, Dublin, from whence he removed to Edinburgh, to study physic. At this place he became security for a fellow-student, on which account he was obliged to escape to England, but was arrested at Sunderland, and released by two college-friends, whom he met with there. He then went to Holland, and travelled through Flanders, and part of Germany, on foot. At Louvain he took the degree of Bachelor of Physic, the highest degree he ever attained. After accompanying an English gentleman to Geneva, and the south of France, he arrived in England in 1758. Being reduced to a low state, he became usher in a school at Peckham; where, however, he did not remain long, but settled in London, and subsisted by writing for periodical publications. He first emerged from obscurity in 1765 by the publication of his poem, entitled, *the Traveller, or a Prospect of Society*. The year following appeared his beautiful novel of the *Vicar of Wakefield*. He now took chambers in the Temple; but the liberality of his temper, and a propensity to gaming, involved him in frequent difficulties. In 1768 he brought out his comedy of the *Good-Natured Man* at Covent Garden. In 1770 he published *The Deserted Village*, a poem, which, in point of description and pathos, is above all praise. As a comic poet he appeared to great advantage in 1772, by the play of *She Stoops to Conquer*, or *the Mistakes of a Night*. He died by taking an extravagant dose of James's powder in 1774, and was buried in the Temple church-yard. A monument was erected to his memory in Westminster-abbey, with a beautiful Latin epitaph by Dr. Johnson. Besides the above works, he produced a number of others: as a *History of England*, in a Series of Letters from a Nobleman to his Son, 2 vols. 12mo. A *History of England*, 4 vols. 8vo.; A *Roman History*, 2 vols. 8vo.; A *Grecian History*, 2 vols.; A *History of the Earth and Animated Nature*, 8 vols. 8vo.; *Chinese Letters*, &c. A *View of Experimental Philosophy*, 3 vols. 8vo.; A *Posthumous Work*, *Miscellanies*, &c.

GOLDSMITH, or SILVERSMITH, is an artist who makes vessels, utensils, and ornaments, in gold and silver. As the goldsmith often has to make his own moulds, he ought to be a good designer, and have a taste in sculpture: he also ought to know enough of metallurgy to be able to assay and refine gold and silver, and to mix the exact quantity of alloy. The goldsmiths in London employ different hands under them for the various branches of their trade; such as jewellers, box-makers, toy-makers, turners, gilders, burnishers, chasers, refiners, founders, &c. Goldsmiths are superior tradesmen: their wares must be assayed by the wardens of their own company in London, and marked; and the gold and silver must be of the standard fineness, under a penalty of 10*l.* Any false metal may be seized and forfeited to the king.

The cities of Edinburgh, York, Exeter, Bristol, &c. have also places appointed for assaying gold and silver plate. Plate sent to the assay-office, when discovered to be coarser than the standard, is broken and defaced; and the fees for assaying are limited.

GOLIUS, JAMES, a celebrated professor of Arabic and the mathematics at Leyden, descended from a very honourable family, and born at the Hague in 1596. He studied at Leyden, under Erpinus; and, having acquired all the learned languages, travelled into Asia and Africa. He was esteemed and honoured by Muley Zidan, emperor of Morocco and the Grand Signior. He brought home many MSS. to Leyden; and in 1624, succeeded Erpinus. As he had been an eye-witness of the wretched state of Christianity in the Mohammedan countries, none ever solicited for a place of honour and profit with greater eagerness, than he did to procure a new edition of the New Testament, in the original language, with a translation into the vulgar Greek, by an Archimandrite; and as some of these Christians use the Arabic tongue in divine service, he also dispersed among them an Arabic translation of the Confession of the Protestants, with the Catechism and Liturgy. He was likewise appointed interpreter to the states for the Arabic, Turkish, Persian, and other eastern languages. He published, 1. The Life of Tamerlane, in Arabic. 2. The History of the Saracens, written by Elmacin. 3. Alferganus's Elements of Astronomy, with a new Version, and Learned Commentaries. 4. An Excellent Arabic Lexicon. 5. A Persian Dictionary. He died in 1667.

GOLNOW, or **GOLNAW**, a town of Upper Saxony, in Pomerania, twelve miles N. of Stargard.

GOMBRON, or **GOMBROON**, a city of Persia, in the province of Farsistan, called by the natives Bander. Lon. 36. 35. E. Lat. 27. 30. N.

GOMERA, or **GOMARA**, one of the Canary islands, between Ferro and Teneriffe.

GOMERA, a town in the above island, with an excellent harbour. Lon. 17. 8. W. Lat. 28. 6. N.

GOMORRAH, in ancient geography, one of the cities of the plain, or vale of Siddim in Judea, destroyed together with Sodom, by fire from heaven, on account of the wickedness of the people. To determine its particular situation is now impossible.

GOMPHOSIS, [*γομφωσις*], in anatomy, a species of articulation, wherein one bone is set in the other, like a nail or peg; as the teeth within the jaws.

GOMPHIA, in botany, a genus of the decandria monogynia class and order. Calyx five-leaved; corolla five-petaled; berries two, on a large receptacle; seed solitary. There are three species.

GOMPHRENA, **GLOBE AMARANTH**; in botany, a genus of the pentandria digynia class and order. Calyx coloured, outer three-leaved; leaflets two, converging, keeled; petals rude, villose; nectary cylindric, five-toothed; style cloven half-way; capsule seed. There are nine species.

GONATOCARPUS, in botany, a genus of the tetrandria monogynia class and order. Corolla four-cleft; drupe eight-cornered, one-seeded. It has only one species, viz. *G. micranthus*.

GONAVE, an island on the W. coast of Hispaniola, thirty miles long, and five broad. The longitude of its N. E. point is $72^{\circ} 56' 27''$ W. from Greenwich, and its latitude $18^{\circ} 48' 35''$ N.

GONDAR, the capital of Abyssinia, seated on the top of a hill of considerable height. Lon. 37. 33. E. Lat. $12^{\circ} 34' 30''$ N.

GONDOLA, a flat boat, very long and narrow, chiefly used at Venice to row on the canals. The word is Italian. Du Cange derives it from the vulgar Greek *κοννικας*, a bark, or little ship.

GONDREVILLE, a town of France, in the department of Meurthe, three miles N. E. of Toul.

GONG, in music, an instrument used in China, is made of a metal composed of silver, lead, and copper, and its shape is a sort of circular concave. The tone is loud, harsh, and clanging. It is never introduced except on occasion of giving a national cast to the music in which it is employed, or to awaken surprize, and rouse the attention of the company.

GONGA, an ancient town of European Turkey, in Romania, fifty-six miles N. E. of Gallipoli.

GONIOMETRICAL, [from *γωνια*, an angle, and *μετρον*, to measure,] belonging to the measurement of angles.

GONIOMETRICAL LINES, in geometry, lines used for determin-

ing the quantity of angles; such as sines, tangents, secants, &c. A paper on this subject is inserted in the Philosophical Transactions, No. 483, § 26.

GONIOMETRY, the art or method of measuring angles. M. De Lagny presented several papers on this art to the Royal Academy, which are inserted in their Memoirs for 1724, 1725, and 1729. His method consists in measuring the angles with a pair of compasses, without any scale, except an undivided semicircle. But as it appears not to have been adopted by any succeeding mathematicians, and has been reckoned of very little value by some, we shall refer the inquisitive reader for a farther description of it to the Academy's Memoirs, or Dr. Hutton's Mathematical Dictionary.

GONIUM, a genus of vermes, of the order infusoria. Worm very simple, flat, angular, invisible to the naked eye. There are five species. The pectoral, quadrangular, pellucid, with sixteen spherical molecules, found in pure water; molecules oval, nearly equal in size, set in a quadrangular membrane, like diamonds in a ring, the lower ones a little larger than the rest.

GONZAGA, or **GONZAGO**, **LUCRETIA**, one of the most illustrious ladies of the sixteenth century; much celebrated for her wit, learning, and delicate style. Hortensio Lando wrote a panegyric upon her, and dedicated to her his dialogue of moderating the passions. Her letters were collected and published at Venice in 1552. She was married, when she was not fourteen years of age, to John Paul Manfrone, who afterwards engaged in a conspiracy against the duke of Ferrara; was detected and imprisoned, but, though condemned, not put to death. She did all in her power to obtain his liberty, but in vain; for he died in prison, having shewn such impatience under his misfortunes, as made it imagined he lost his senses. She never would listen afterwards to any proposals of marriage, though several were made to her. All that came from her pen was so much esteemed, that a collection was made even of the notes she wrote to her servants.

GOODENIA, a genus of the pentandria monogynia class and order. The corolla is five-cleft; anthers linear; stigma cup-shaped, ciliated; capsule two-celled, two-valved. Seeds many, imbricated. There are nine species, shrubs of South Wales.

GOOD BEHAVIOUR, in law, an exact carriage and behaviour to the king and the people. A justice of the peace may, at the request of another, or where he himself sees cause, demand surety for the good behaviour; and to that end the justice may issue out his warrant against any persons whatsoever, under the degree of nobility; but when it is a nobleman, complaint is to be made in the court of chancery, or king's bench, where such nobleman may be bound to keep the peace. Infants and femmes couvertes, who ought to find surety by their friends, may be bound over to their good behaviour; also lunatics, who have sometimes lucid intervals, and all others who break the peace, or are suspected to do it by affrays, assaults, battery, wounding, fighting, quarrelling, threatening, &c. Persons may be likewise bound to good behaviour for a scandalous way of living, keeping bawdy-houses, gaming-houses, &c. and so may common drunkards, whoremongers, common whores, cheats, libellers, &c. He who demands surety for the peace, on any violence offered, must take an oath before the justice, that he goes in fear of his life, or some bodily harm, &c. and that it is not out of malice, but from a regard to his own safety.

GOOD FORTUNE, an island in the E. Sea, called also Pora, near the W. coast of Sumatra, thirty-six miles long, and six broad. Lon. 98. 30. E. Lat. 15. S.

GOOD FRIDAY, a fast of the Christian church, in memory of the sufferings and death of Jesus Christ. It is observed on the Friday in holy or passion week. Among the Saxons it was called Long Friday; probably on account of the long fastings, &c. then used.

GOOD HOPE, **CAPE OF**, a promontory of Africa, where the Dutch built a good town and fort. It now belongs to the English. The Cape lies west of Cape Lagullas, the most southern extremity of Africa. Lon. 18. 23. E. Lat. 34. 29. S.

GOODWIN SANDS, or **GODWIN SANDS**, famous sandbanks off the coast of Kent, lying between the north and south Foreland.

GOOGINGS, in sea-language, are clumps of iron bolted on the stern-post of a ship, whereon to hang the rudder, and keep it steady; for which purpose there is a hole in each of them, to receive

ceive a correspondent spindle bolted on the back of the rudder, which turns thereby as upon hinges.

GOOSE, in ornithology. See ANAS.

GOOSE, EMBER, a peculiar species of geese that frequent the coasts of the Orkney and Shetland isles in the winter, described by the rev. Mr. Bremner, in his account of Walls and Flota.

GOOSEBERRY, in botany. See RIBES.

GOOSEBERRY, AMERICAN. See MELASTOMA.

GOOSEBERRY, BARBADOES. See CACTUS.

GOOSEFOOT. See CHENOPodium.

GOOSEGRASS. See GALIUM.

GOOSE-NECK, in a ship, a piece of iron fixed on the one end of the tiller, to which the lanyard of the whip-staff or the wheel-rope comes, for steering the ship.

GOOSE-WING, in sea-language. When a ship sails before, or with a quarter-wind on a fresh gale, to make the more haste, they launch out a boom and sail on the lee-side; and a sail so fitted, is called a goose-wing.

GOOTY, or GUTTI, a strong fort of Hindostan, 25 miles S. by E. of Adoni. Lon. 77. 35. E. Lat. 15. 15. N.

GORCUM, or GORICHEM, a town of Batavia, in the department of Delft, and late province of Holland, 12 miles E. of Dort, and 30 S. of Amsterdam.

GORDIAN KNOT, in antiquity, a knot made by king Gordius, in one of the cords of his yoke, or as some have it, in the leathers of his chariot-harness; which was so very intricately twisted that it was impossible to discover where it began or ended. The oracle of Apollo having declared that whoever should untie this knot should be master of all Asia, many attempted it, but without success; till at last Alexander the Great, after likewise attempting in vain to untie it, cut it asunder with his sword, and thus either eluded or fulfilled the prediction.

GORDIUS, in fabulous history, a poor husbandman who had two yokes of oxen, wherewith he ploughed his land and drew his wain. An eagle sitting a long while upon one of his oxen, he consulted the soothsayers; a virgin bad him sacrifice to Jupiter in the capacity of king. He married the virgin, who bore to him Midas. The Phrygians instructed by the oracle to set the first person they met in a wain upon the throne, met Gordius, and made him king. Midas for this good fortune dedicated to Jupiter his father's cart; and Gordius hung up the knot of the yoke in the temple. See GORDIAN KNOT.

GORDIUS, HAIR-WORM, in natural history, a genus of the vermes intestina class and order. Body round, filiform, equal, smooth. There are five species.

G. AQUATICUS, is from four to six inches long, of a pale brown colour, but darker at the extremities: it is found in stagnant waters, and twists itself into various contortions and knots, and it is said that if it is handled without caution, it will inflict a bite that occasions the whitlow.

GORDON, ALEXANDER, M.A. an eminent Scotch antiquary, an excellent draughtsman, and a good Greek scholar, who resided many years in Italy, visited most parts of that country, and travelled into France, Germany, &c. He was secretary to the Society for Encouragement of Learning; and afterwards to the Egyptian Club, composed of gentlemen who had visited Egypt such as Lord Sandwich, Dr. Shaw, Dr. Pococke, &c. He succeeded Dr. Stukely as secretary to the Antiquarian Society, which office he resigned in 1741 to Mr. Joseph Ames. He went to Carolina with governor Glen, where, besides a grant of land, he had several offices, such as register of the province, &c. and died a justice of the peace, leaving a handsome estate to his family. He published, 1. Itinerarium Septentrionale, or a Journey through most parts of the Counties of Scotland, in two parts, with sixty-six copperplates, 1726, folio. 2. Supplement to the Itinerarium, 1732, folio. 3. The Lives of Pope Alexander VI. and his son Caesar Borgia. 4. A complete History of the ancient Amphitheatres, 1730, 8vo. afterwards enlarged in a second edition. 5. An Essay towards explaining the hieroglyphical Figures on the Coffin of the ancient Mummy belonging to Captain William Lethieullier, 1737, folio, with cuts. 6. Twenty-five plates of all the Egyptian Mummies and other Egyptian Antiquities in England, 1739, folio.

GORDONIA, LOBLOLLY-BAY; in botany, a genus of the monodelphia polyandria class and order. Natural order, Columnifera.

Calyx five-leaved; petals five, united at the base by means of the nectary; filament inserted into the nectary; capsule superior, five-celled; seeds winged. There are three species.

GORÉ, in heraldry, one of the abatements, which, according to Gullim, denotes a coward. It is a figure consisting of two arch-lines drawn one from the sinister chief, and the other from the sinister base, both meeting in an acute angle in the middle of the fess-point. See HERALDRY.

GORÉE, a small island of Africa, near Cape de Verd. Lon. 17. 25. W. Lat. 14. 40. N.

GORÉE, an island of Batavia, in the department of Delft, near the mouth of the Meuse.

GORÉE, the capital of the above island, 6 miles S. of Helvoetsluys.

GOOREY, a borough and post town of Ireland, in Wexford, otherwise called Newborough, 18 miles N. of Wexford.

GORGE, in architecture, the narrowest part of the Tuscan and Doric capitals, lying between the astragal, above the shaft of the pillar and the annulets.

GORGE, in fortification, the entrance of the platform of any work. See FORTIFICATION.

GORGED, in heraldry, the bearing of a crown, coronet, or the like, about the neck of a lion, a swan, &c. The term is also used when the gorge or neck of a peacock, swan, or the like bird, is of a different colour or metal from the rest.

GORGET, a kind of breast-plate like a half-moon, with the arms of the prince thereon; worn by the officers of foot.

GORGON, [*γοργων*], a monster with snaky hairs, of which the sight turned the beholders to stone; any thing ugly or horrid. The Gorgons, in antiquity and mythology, were three sisters, whose names were Stheno, Boryale, and Medusa; the latter of whom was mortal, but the two former were subject to neither age nor death. They are described with wings on their shoulders, with serpents round their heads, their hands were of brass, and their teeth of a prodigious size, so that they were objects of terror to mankind.

GORGONIA, in natural history, a genus of the vermes zoophyta class and order. Animal growing in the form of a plant; stem coriaceous, corky, woody, horny, or bony, composed of glassy fibres, or like stone, striate, tapering, dilated at the base, covered with a vascular or cellular flesh or bark, and becoming spongy and friable when dry; mouths or florets covering the surface of the stem and polype-bearing. There are about forty species.

GORHAM, a kingdom of Africa lying between Lon. 24° and 29° E. and between Lat. 10° and 15° N.

GORTIA, GORTITZ, or GORZ, a county of Austria.

GORTIA, or GORTITZ, a strong town in the above county, with a castle. It is 20 miles N. E. of Aquileia.

GORLITZ, a strong town in Upper Lusatia, 50 miles W. of Dresden.

GORTA, or St. MARIA LA GORTA, an island in the Pacific Ocean. Lon. 135. 0. W. Lat. 26. 35. N.

GORTERIA, in botany, a genus of the polygamia frustranea order, and syngenesia class of plants; natural order, Compositæ. Character: calyx imbricate, with spiny scales; corolla of the ray ligulate; down woolly; receptacle naked. There are thirteen species, mostly shrubby plants from the Cape of Good Hope.

GOSHEN, in ancient geography, a district of Egypt, which Joseph procured for his father and brethren. It was the most fruitful part of the country; and its name seems to be derived from the Hebrew, Gesham; which signifies "rain;" Calmet thinks that Goshen, which Joshua (x. 41, xi. 16, xv. 51,) makes part of the tribe of Judah, is the same land of Goshen, which was given to Jacob and his sons by Pharaoh. Gen. xlv. 26. It is certain that this country lay between Palestine and the city of Tanais, and that the allotment of the Hebrews reached southward as far as the Nile. Josh. xiii. 3.

GOSHEN, a township of Massachusetts in Hampshire county, 14 miles N. of Northampton.

GOSPEL, the history of the life, actions, death, resurrection, ascension, and doctrine, of Jesus Christ. The word is Saxon, and of the same import with the Latin term *evangelium*, or the Greek *εὐαγγέλιον*, which signifies glad tidings; or good news; the history of our blessed Saviour being the best news ever published to mankind. This history is contained in the writings of St. Matthew, St.

St. Mark, St. Luke, and St. John; who from thence are called evangelists. The Christian church never acknowledged any more than these four gospels as canonical; notwithstanding which, several apocryphal gospels are handed down to us, and others are entirely lost.

GOSPORT, a town of Hampshire, 79 miles from London.

GOSSAMER, the name of a fine filmy substance, like cobwebs, which is seen to float in the air, in clear days in autumn, and is more observable in stubble-fields, and upon furze and other low bushes. This is probably formed by the flying spider, which, in traversing the air for food, shoots out these threads from its arms which are borne down by the dew, &c.

GOSSEINS, a town of Asia in Thibet, on the E. coast of the Dewah.

GOSSLAR, a town of lower Saxony. Lon. 5. 37. E. Lat. 51. 55. N.

GOSSYPIMUM, **COTTON**; a genus of the polyandria order, and monadelphia class of plants; natural order, Columniferae. Calyx double, the exterior one trifold; capsule quadrilocular; seeds wrapt in cotton-wool. It has six species natives of warm climates. Cotton-plants are cultivated in great quantities in fields for the sake of the cotton: but the herbaceous species is most generally cultivated. The pods are sometimes as large as middling-sized apples, closely filled with the cotton surrounding the seed. When these plants are raised in this country, they must be continually kept in a warm stove, where they will produce seeds and cotton. They are propagated by seeds. The American Islands produce cotton-shrubs of various sizes, which rise and grow up without any culture; especially in low and marshy grounds. Their produce is of a pale red; some paler than others; but so short that it cannot be spun. None of this is brought to Europe, though it might be usefully employed in making hats. The cotton-shrubs, that supply our manufactures, require a dry and stony soil, and thrive best in grounds that have been tilled.

GOTHA, a city of Germany, in Upper Saxony. It is eighteen miles W. of Erfurt. Lat. 50° 56' 17" N. Lon. from Greenwich 10° 41' 46" E.

GOTHARD, **ST** one of the highest mountains of Switzerland. From the top, where there is an hospital for travellers, and a monastery for monks, is one of the most pleasing prospects in the world. It is eight miles from Altorf, and is situated in the canton of Uri, on the confines of the Vallais, the Grisons, and Italy. Its ancient name, according to Ptolemy and Strabo, was Adula.

GOTHIC STILE, in architecture. See **ARCHITECTURE**.

GOTHLAND, the most southern province of Sweden. It contains 48 towns, and is divided into E. S. and W. Gothland.

GOTHLAND, EAST, or **OSTROGOTHIA**, a province of Sweden, bounded on the E. by the Baltic, S. by Smaland, W. by the Wetter lake, which divides it from W. Gothland, and on the N. by Nericia and Sundermantand. The chief towns are Nordkiöping, Söderkiöping, Linköping, and Wadstena.

GOTHLAND, SOUTH, a country of Sweden, which is divided into three provinces, viz. Schonen, Halland, and Blekingen.

GOTHLAND, WEST, or **WESTROGOTHIA**, a province of Sweden, bounded on the E. by Nericia, Wetter Lake, and Smaland; S. by Smaland and Halland; W. by the Scaggerac; and N. by Warmeland. Gothland is fertile in corn and fruits, and has excellent pastures. The rivers, lakes, and sea-coast, abound with fish. Iron, alum, &c. are manufactured by the natives.

GOTHLAND, or **GOTTLAND**, an island of Sweden, in the Baltic, 70 miles long, and no where above 25 broad. Wisby is the capital. Lon. from 18. 6. to 19. 6. E. Lat. from 56. 54. to 57. 56. N.

GOTHS, a warlike nation, famous in the Roman history, who came originally out of Scandinavia, the name given by the ancients to Sweden, Norway, Lapland, and Finmark. According to the most probable accounts, they were the first inhabitants of those countries; and from thence sent colonies into the islands of the Baltic, the Cimbric Chersonesus, and the adjacent places. The time of their first settling in Scandinavia, and of their first peopling the abovementioned islands and Chersonesus, are equally uncertain; though the Gothic annals state the latter to have happened in the time of Serug the great grandfather of Abraham. This first migration of the Goths is said to have been conducted by their king Eric; in which all the ancient Gothic chronicles, as well as the Danish and Swedish ones, agree. Their second migration is said to have happened many ages after; when, being overstocked

with people, Berig, then king of the Goths, went out with a fleet in quest of new settlements. He landed in the country of the Ulmerugians, now Pomerania, drove out the ancient inhabitants, and divided their lands among his followers. The Goths, who settled in Pomerania and the adjacent parts of Germany, being greatly increased, they undertook a third migration in great numbers under Filimer the Great, their fifth prince after leaving Scandinavia; and taking their route eastward, entered Scythia, advanced to the Cimmerian Bosphorus, and driving out the Cimmerians, settled near the Palus Maotis. Thence in process of time, being greatly increased in Scythia, they resolved to seek new settlements; and accordingly taking their route eastward, they traversed several countries, and at length returned into Germany. Their leader in this expedition was the celebrated Woden. The Romans distinguished the Goths into two classes; the Ostrogoths and Visigoths. These names they received before they left Scandinavia, the Visigoths being softened by the Latins from Westergoths, or those who inhabit the western part of Scandinavia, as the Ostrogoths were those who inhabited the eastern part of that country. After the destruction of the Roman empire by the Heruli, the Ostrogoths, under Theodoric, became masters of the greatest part of Italy, having overcome and put to death Odoacer king of the Heruli in 494. They retained their dominion in this country till A. D. 553; when they were finally conquered by Narses, Justinian's general. The Visigoths settled in Spain in the time of Honorius, where they founded a kingdom which continued till the country was subdued by the Saracens. The Goths were famous for their hospitality and kindness to strangers, even before they embraced Christianity. Nay, it is said, that from their being eminently good, they were called Goths, by the neighbouring nations; that name, according to Grotius and most other writers, being derived from the German word *guten*, which signifies good. They encouraged, says Dio, the study of philosophy above all other barbarous or foreign nations, and often chose kings from among their philosophers. Polygamy was not only allowed but countenanced among them: every one being valued or respected according to the number of his wives.

GOTTENBURG, or **GOTHENBORG**, a rich and strong town of Sweden, in W. Gothland, with a good harbour, at the mouth of the Gøthelba. Lon. 11. 50. E. Lat. 57. 42. N.

GOTTINGEN, a considerable town of Lower Saxony in the duchy of Brunswick. Lon. 10. 5. E. Lat. 51. 32. N.

GOTTINGEN, a town of Sweden, 28 miles S. W. of Stockholm. The latitude of the observatory is 51° 31' 54" N. and its longitude from Greenwich 9° 54' 15" E.

GOTTORP, a town of Denmark, in the duchy of Sleswic, capital of Holstein Gottorp.

GOUANIA, in botany, a genus of the monœcia order, and polygamia class of plants. Hermaphrodite, quinquefid; calyx no corolla; style trifid; the fruit, inferior to the receptacle of the flower, divisible into three seeds. The male is like the hermaphrodite, but wanting stigma and germen.

GOUDA, or **TURGOW**, a considerable town of Batavia in the department of Delit, and late province of S. Holland, 9 miles N. E. of Rotterdam.

GOUDHURST, a town of Kent, 12 miles S. W. of Maidstone, and 44 S. E. of London.

GOVERNMENT, in general, is the polity of a state, or an orderly power constituted for the public good. Civil government was instituted for the preservation and advancement of men's civil interests, and for the better security of their lives, liberties, and properties. The use and necessity of government is such, that there never was an age or country without some sort of civil authority: but as men are seldom unanimous in the means of attaining their ends, so their difference in opinion in relation to government, has produced a variety of forms of it. To enumerate them, would be to recapitulate the history of the whole earth. But they may, in general, be reduced to one of these heads: either the civil authority is delegated to one or more, or else it is still reserved to the whole body of the people; whence arises the known distinction of government into monarchy, aristocracy, and democracy. See **ARISTOCRACY**, **DEMOCRACY**, **FEODAL SYSTEM**, &c. Governments are commonly divided into two classes, arbitrary and free governments; but there are many different sorts of each. Thus the governments of France and Spain, are generally called arbitrary; though they differ as much from the governments of Turkey and other eastern empires, where absolute despotism prevails, as they

they do from the government of England, and other European nations, where liberty is said to flourish in its fullest perfection.

GOVERNMENT is also used for a post or office, which gives a person the power or right to rule over a city, or a province, either supremely or by deputation.

GOVERNMENT is likewise used for the city, country, or place, to which the power of governing is extended.

GOVERNOLO, a town of the late Cisalpine republic, in the department of Mincio, and late duchy of Mantua, 12 miles S. E. of Mantua.

GOUGE, is a round hollow chisel, serving to cut holes, channels, grooves, &c. in wood, stone, &c.

GOURD, in botany. See **CUCURBITA**.

GOURD, BITTER. See **CUCUMIS**.

GOURD, ETHIOPIAN SOUR. See **ADANSONIA**.

GOURDON, a town of France, in the department of Lot, 17 miles N. of Cahors.

GOURNAY, a town of France, in the department of Lower Seine, and late duchy of Normandy. It is 52 miles N. W. of Paris.

GOUT. See **MEDICINE**. In the new system of medicine, the gout is considered as a disease not arising from plethora, but from the very opposite cause, viz debility; and therefore to be cured by means the reverse of those formerly too generally prescribed.

GOUTWORT. See **ÆGOPodium**.

GOWER, JOHN, one of the most ancient English poets, was contemporary with Chaucer, and his intimate friend. He studied the law, and was some time a member of the society of Lincoln's-inn. Some have asserted that he was a judge. In the first year of Henry IV. he became blind, which he laments in one of his Latin poems. He died in 1402; and was buried in St. Mary Overie, which church he had rebuilt chiefly at his own expence, so that he must have lived in affluent circumstances. His tomb was magnificent, and curiously ornamented. It still remains, but has been repaired in later times. From the collar of SS round the neck of his effigies, which lies upon the tomb, it is supposed that he had been knighted. With regard to his poetical talents, it is sufficient to say, that he was admired at the time when he wrote. He wrote, 1. *Speculum Meditantis*, in French, in ten books. There are two copies of this in the Bodleian library. 2. *Vox Clamantis*, in Latin verse, in seven books. Preserved also in the Bodleian library, and in that of All-souls. It is a chronicle of the insurrection of the commons in the reign of Richard II. 3. *Confessio Amantis*; printed at Westminster by Caxton in 1493, London 1532, 1545. It is a sort of poetical system of morality, interspersed with a variety of moral tales. 4. *De Rege Henrico IV.*; printed in Chaucer's works. There are likewise several historical tracts, in MS. written by our author, which are to be found in different libraries; also some short poems printed in Chaucer's works.

GOWER'S ISLAND, an isle in the S. Pacific ocean, which has no anchorage near it. Lon. 158. 56. E. Lat. 7. 55. S.

GOWRAN, a borough and post town of Ireland, in Kilkenny, 52 miles from Dublin.

GOZA, or **GOZZO**, an island of the Mediterranean, four miles and a half from Malta, and 24 in circumference. It is supposed to be the island of Calypso, celebrated by Homer.

GOZZO DI CANDIA, an island of the Mediterranean near Candia.

GRACE, among divines, is taken, 1. For the free love and favour of God, which is the spring and source of all the benefits we receive from him. 2. For the work of the Spirit renewing the soul after the image of God; and continually guiding and strengthening the believer to obey his will, and to resist and overcome sin.

GRACE, or **GRACEFULNESS**, in the human character, is an agreeable attribute, inseparable from motion as opposed to rest, and as comprehending speech, looks, gesture, and loco-motion. As some motions are homely, the opposite to graceful, it may be inquired, With what motions is this attribute connected? No man appears graceful in a mask; and therefore, laying aside the expressions of the countenance, the other motions may be genteel, may be elegant, but of themselves never are graceful. A motion adjusted in the most perfect manner to answer its end is elegant;

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but still somewhat more is required to complete our idea of grace or gracefulness. What this more may be, is the nice point. One thing is clear from what is said, that it must arise from the expressions of the countenance: and from what expressions so naturally as from those which indicate mental qualities, such as sweetness, benevolence, elevation, dignity? This promises to be a fair analysis; because of all objects mental qualities affect us the most; and the impression made by a graceful appearance, upon every spectator of taste, is too deep for any cause purely corporeal. The next step is, to examine what are the mental qualities, that, in conjunction with elegance of motion, produce a graceful appearance. Sweetness, cheerfulness, affability, are not separately sufficient, nor even in conjunction. Dignity alone, with elegant motion, produce a graceful appearance; but still more graceful with the aid of other qualities, those especially that are the most exalted. But this is not all. The most exalted virtues may be the lot of a person whose countenance has little expression; but such a person cannot be graceful. To produce this appearance, must be added, an expressive countenance, displaying to every spectator of taste, with life and energy, every thing that passes in the mind. Collecting these circumstances together, grace may be defined, "that agreeable appearance, which arises from elegance of motion, and from a countenance expressive of dignity." Expressions of other mental qualities are not essential to that appearance, but they heighten it greatly. See **DECLAMATION** and **ORATORY**. But in vain will a person attempt to be graceful who is deficient in amiable qualities. A man, it is true, may form an idea of qualities he is destitute of; and, by means of that idea, may endeavour to express these qualities by looks and gestures; but such studied expression will be too faint and obscure to be graceful.

GRACE, ACT OF, the appellation given to the act of parliament, 1696, c. 32, which allows prisoners for civil debts to be set at liberty, upon making oath that they have not wherewithal to support themselves in prison, unless they are alimanted by the creditors on whose diligence they were imprisoned, within ten days after intimation made for that purpose.

GRACE, DAYS OF, three days immediately following the term of payment of a bill, within which the creditor must protest it, if payment is not obtained, in order to entitle him to recourse against the drawer.

THE GRACES, GRATIE, or CHARITES, in the heathen theology, were fabulous deities, three in number, who attended on Venus. Their names are, Aglaia, Thalia, and Euphrosyne; i. e. shining, flourishing, and gay; or, according to some authors, Pasithea, Euphrosyne, and Ægiale. They were said by some to be the daughters of Jupiter, by Eurynome the daughter of Oceanus; and by others, of Bacchus and Venus. Some will have the Graces to have been four; and make them the same with the Horæ, Hours, or rather with the four seasons of the year.

GRACILIS, a muscle of the leg, so called from its slender shape. See **ANATOMY**.

GRACULA, the GRAKLE; in ornithology, a genus of the order picæ. Bill convex, thick, sharp-edged, somewhat naked at the base; nostrils small, near the base of the bill; tongue entire, rather sharp at the end; claws hooked and sharp. There are thirteen species, none of them found in Europe. *G. kelegiosa*, or the minor grakle, is of the size of a blackbird, is found in various districts of the East Indies, and almost in every island beyond the Ganges. It is rendered familiar with the greatest ease, and taught to speak with greater facility than even the parrot; and also pronounces its words with more distinctness.

GRADATION, in logic, a form of reasoning, otherwise called **Sorites**. See **LOGIC** and **SORITES**.

GRADATION, in painting, a gradual and insensible change of colour, by the diminution of the tints and shades.

GRADATION, in rhetoric, the same with **Climax**. See **CLIMAX**.

GRADISCA, GRADISG, or GRADISKA, a town of Sclavonia, on the borders of Croatia, 20 miles S. W. of Posega.

GRADISCA, or GRADISKA, a town of Germany, in Austria, 5 miles S. of Goritz.

GRADO, a podestaria or district of Maritime Austria, in the Dogado of Venice, including several lakes and islands.

GRADUATE, a person who has taken a degree in the university. See **DEGREES**.

Z X

GRADUATION,

GRADUATION, in mathematics, the act of graduating or dividing any thing into degrees or equal parts.

GRAFF, or **GRAFT**, [*greffe*, Fr.] a small branch inserted into the stock of another tree, and nourished by its sap, but bearing its own fruit; a young cyon.

GRAFTING, or **ENGRAFTING**, in gardening, the taking of a shoot from one tree, and inserting it into another, so that they may closely unite, and form one trunk. Grafting has been practised from the most remote antiquity; but its origin and invention are differently related by Naturalists. The great aim of this useful art is, to propagate any curious sorts of fruit-trees, to insure the growth of similar kinds, which cannot be effected by any other method: for, as all the good species of fruit have been accidentally obtained from seeds, many of these, when sown, will degenerate, and produce bad fruit. But, when shoots are taken from such trees as bear good fruit, they will never change their kind, whatever be their stock, or the tree on which they are grafted. Mr. Bradley observes, that the stock grafted on, is only to be considered as a fund of vegetable matter, which is to be filtered through the cyon, digested, and brought to maturity, as the time of growth in the vessels of the cyon directs. A cyon, therefore, of one kind, grafted on a tree of another, may be rather said to take root in the tree it is grafted, than to unite with it: for it is obvious that the cyon preserves its natural purity, though it be fed and nourished by a mere crab. The grafts or cyons with which this operation is effected, should be of the last summer's growth, from the outside branches; firm and well-ripened; and selected from healthy trees. The graft is always the middle part of each shoot, cut to five or six inches in length, or so as to have four or five good eyes, or buds, but should be preserved at full length, till grafting time. The proper tools and other materials used in grafting, are: 1. A strong knife for cutting off the heads of the stocks, previous to the insertion of the graft; also a small hand-saw, for occasional use, in cutting off the heads of large stocks; 2. A common grafting-knife, or strong sharp penknife, for cutting and shaping the grafts ready for insertion; also to slope and form the stocks for the reception of the cyons; 3. A flat grafting-chisel, and small mallet for clefting large stocks, in cleft-grafting; 4. A quantity of new bass-strings for bandages, for securing the grafts, and promoting their speedy union with the stock; and 5. A quantity of clay, for applying closely round the grafts after their insertion and binding, to defend the parts from the influence of the sun, winds, and wet weather, or from being affected by cold. For this purpose a kind of stiff loamy mortar may be prepared of strong fat loam; or any other tough clay may be substituted; to which may be added a fourth part of fresh horse-dung, free from litter, and a small portion of cut hay, with a little water, well mixed: the whole should be properly beaten with a stick, and thus incorporated. This operation should be repeated, according to the nature of the clay, and performed several times during the first day; the composition being still moistened with water for six or seven days successively, at the end of which time it will be fit for use. There are various other modes of engrafting, which are termed whip-grafting, or tongue-grafting, cleft-grafting, crown-grafting, root-grafting, cheek-grafting, side-grafting; and, lastly, grafting by approach, or inarching. The following are most commonly and successfully practised:

1. **WHIP-GRAFTING**, or **TONGUE-GRAFTING**, is generally performed in nurseries, upon small stocks, from a quarter of an inch to half, or a whole inch in diameter. The stock, and cyons or grafts, should in every instance be of the same size or approach as nearly to the same size as possible. They are both to be sloped off a full inch, or more, and then tied closely together. This method may be much improved, by performing what gardeners call tongueing, or tipping; that is, by making an incision in the bare part of the stock, downwards, and a similar slit in the cyon, upwards; after which they are to be carefully joined together, so that the rinds of both may meet in every part, when a ligament or bandage of bass is to be tied round the cyon, to prevent it from being displaced; and the whole is to be covered over, or coated, with the clay above described.

2. **CLEFT-GRAFTING**, or **SLIT-GRAFTING**, as gardeners differently term it, is performed upon stocks from one to two inches in diameter. The head of the stock being carefully cut off, in a sloping direction, a perpendicular cleft, or slit, is to be made

about two inches deep, with a knife or chisel, towards the back of the slope, into which a wedge is to be driven, in order to keep it open for the admission of the cyon: the latter must now be cut in a perpendicular direction, and in the form of a wedge, so as to fit the incision in the stock. As soon as it is prepared, it should be placed in the cleft, in such a manner that the inner bark of both the stock and cyon may meet exactly together. It is then to be tied with a ligature of bass, and clayed over, as is practised in whip-grafting, three or four eyes being left on the cyon uncovered. The proper season for this mode of grafting is the same as for the preceding, viz. the months of February and March: towards the latter end of May, or the beginning of June, the junction of the graft and stock will be completed, and the latter begin to shoot; when the clay may be taken off, and, in the course of a fortnight or three weeks, the bandages may be removed.

3. **APPROACH-GRAFTING**, or **INARCHING**, is performed in April or May, when the stock we would graft, and the tree we would propagate, grow so near together, as to be conveniently in contact, and the nearer the graft and the stock are of a size the better. This mode of propagation is esteemed the surest of all; and in truth, some things cannot be so well propagated any other way. It is a method that is, or can be, seldom used for common fruit-trees; but if any one wishes to try the experiment, the stock or stocks must be planted at least a year before, first making the soil good, as it may need it, being so near another tree, for it of course must be close. Plants in pots or tubs, being easily brought together, are frequently propagated this way; so that inarching is used much in greenhouses and hot-houses for various things, as oranges, lemons, pomegranates, jasmynes, and vines sometimes; oranges and lemons thus treated in May will be united by August. The method of inarching is this, bend the best-situated young branch of the tree or shrub to be propagated, to the stock to be grafted, and having determined on the part at which most conveniently to fix the shoot, cut the bark of that part of the shoot off, with nearly half the wood (not to touch the pith) to the length of about three inches for a strong branch, or less for a weaker. Then cut exactly so much of the bark and branch of the stock off, as will receive the cut part of the branch or shoot, so as to bring bark and bark in contact in every part; and if the contrivance of lipping is used, it will secure them better together. Bind and clay, and if in open ground, fix a stake to tie the work so that the wind may have no power over it; a tie also to a neat stick may be proper for those inarched in pots, &c. By this kind of grafting may be raised almost any kind of tree or shrub, which is often done by way of curiosity, to ingraft a fruit-bearing branch of a fruit-tree upon any common stock of the same genus, whereby a new tree bearing fruit is raised in a few months. This is sometimes practised upon orange and lemon-trees, &c. by grafting bearing branches of a fruit-tree upon any common stocks raised from the kernels of any of the same kind of fruit, or into branches of each other, so as to have oranges, lemons, and citrons, all on the same tree.

GRAFTON, RICHARD, an English historian, born at London, in the reign of Henry VIII. He published, 1. An Abridgement of the Chronicles of England; and, 2. A Chronicle and large History of the Affayres of England and Kings of the same, deduced from the Creation of the World. He died in the reign of Queen Elizabeth.

GRAFTON, an extensive county of New Hampshire, bounded on the E. by Maine District, S. by Strafford, Hillsborough, and Cheshire counties; W. by Vermont, and N. by Canada.

GRAFTON, a township of the above county, 13 miles S. E. of Dartmouth, and 19 S. W. of Plymouth.

GRAFTON, or **GRAFTON ISLAND**, one of the Bashee islands in the East Indian Sea. Lon. 120. 55. E. Lat. 21. 4. N.

GRAHAM, GEORGE, clock and watch-maker, the most ingenious and accurate artist in his time, was born in 1675. After his apprenticeship, Mr. Tompson received him into his family, purely on account of his merit; and treated him with a kind of parental affection as long as he lived. Besides his universally acknowledged skill in his profession, he was a complete mechanic and astronomer: the great mural arch in the observatory at Greenwich was made by Dr. Halley, under his immediate inspection, and divided by his own hand; and from this incomparable original, the best foreign instruments of the kind are copies made by English artists. The sector, by which Dr. Bradley first discover-

ed two new motions in the fixed stars, was of his invention and fabric; and when the French academicians were sent to the north to ascertain the figure of the earth, Mr. Graham was thought the fittest person in Europe to supply them with instruments: those who went to the south were not so well furnished. He was for many years a member of the Royal Society, to which he communicated several ingenious and important discoveries; and regarded the advancement of science more than the accumulation of wealth. He died in 1751.

GRAIN, all sorts of corn, as wheat, barley, oats, rye, &c.

GRAIN is also the name of a small weight, the twentieth part of a scruple in apothecaries weight, and the twenty-fourth of a penny-weight troy. See the article **WEIGHT**. A grain-weight of gold-bullion is worth two-pence, and that of silver but half a farthing.

GRAIN also denotes the component particle of stones and metals, the veins of wood, &c. Hence cross-grained, or against the grain, is contrary to the fibres of wood, &c.

GRAINING-BOARD, among curriers, an instrument called also a pummel, used to give a grain to their leather.

GRAITNEY GREEN, a village of Scotland in Dumfriesshire, long famous for the clandestine marriages of young persons of fortune from England; performed according to the rites of the church of England, by a blacksmith, who is said to gain near 1,000l. a-year by this encroachment on the clerical office.

GRALLÆ, in ornithology, an order of birds analogous to the bruta in the class of mammalia, in the Linnæan system. See **ZOOLOGY** and **ORNITHOLOGY**.

GRAMAT, a town of France, in the department of Lot; 8 miles S. W. of St. Cere and 2½ N. N. E. of Cahors.

GRAMAYE, JOHN BAPTIST, a historian and poet, born at Antwerp, and provost of Arnhem. He travelled over Germany and Italy, but in going to Spain, was carried off by African corsairs to Algiers. He returned to the Netherlands, and died at Lubek. He published, 1. *Africa illustrata*, libri X. in 1622; 4to. 2. *Diarium Algeriense*; 3. *Peregrinatio Belgica*: a curious work; 4. *Antiquitates Flandriæ*; fol. and, 5. *Historia Namurcensis*.

GRAMINA, GRASSES; one of the seven tribes or natural

families, into which all vegetables are distributed by Linnæus in his *Philosophia Botanica*. They are defined to be plants which have very simple leaves, a jointed stem, a husky calyx termed gluma, and a single seed. This description includes the several sorts of corn as well as grasses. In Tournefort they constitute a part of the 15th class, termed apetal; and in Linnæus's sexual method, they are mostly contained in the second order of the third class, triandria digynia. This numerous and natural family of the grasses has engaged the attention and researches of several eminent botanists; particularly Ray, Monti, Micheli, and Linnæus. M. Monti, in his *Catalogus Stirpium Agri Bononiensis*, *Gramina ac hujus Modi Affinia complectens*, printed at Bononia in 1719, divides the grasses from the disposition of their flowers, as Theophrastus and Ray had done before him, into three sections or orders—These are, 1. Grasses having flowers collected in a spike. 2. Grasses having their flowers collected in a panicle or loose spike. 3. Plants that in their habit and external appearance are allied to the grasses. This class would have been natural if the author had not improperly introduced sweet-rush, juncus, and arrow-headed grass, into the third section. Monti enumerates about 306 species of the grasses, which he reduces under Tournefort's genera; to these he added three new genera. Scheuchzer, in his *Aristographia*, published likewise in 1719, divides the grasses, as Monti, from the disposition of their flowers, into the five following sections: 1. Grasses with flowers in a spike, as phalaris, anthoxanthum, and frumentum. 2. Irregular grasses, as schoenanthus and cornucopia. 3. Grasses with flowers growing in a simple panicle or loose spike, as reed and millet. 4. Grasses with flowers growing in a compound panicle, or diffused spike, as oats and poa. 5. Plants by their habit nearly allied to the grasses, as cypress-grass, scirpus, linagrostis, rush, and scuechzeria. He has enumerated about 400 species, which he describes with amazing exactness. Micheli has divided the grasses into six sections, which contain in all 44 genera, and are arranged from the situation and number of the flowers.

GRAMINA, the fourth order in Linnæus's *Fragments of a Natural Method*, consisting of the numerous and natural family of the grasses. See **BOTANY**, and **GRASS**.

GRAMMAR.

GRAMMAR, [*γραμματική*], an art which teaches the several kinds and relations of words, with their propriety, and their disposition into sentences. Grammar is usually divided into four parts. 1. Etymology, which treats of the kinds of words and their derivations. 2. Orthography, which treats of the characters or letters of which words are composed. 3. Syntax, which treats on the right dispositions of words according to their agreement with, and dependencies on, one another in a sentence. 4. Prosody, which treats of the accents and quantity of syllables, and the arrangement of words so as to preserve such a regularity in the accents and quantity as is required in versification.

ETYMOLOGY.

Since words are the signs, by which we express our ideas, they will naturally be of so many kinds in any language as are requisite for doing this intelligibly and with proper dispatch. The objects of our ideas are beings real or imaginary. In order to discourse of these it is requisite that they have names; hence arises a class or kind of words called *nouns*. It is also found necessary in order to discourse intelligibly on beings, to express their properties and the limits of the signification of their names; hence arises another kind of words called very properly *adnouns* or *adjectives*. In pursuing a discourse on any subject, frequent repetitions of the same noun would often be found to occur, and in many cases, except great attention were paid, and circumlocutions used, it would tend to produce ambiguity; hence a third sort of words was introduced, and named *pronouns*, as being intended to stand for nouns, that is, to supply their place, or express the same idea. Since all beings are conceived in the mind as being in some state simply, or as acting, or receiving the impression of some action, it became requisite in good language to have words by means of which these

states and actions might be readily expressed; words used for this purpose are called *verbs*. But as the states and actions which are expressed by verbs, as well as the qualities, which are denoted by adjectives, may be very different according to the circumstances attending them, it has been found convenient to have a class of words to express those circumstances; such words from their principal use are named *adverbs*. The beings of which we discourse, and the state in which they exist, may on different occasions be under such an infinity of circumstances that it would be impossible, as well as inconvenient, to give them different names under these varying circumstances, and the class of adverbs is not sufficient, or always adapted, to express them; hence was wanting a class of connective words, which might serve to join another word to the sentences, and at the same time to exhibit its relation to it, so that the whole may express the beings spoken of in the state and circumstances conceived by the speaker; such words have obtained the appellation of *prepositions*, on account of being generally placed before the nouns they are intended to connect. As in language there is frequent occasion to affirm the same thing of different beings, and also different things of the same being, it was found very convenient to have a class of words to connect such beings or affirmations, since by their means a great multitude of repetitions are avoided: these simple connective words are denominated *conjunctions*. Besides these a few other words, if we may be allowed to call them words, are introduced to express some emotion or feeling of the mind; these have been called *interjections*, as being generally thrown in between the parts of a sentence. Thus in most languages the parts of speech or kinds of words are eight, viz. noun, adjective, pronoun, verb, adverb, preposition, conjunction, and interjection. These different kinds of words are not only convenient for expressing the several ideas we wish to communicate,

municate, but they afford a rich variety in language, as it is evident that by means of them the same ideas may be in many cases designated various ways; which advantage is further increased by the inflections which most languages give to some parts of speech. Of the different ways of expressing our ideas it is the business of the orator to choose the best. It will be unnecessary here to enter into a particular account of each part of speech; the limits of our work will not properly allow it, and sufficient information on this head is generally at hand. We shall therefore only add a few general remarks on some of the principal variations which have been adopted in some of this class of words. Nouns in most languages are changed in their terminations. 1. To express the singular or plural number. 2. To express the difference of sex or gender. 3. To express when the noun is used as a subject or an object: some languages denote this by its place in the sentence. 4. To express those relations, which are otherwise denoted by prepositions. Similar variations are made in adjectives and pronouns, for the same purpose and to make them agree with the varying nouns. Adjectives are also changed in their endings to indicate different degrees of the qualities of nouns. Also the verbs in some languages undergo a great variety of changes to particularize the speaker, and that which is spoken to or of, and the different numbers of each; also to denote the several times and modes of action and of being. The reader, who wishes to enter into a critical examination of the derivations of words, and in what manner the words of one class have been transformed in order to constitute those of another, we refer to the "Diversions of Purley" written by our great philosophical etymologist Mr. Horne Tooke. A judicious enquiry into the etymologies, or derivations, of words, is thought by some of considerable use; because nations, who value themselves upon their antiquity, have always looked on the antiquity of their language as one of the best titles they could plead; and the etymologist, by seeking the true and original reason of the notions and ideas affixed to each word and expression, may often furnish an argument of antiquity, from the traces remaining thereof, compared with the ancient uses. Then that etymologies are necessary for the thorough understanding of a language. It is objected, however, that the art is arbitrary, and built altogether on conjectures and appearances; and the etymologists are charged with deriving their words from where they please; and it must certainly be owned, that etymologies are frequently so far fetched, that one can scarce see any resemblance or correspondence therein. Quintilian has shewn, that the ancient etymologists, notwithstanding all their learning, fell into very ridiculous derivations.

ORTHOGRAPHY.

This part of grammar belongs properly to the elements of words, which are letters, and hence treats of, 1. The number and division of letters. 2. Their accidents. 3. The just manner of writing letters, which, properly speaking, is orthography. 4. The disposition of letters into syllables. And 5. The pronunciation of letters. As to the right letters used in the spelling of words, it must be learned from the best authors in each language. However, it ought to be observed, that orthography has appointed one way of spelling a word in common language, and another in the learned and polite diction: thus, in ordinary, we say, and write, *fancy, fantom, frenzy*, &c. for *phantasy, phantom, phrenzy*, &c. according to the original etymology of these words: and in such cases, as vulgarisms ought to be carefully avoided, so as not to write *obstropolous* for *obstreperous*, and the like; so, on the other hand, we must not alter the received orthography, in imitation of any one man, be his authority or learning ever so great; the general usage being, in this respect, the only rule that ought to be followed, since innovations rather confound than help the learner. We shall therefore only add one observation more, with respect to the orthography of words, viz. that it ought, as much as possible, to be agreeable to the original etymology, sense, and pronunciation, of words: thus it is better to write *phrenzy* than *frenzy*, on account of its being derived from the greek φρεν; in the same manner, the participle of the verb *singe* should be written *singeing*, on account of the sense, to distinguish it from *singing*; and, lastly, when letters are neither necessary on account of the etymology, sense, or sound, they ought to be rejected, as *public* for *publick*, the *k* being wholly superfluous. The rules for the proper disposition of words into syllables must be such as are derived

from the analogy of language in general, or from the established custom of speaking; which, for the English language, are reduced to the following rules: 1. A consonant between two vowels must be joined with the latter in spelling, as *na-ture, ve-ri-ty, ge-ne-rous*: except, however, the letter *x*, which is joined to the first, as in *flax-en, ox-en*, &c. and compound words, as in *up-on, un-used*, &c. 2. A double consonant must be divided, as in *letter, man-ner*, &c. 3. Those consonants which can begin a word, must not be parted in spelling, as in *de-fraud, re-prove, di-stinct*: however, this rule is found sometimes to fail; for though *gn* begins a word, as *gnaw, gnat*, &c. yet it must be divided in spelling, as in *cog-ni-zance, ma-lig-ni-ty*, &c. 4. Those consonants which cannot begin a word must be divided, as *ld* in *sel-dom*, *lt* in *mul-ti-tude*, *mp* in *tem-per*, *rd* in *ar-dent*; but, in final syllables, there are exceptions, as *tl* in *ti-tle*, *dl* in *han-dle*, &c. 5. When two vowels come together, and are both of them distinctly sounded, they must be separated in spelling, as in *co-e-val, mu-tu-al*, &c. 6. The grammatical terminations, or endings, must be separated in spelling, as *ed* in *wing-ed*, *edst* in *de-li-ver-edst*, *ing* in *hear-ing*, *ance* in *de-li-ver-ance*, &c. 7. Compound words must be resolved into their simple or component words, as *up-on, in-to, never-the-less, not-with-stand-ing*, &c. Pronunciation makes much the most difficult part of a written grammar; since a book expressing itself to the eyes, in a matter that wholly concerns the ears, seems next akin to that of teaching the blind to distinguish colours: hence it is that there is no part so defective in grammar as that of the pronunciation, as the writer has frequently no term whereby to give the reader an idea of the sound he would express; for want of a proper term, therefore, he substitutes a vicious and precarious one. To give a just idea of the pronunciation of a language, it seems necessary to fix as nearly as possible all the several sounds employed in the pronunciation of that language. Cicero tells us, that the pronunciation underwent several changes among the Romans; and indeed it is more precarious in the living languages, being, as Du Bos tells us, subservient to fashion in these. The French language is clogged with a difficulty in pronunciation from which most others are free; and it consists in this, that most of their words have two different pronunciations, the one in common prose, the other in verse. As to the pronunciation of the English language, the late Mr. B. Martin, in his Spelling Book of Arts and Sciences, lays down the following rules: 1. The final (*e*) lengthens the sound of the foregoing vowel; as in *can, cane*; *rob, robe*; *tun, tune*, &c. 2. The final (*e*) in words ending in *re*, is sounded before the *r* like *u*; as *nitre, nitur*; *lucre, lu-cur*, &c. 3. The Latin diphthongs *a, æ*, are sounded like *e*; as *Ætna, Etna*; *æconomy, economy*, &c. but at the end of words *oe* sounds like *o*; as in *toe, foe*, &c. 4. Also the English improper diphthongs, *ea, eo, eu, ue*, sound only the *e* and *u*; as *tea or te, feoffee or fessie, due du, true tru*, &c. though sometimes *eo* and *ea* are pronounced like *ee*, as in *people, fear, near*, &c. 5. Sometimes the diphthong (*ie*) is pronounced like *e* in *cieling*, like *ee* in *field*, and, at the end of words, always like *y*; as in *lie*, &c. and *ei* is pronounced either like *e* or *ai*; as in *deceit, reign*, &c. 6. The triphthong *eau* is pronounced like *o*, in *beau* and *jet d'eau*; and *ieu* sound like *u* in *lieu, adieu*, &c. 7. The sound of *c* is hard before the vowels *a, o, u*; as in *call, cold, cup*, &c. also sometimes before *h*, as in *chart, chord*, &c. and before *l* and *r*; as in *cleur, creep*, &c. It is otherwise generally soft, as in *city, cell, cyder, child*, &c. 8. In French words *ch* is sounded like *sh*; as in *chagreen, machine*; and sometimes like *qu*, as in *choir*. 9. The sound of *g* is hard before *a, o, u, l, r*; as in *gall, go, gum, glean, grope*; also before *ui*, as in *guilt, guild*, &c. and before *h*, as in *ghost*; sometimes before *i*, as in *gibbous, gibberish*. It is also generally hard before *e*, as in *get, geld*, &c. but soft in many words derived from the Greek and Latin, as in *geometry, genealogy, genus*, &c. Two *gg* are always hard, as in *dagger*, &c. The sound of *g*, when soft, is like that of *j*. 10. In any part of a word, *ph* sounds like *f*, as in *philosophy*, &c. 11. The sound of *qu*, at the end of French words, is like *k*, as in *risque*, &c. 12. The syllables *ti* and *ci*, if followed by a vowel, sound like *si* or *shi*; as in *fiction, logician*, &c. 13. When *cc* occur before *i*, the first is hard and the latter is soft; as in *flaccid*, &c. 14. The letter *p* is not pronounced at the beginning of syllables, before *s* and *t*; as in *psalm, ptarmics*, &c. As to other peculiarities, regarding single letters, and their pronunciation, many of them have been taken notice of at the beginning of each, in the course of this work.

SYNTAX.

The office of syntax is to consider the natural suitableness of words with respect to one another, in order to make them agree in gender, number, person, mood, &c. To offend in any of these points, is to offend against syntax; and such kind of offence, when gross, is called a solecism, and when more slight, a barbarism. Syntax is generally divided into two parts, viz. concord, wherein the words are to agree in gender, number, case, and person; and regimen or government, wherein one word governs another, and occasions some variations therein. Generally in every language the rules of concord are the same, as being almost every where of the same nature, for the better distinguishing of discourse; thus, from the distinction of two numbers, namely the singular and the plural, the adjective must be made to agree with the substantive accordingly; that is, the former is to be put in this or that number, as the latter is; for the substantive being what is confusedly, though directly, marked by the adjective, should the substantive denote several, there are several subjects of that form signified by the adjective, and consequently this should be in the plural number, as *virī fortes*, &c. Again, as there is a distinction of masculine and feminine in most languages, there hence arises a necessity of putting the substantive and adjective in the same gender; and, in like manner, verbs should agree in number and person with nouns and pronouns: but should any thing, in writing or discourse, be apparently contrary to those rules above-mentioned, this is by some figure or other in grammar, whereby something is implied, or the ideas themselves are considered more than the words that represent them. Regimen, is that part of syntax which regulates the dependency of words, and the alterations which one occasions in another. In general, the regimen, or constitution of government, is almost intirely arbitrary, and varies greatly in all languages. For one language forms its regimen by cases, as the Latin and Greek. Others, instead of cases, make use only of small particles, as the English, *by, of, to*, &c. The French, Spanish, and Italian by *de, a, da*, &c. There are, however, some few maxims which hold good in every language, as, 1. That there is no nominative case in any sentence but has a reference to some verb either expressed or understood. 2. That there is no verb which has not its nominative case expressed or understood, though in the Latin before an infinitive, there is an accusative. 3. That there is no adjective but has a relation to some substantive. 4. That there is no genitive case but is governed by some other noun. This rule does not so apparently hold in the modern, as in the ancient languages, as the particle *of, de*, &c. which are the proper signs of the genitive case, are frequently used as prepositions. 5. That the regimen of verbs is frequently laid upon different kinds of relations, according to custom or usage, which yet does not change the specific relation of each case, but only shews that custom has made choice of this or that according to fancy. Sometimes these different governments have a power of changing the sense according to the different custom of languages, in which case the particular use of languages must be always consulted. There is one very common fault committed in regimen, which should be carefully avoided by accurate writers, viz. the using two verbs that require different cases together, as only governing one case, as in this example, "after embracing and giving his blessing to his son," where, "embracing," requires an accusative case, and "giving," a dative. The same is to be observed in the regimen of nouns.

PROSODY.

Prosody comprises, 1. The accenting of the syllables of a word. 2. The giving of a syllable its proper quantity; and 3. The manner of making verses. The two first parts are, in a great measure, dependent on one another; and in some languages, as the English, they are nearly the same: on these depend the pronunciation of words. The accent of syllables relates chiefly to the stress and tone of voice in pronouncing them; in English, we lay the stress on the long syllable. The proper accenting of words ought to be well understood; since nothing is more harsh and disagreeable to the ear, than to hear a person speak or read with wrong accents: and, indeed, in English, the same word is often both a noun and a verb, distinguished only by the accent, which is on the first syllable of the noun, and on the last verb; as *férment* and *fermént*,

récord and *recórd*, &c. We are to observe also, that in order to a just expression of words, some require only a single accent on the long syllable; as in *tórmént*, &c. but in others it should be marked double, as in *ánímal*, because it is pronounced as if the letter was writ double, viz. *ánnímal*. The rules for the accent or quantity of English words are not easily to be given, being subject to innumerable exceptions. The following we shall give from Dr. Johnson.

1. Of dissyllables formed by affixing a termination, the former syllable is commonly accented, as *childish*, *kingdom*, *áctest*, *ácted*, *tóilsome*, *lóver*, *schóffer*, *fairer*, *fóremost*, *zéalous*, *fúlness*, *gódly*, *méckly*, *ártist*.

2. Dissyllables formed by prefixing a syllable to the radical word, have commonly the accent on the latter; as *to begét*, *to beséem*, *to bestów*.

3. Of dissyllables, which are at once nouns and verbs, the verb has commonly the accent on the latter, and the noun on the former syllable; as, *to descánt*, *a descánt*; *to cemént*, *a cemént*; *to contráct*, *a contráct*.

This rule has many exceptions. Though verbs seldom have their accent on the former, yet nouns often have it on the latter syllable; as *delight*, *perfúme*.

4. All dissyllables ending in *y*, as *cránny*; in *our*, as *labóur*, *fávour*; in *ow*, as *willow*, *wállow*; except *allow*; in *le*, as *báttle*, *bíble*; in *ish*, as *bánish*; in *e*, as *cámbric*, *cássoc*; in *ter*, as *bátter*; in *age*, as *cóurage*; in *en*, as *fásten*; in *et*, as *quíet*, accent the former syllable.

5. Dissyllable nouns in *er*, as *cánker*, *bútter*, have the accent on the former syllable.

6. Dissyllable verbs terminating in a consonant and *e* final, as *comprise*, *escápe*; or having a diphthong in the last syllable, as *appéase*, *revéál*; or ending in two consonants, as *atténd*, have the accent on the latter syllable.

7. Dissyllable nouns having a diphthong in the latter syllable, have commonly their accent on the latter syllable, as *appláuse*; except words in *ain*, as *cértaín*, *mountáin*.

8. Trissyllables formed by adding a termination, or prefixing a syllable, retain the accent of the radical word, as *lovéliness*, *ténderness*, *contémner*, *wágonner*, *physícal*, *bespáttér*, *commenting*, *commendéng*, *assúrance*.

9. Trissyllables ending in *ous*, as *grácíous*, *árduous*; in *al*, as *cápítal*; in *ion*, as *méntion*, accent the first.

10. Trissyllables ending in *ce*, *ent*, and *ate*, accent the first syllable, as *counténance*, *contínence*, *ármament*, *ímminent*, *élegant*, *própagate*, except they be derived from words having the accent on the last, as *comívance*, *acquáintance*; or the middle syllable hath a vowel before two consonants, as *promúlgate*.

11. Trissyllables ending in *y*, as *éntity*, *spécify*, *liberty*, *victory*, *subsidy*, commonly accent the first syllable.

12. Trissyllables in *re* or *le* accent the first syllable, as *légible*, *théâtre*, except *disciple*, and some words which have a position, as *exámple*, *épístle*.

13. Trissyllables in *ude* commonly accent the first syllable, as *plénitude*.

14. Trissyllables ending in *ator*, *atour*, as *créator*, or having in the middle syllable a diphthong, as *endeávour*; or a vowel before two consonants, as *doméstic*, accent the middle syllable.

15. Trissyllables that have their accent on the last syllable are commonly French, as *acquiesce*, *repurtée*, *magazíne*, or words formed by prefixing one or two syllables to an acute syllable, as *immátüre*, *overchárge*.

16. Polysyllables, or words of more than three syllables, follow the accent of the words from which they are derived, as *árrogátíng*, *contínency*, *incóntinently*, *comméndable*, *commúnícableness*. We should, therefore, say, *disputáble*, *indisputáble*, rather than *disputable*, *indisputable*; and *advertísément* rather than *advértisement*.

17. Words in *ion* have the accent upon the antepenult, as *salvátion*, *perturbátion*, *concóction*; words in *atour* or *ator* on the penult, as *dedicátor*.

18. Words ending in *le* commonly have the accent on the first syllable, as *ámicable*, unless the second syllable have a vowel before two consonants, as *combústible*.

19. Words ending in *ous*, have the accent on the antepenult, as *uxúrious*, *volúptuous*.

20, Words ending in *ty* have their accent on the antepenult, as *pustillanimit̃y, activity*.

These rules are not advanced as complete or infallible, but proposed as useful. Almost every rule of every language has its exceptions; and in English, as in other tongues, much must be learned by example and authority. Perhaps more and better rules may be given that have escaped my observation.

Quantity ascertains the time in which a syllable is pronounced, determining it to be long or short. Quantity distinguishes verse from prose; and the economy and arrangement of quantities, that is, the distribution of long and short syllables, makes what we call the metre. The quantities are distinguished, among grammarians, by the characters *u*, short, as *p̃er*; and *-*, long, as *r̃os*. There is also a common, variable, or dubious quantity; that is, syllables that are one time taken for short ones, and at another time for long ones, as the first syllable in *A'tlas, p̃atres, &c.* Feet are made up of quantities. The quantity of a syllable is either natural or accidental: natural quantity is that taken from the nature of the vowel, as *re* in *resisto*, is short, and *de* in *depello* is long. Accidental quantity is that departing from the natural quantity, merely by accident, as *re* in *restiti* is long, because it is immediately followed by two consonants; and *de* in *deamo* is short, because it immediately precedes a vowel. The quantity of syllables is known two ways. 1. By rules for that purpose. And, 2. By authority. The rules for this end are taught by that part of grammar called prosody; the authority made use of in this case is no more than examples from, or the testimony of, approved authors; and is never used but either when the rules are deficient, or when we are unacquainted with them. The quantity of the syllables is but little fixed in the modern tongues; and there is still less regard paid to it in the composition of modern verses. The want of feet, or rather the shortness and uniformity of our feet, makes a great difference between the numbers of the ancient and modern verse.

Versification is the disposing of long and short syllables in a discourse, so that they may run with an agreeable cadence, the like being also reiterated in the course of the piece. This repetition, according to Bossu, is necessary to distinguish the notion of verse from that of prose; for in prose, as well as verse, each period and member are parts of a discourse, consisting of a certain number of long and short syllables; only prose is continually diversifying its measures and cadences, and verse regularly repeating them. This repetition of the poets appears even in the manner of writing; for one verse being finished, they return to the beginning of another line, to write the verse following, and it is to this return, that verse owes its name. Verses are sometimes denominated from the number of feet, whereof they are composed, as the monometer, dimeter, trimeter, tetrameter, pentameter, hexameter, &c. See HEXAMETER, &c. Some also, from the kinds of feet used in them, as the pyrrhichion, proceleusmatic, iambic, trochaic, &c. See PYRRHICHION, &c. Sometimes verses are denominated from the names of the inventors, or the authors who have used them with most success, as the anacreontic, archilochian, asclepiæ, alcaic, sapphic, &c. See ANACREONTIC, &c. The moderns have invented heroic or alexandrine verses; the ancients likewise invented various kinds of poetical devices in verse, as centos, echos, &c. See ALEXANDRINE, &c.

The feet of our verses are either iambic, as *alóft, creáte*; or, trochaic, as *hóly, léfty*.

Our iambic measure comprises verses of four syllables.

With ravish'd ears
The monarch hears.

Of six,

Thus while we are abroad,
Shall we not touch our lyre?
Shall we not sing an ode?
Or shall that holy fire,
In us that strongly glow'd,
In this cold air expire?

Of eight, which is the usual measure of short poems,

And may at last my weary age
Find out the peaceful hermitage,
The hairy gown, and mossy cell
Where I may sit, and nightly spell
Of ev'ry star the sky doth shew,
And ev'ry herb that sips the dew.

Of ten, which is the common measure of heroic and tragic poetry,

The courts are filled with a tumultuous din
Of crowds, or issuing forth, or entering in:
A thorough-fare of news; where some devise
Things never heard, some mingle truth with lies:
The troubled air with empty sounds they beat,
Intent to hear, and eager to repeat.

In all these measures the accents are to be placed on even syllables; and every line considered by itself is more harmonious, as this rule is more strictly observed. The variations necessary to pleasure belong to the art of poetry, not the rules of grammar.

Our trochaic measures are

Of three syllables,

Here we may
Think and pray
Before death
Stops our breath;
Other joys
Are but toys.

Of five,

In the days of old,
Stories plainly told,
Lovers felt annoy.

Of seven,

Fairest piece of welform'd earth,
Urge not thus your haughty birth.

In these measures the accent is to be placed on the odd syllables.

These are the measures which are now in use, and above the rest those of seven, eight, and ten syllables. However, various other kinds of verses have been invented, and used by different poets, as above observed.

The authors who have written on grammar are innumerable. The grammar of the English language by Dr. Louth, and that by Lindley Murray, are deservedly held in high estimation.

GRAMMAR, PHILOSOPHIC, OR UNIVERSAL. "Grammar," says the Rev. Mr. Bruce, "considered as an art, necessarily supposes the previous existence of language; and as its design is to teach any language to those who are ignorant of it, it must be adapted to the genius of that particular language of which it treats. But grammar, considered as a science, views language only as it is significant of thought. Neglecting particular and arbitrary modifications introduced for the sake of beauty or elegance, it examines the analogy and relation between words and ideas; distinguishes between those particulars, which are essential to language, and those which are only accidental; and thus furnishes a certain stand-

ard, by which different languages may be compared, and their several excellencies or defects pointed out. This is what is called Philosophic or Universal Grammar." Encyc. Brit. See LANGUAGE.

GRAMMARIAN, was anciently a title of honour, literature, and erudition, being given to persons accounted learned in any art or faculty. But it is now often used as a term of reproach, to signify a plodding person, employed about words and phrases, but inattentive to the beauties of expression and delicacy of sentiment. The ancient grammarians, called also philologers, must not be confounded with the grammatists, whose business was to teach children the first elements

elements of language. Varro, Cicero, Messala, and even Julius Caesar, thought it no dishonour to be ranked as grammarians, who had many privileges granted to them by the Roman emperors.

GRAMMONT, a town of France, in the department of Upper Vienne, and late province of Limosine, 15 miles N.E. of Limoges.

GRAMMONT, or **GEERSBERGH**, a town of France, in the department of the Scheldt, and late province of Austrian Flanders, 17 miles S. E. of Ghent, and 20 miles W. of Brussels.

GRAMPIAN HILLS, a chain of mountains in Scotland, which run from E. to W. almost the whole breadth of the kingdom.

GRAMPOUND, a town of England, in Cornwall, 46 miles S. W. of Launceston.

GRAN, or **ESZTERGAN**, a large and strong town of Hungary, 55 miles S. E. of Presburg.

GRANADA, a province of Spain, which was long an independent kingdom. It made a part of the ancient Bætica; and was inhabited by the Bastuli, the Sexitani, &c. It is sometimes called Upper Andalusia. It is bounded on the S. and E. by the Mediterranean, on the W. and N. by Lower Andalusia, and on the N. E. by Murcia. Its extent from W. to E. is 210 miles; but its greatest breadth exceeds not 80. The air is temperate and healthy; and though there are many mountains in the province, and some of them very high, yet they are almost every where covered with vines and fruit-trees, together with laurel, myrtle, sweet basil, thyme, lavender, marjoram, and other aromatic herbs; which give an exquisite taste to the flesh of their sheep and cattle. A great deal of silk and sugar, flax and hemp, honey and wax, is also produced here; besides dates and acorns, superior to the finest nuts; good stone for building; several sorts of gems; sumach, used in dressing goat-skins; and galls, of which a dye is made for leather. The valleys, with which the mountains are interspersed, are extremely beautiful and fertile.

GRANADA, the capital of the above province, is 125 miles S. W. of Murcia, and 183 S. of Madrid. Lon. 3. 30. W. Lat. 37. 17. N.

GRANADA, NEW, a province of S. America, in Terra Firma, about 75 miles in length, and as much in breadth. It is bounded on the N. by Carthagena and St. Martha, on the E. by Venezuela, on the S. by Popayan, and on the W. by Darien. It contains mines of gold, copper, and iron; horses, mules, good pastures, corn, and fruits. It belongs to the Spaniards, and Santa Fe de Bagota is the capital.

GRANADE. See **GRENADE**.

GRANADIER. See **GRENADIER**.

GRANADILLOES, or **GRENADINES**, dangerous islands of the Caribbees, in America, having St. Vincent on the N. and Granada on the S.

GRANARD, or **GRENARD**, a borough and post-town of Ireland, in Longford, Leinster; 52 miles from Dublin, and 16 S. of Cavan.

GRANARY, a building in which corn is deposited, especially when designed to be kept for a considerable time. In constructing granaries, the principal objects are, strength or solidity of the edifice, and its exposure to the most drying winds. In the county of Kent, previously to removing the corn to such a magazine, it is tossed with a shovel from one end of a large room to the other; by which means the lighter substances fall into the middle, while the ripe grain only is collected at the sides or extremities of the room. The corn is then screened, and conveyed to the granaries, where it is spread to the depth of half a foot on the floor, and turned twice in the week: the operation of screening is repeated once a week. At the expiration of two months, the corn is heaped up to the thickness of a foot, for a similar period, during which it is turned once, or, if the weather be damp, twice in the week, and is also occasionally screened. At the end of five or six months, the heaps are enlarged to the height of two feet, and turned once or twice in a month, the operation of screening being likewise from time to time continued. When grain has thus lain for one year, the quantity is increased to the thickness of two and a half or three feet; it is turned once in the course of three weeks or a month, and screened accordingly. At the expiration of two or three years, it is moved only once in two months, and screened every quarter; but, in proportion to the length of time it is kept, the turning, &c. should be more frequently repeated, in

consequence of which the grain will be much improved. In storing corn, it is requisite to leave an area of a yard in width on every side of each heap, into which the corn should be tossed as often as appears necessary. In the Kentish granaries, two square holes are made at each end of the floor, and a circular one in the middle of the building, through which the corn is shifted from the upper rooms into those below, and again from the lower rooms into the upper ones, in order that it may be the more effectually turned and aired. The screens or frames employed for sifting the corn are made with two partitions, for the purpose of separating the pure grain from the dust, which falls into a bag. By these precautions, corn has often been preserved sound and pure for thirty years; and it is a circumstance worthy of notice that, though by long keeping the grain decreases in bulk, yet it will yield proportionably more flour, and the bread will likewise be whiter and more wholesome; as the superfluous moisture only evaporates during the frequent airing. M. Du Hamel, and Dr. Hales, have recommended various contrivances for ventilating, or introducing fresh air through corn deposited in granaries, with a view to preserve it sweet and dry, as well as to secure it from weevils or other insects. This object is to be effected, by constructing granaries with lattice-work, and hair-cloth at the bottom. The ventilators for supplying fresh air may be affixed to the wall, either within or on the outside of the granary, beneath the floor, or in the ceiling; but, in the former case, it will be necessary to place the handle of the lever externally, as otherwise the person working the machinery would be exposed to suffocation, when the corn is fumigated with sulphur for the expulsion of weevils. Small moveable ventilators may be constructed on this plan, for ventilating corn in large bins deposited in granaries. Similar contrivances may be applied to the lowest floors of small magazines, so as to be worked by men standing on the ground, either within or without the buildings. In the eighth volume of the "Letters and Papers of the Bath and West of England Society," &c. Thomas South, Esq. gives a description of a cheap and efficacious ventilator, for preserving corn on ship-board. This machine consists of a forcing-pump, with perforated tubes annexed to it; and by means of which fresh air may be communicated to every part of the cargo. Mr. South's air-vessel is, for the sake of cheapness, confined to a diameter of ten inches; but he observes, that, if the latter be enlarged to fourteen inches, the effect of the machine will be nearly doubled; and if the length of the trough (by the suction-valve) be extended ten inches, a power will be obtained capable of ventilating a cargo of 400 tons in the course of one hour. To preserve corn in barns or granaries, Dr. Darwin observes, it is requisite first to make them dry, and, secondly, to keep them in that state; because no seeds will vegetate without moisture. In order to dry seeds, the heaps should be frequently turned over in warm dry weather; hence, in this climate, the doors and windows of granaries should open towards the south, for the reception of the warmth of the sun, with air-holes round the building, for sufficient ventilation; and which apertures ought to be sheltered from rain or snow, by boards placed for that purpose on the outside.—Heaps of corn should be surrounded with planks, in order to prevent them from touching either brick or stone walls; because, when cold north-east winds are succeeded by moist and warm south-west winds, such walls frequently precipitate the moisture from the atmosphere, and communicate it to those bodies which are in contact with them. According to Mr. Tull, the safest method of preserving a large quantity of wheat is, to dry it gradually in a malt-kiln on an air-cloth, with no other fuel than clean straw, and with a heat scarcely exceeding that produced by the rays of the sun. In this temperature, the grain is to remain from four to twelve hours, in proportion to its previous dampness. The vegetative principle of the corn is not destroyed by this process; as instances have occurred of its growing when sown, after it had been thus treated and kept for seven years. The preservation of grain from the ravages of insects may be effected by timely and frequent screening, and ventilation; as little or no inconvenience will follow corn or malt lodged dry, but what evidently results from a neglect of these precautions. For, whether the obvious damage arise from the weevil, the moth, or the beetle, that damage has ceased at the time the vermin make their appearance under either of these species, they being, when in this last state of existence, only propagators of their respective kinds of vermiculi;

culi; which, while they continue in that form do the mischief. In this last, or insect-state, they eat little, their principal business being to deposit their eggs, which unerring instinct prompts them to do where large collections of grain furnish food for their successors while in a vermicular state. It is therefore the business of industry to prevent future generations of these ravagers, by destroying the eggs previous to their hatching; and this is best accomplished by frequent screening, and exposure to draughts of wind or fresh air. By frequently stirring the grain, the cohesion of their eggs is broken, and the nidus of those minute worms is destroyed, which on hatching collect together, and weave numerous nests of a cobweb-like substance for their security. To these nests they attach, by an infinity of small threads, many grains of corn together, first for their protection, and then for their food. When their habitations are broken and separated by the screen, they fall through its small interstices, and may be easily removed from the granary with the dust. Those that escape an early screening will be destroyed by subsequent ones, while the grain is but little injured; and the corn will acquire thereby a superior purity. But by inattention to this, and sometimes by receiving grain already infected into the granary, these vermin, particularly the weevil, will soon spread themselves in that state every where upon the surface, and darken the walls by their number. Under such circumstances hens, with new hatched chickens, if turned on the heap, will traverse, without feeding (or very sparingly so) on the corn, wherever they spread; as they seem insatiable in the pursuit of these insects. When the numbers are reduced within reach, a hen will fly up against the walls, and brush them down with her wings, while her chickens seize them with the greatest avidity. This being repeated as often as they want food, the whole species will in a day or two be destroyed. Of the phalana, or moth, and the small beetle, they seem equally voracious: on which account they may be deemed the most-useful instruments in nature for eradicating these noxious and destructive vermin.

GRANATITE, Cross-Stone, a mineral found in Spain, France, and Switzerland. It is crystallized in a very peculiar form; two six-sided prisms intersect each other at right angles, or obliquely. Hence its name, cross-stone. It is of a reddish brown colour: specific gravity 3.3, nearly; fusible before the blow-pipe: its component parts are,

Silica	33
Alumina	44
Lime	3.84
Oxide of iron	13
Oxide of manganese	1
Matter lost	5.16

100

GRAND ASSIZE. See **ASSIZE**.

GRAND DISTRESS, [*districtio magna*, Lat.] in English law, a writ of distress, so called on account of its extent, which reaches to all the goods and chattels of the party within the county. This writ lies in two cases: either when the tenant or defendant is attached and appears not, but makes default; or where the tenant or defendant hath once appeared, and after makes default. On such occasions, this writ lies by common law, in lieu of a petit cape.

GRAND GUSTO, among painters, a term used to express that there is something in the picture very great and extraordinary, calculated to surprise, please, and instruct.

GRAND JURY, GRAND LARCENY, &c. See **JURY, LARCENY, &c.**

GRAND LAKE, a lake of North America, in New Brunswick, near St. John's river, 30 miles long, from 8 to 10 broad, and in some places 40 fathoms deep.

GRAND RIVER, or **RIO GRANDE**, a river in Africa, which runs into the Atlantic, in Lon. 13. 50. W. Lat. 11. 0. N.

GRAND RIVER, a river of North America, which runs N. W. into Lake Erie, 80 miles S. W. of Presque Isle.

GRANDE, two rivers of South America; 1. in Peru, near Cayanta, whose sands are rich in gold; 2. in Brasil.

GRANDEE, in Spain, is used absolutely to denote the prime

lords of the court, to whom the king has once given leave to be covered in his presence: there are some grantees for life only; made by the king's saying simply, Be covered. Others are grantees by descent; made by the king's saying, Be covered for thyself and heirs. These last are reputed far above the former. Some have three or four grandeeships in their family.

GRANDEUR. See **SUBLIMITY**.

GRANDS SEAUX, or GREAT SEALS, a nation of North American Indians, who inhabit the country S. of the Missouri. They have about 300 warriors.

GRANDVILLE, a town of France in the department of the Channel, and late province of Normandy, 15 miles S. by E. of Coutances.

GRANITE, a genus of stones of the order petre, belonging to the class saxa. The principal constituent parts of this stone are felt-spar or rhombic quartz, mica, and quartz. These ingredients constitute the hardest sort of granite, and that most anciently known. That into which schoerl enters is more subject to decomposition. They never have any particular texture or regular form, but consist of enormous shapeless masses extremely hard. In the finer granites the quartz is transparent; in others generally white or grey, violet or brown. The felt-spar is generally the most copious ingredient, and of a white, yellow, red, black, or brown colour. The mica is also grey, brown, yellow, green, red, violet, or black; and commonly the least copious. The schoerl is generally black, and abounds in the granites that contain it. Hence the colour of the granites depends principally on that of the spar or schoerl. The red granites consist commonly of white quartz, red felt-spar, and grey mica; the grey ones of white quartz, grey or violet felt-spar, and black mica. The black granites commonly contain schoerl instead of felt-spar; and the green usually contain green quartz. On exposing granite to the flame of the blow-pipe, the component ingredients separate from one another. Mr. Gerhardt, having melted some in a crucible, found the felt-spar run into a transparent glass; below it the mica lay in form of black flag, the quartz remaining unaltered. It melted somewhat better when all the three were powdered and mixed together; though even then the quartz was still discernible by a magnifying glass. Hence we may explain the reason why grains of a white colour are sometimes found in volcanic lavas. The mixture of mica prevents the siliceous or quartz from splitting or cracking; and hence its infusibility and use in furnace-building. Granites are seldom slaty or laminated. In those of a close texture, the quartz and schoerl predominate. They take a good polish; for which reason the Egyptians formerly, and the Italians still, work them into large pieces of ornamental architecture, for which they are extremely fit, as not being liable to decay in the air.

GRANSON, a town of the Helvetic republic, in Neuchâtel, 16 miles S. W. of Neuchâtel.

GRANT, in law, a conveyance in writing of such things as cannot pass or be conveyed by word only; such are rents, reversions, services, advowsons in gross, tithes, &c. The person making such a conveyance is called the grantor, and he to whom the grant is made, the grantee.

GRANTHAM, a town of Lincolnshire, 30 miles S. of Lincoln, and 110 N. of London.

GRANVILLE, a fertile county of North Carolina, in Hills-bury district, bounded on the N. by Virginia.

GRANULATION, in chemistry, is an operation by which metallic substances are reduced into small roundish particles, to facilitate their combination with other substances. This operation consists only in pouring the melted metal slowly into a vessel filled with water, which is in the mean time to be agitated with a broom. With melted copper, however, which is apt to explode with great violence on the contact of water, some precautions are to be observed. In the brass-works at Bristol, copper is granulated, without danger of explosion, by letting it fall in small drops into a large cistern of cold water covered with a brass-plate. In the middle of the plate is an aperture; in which is secured with Sturbridge clay a small vessel, whose capacity does not exceed a spoonful, perforated with many minute holes through which the copper passes. A stream of cold water passes through the cistern. If allowed to grow hot the copper will fall to the bottom and run into flat plates instead of granulating. Lead or tin may be granulated by pouring them when melted into a box; the internal surface

face of which is rubbed with powdered chalk, and the box strongly shaken till the grains have become solid.

GRAPE HYACINTH. See **HYACINTHUS**.

GRAPEs, in the manege, a term used to signify the arrests or mangy tumours that happen in the horse's legs.

GRAPE-SHOT, in artillery, is a combination of small shot, put into a thick canvas-bag, and corded strongly together, so as to form a kind of cylinder, whose diameter is equal to that of the ball adapted to the cannon. The number of shot in a grape varies according to the service or size of the guns: in the sea-service nine is always the number; but by land it is increased to any number or size, from an ounce and a quarter in weight to three or four pounds. In sea-service the bottoms and pins are made of iron, whereas those used by land are of wood.

GRAPHITES, in mineralogy, a mineral consisting principally of carbon with a little iron, and generally a little silica or alumina; when pure it burns with a reddish flame, emitting beautiful sparks, and a smell of sulphur, and leaving a little residuum. Its colour is dark iron-grey, or brownish black; when cut, blueish grey. Opaque: structure slaty. Texture fine-grained. Brittle. Specific gravity about 2. Feels somewhat greasy, stains the fingers, and marks strongly. In modern chemistry it is denominated carburet of iron; and one of the species is plumbago; the use of which, when manufactured into pencils, is known to every one. When pure it consists of,

90 carbon

10 iron

100

GRAPHOMETER, a mathematical instrument, otherwise called a semicircle; the use of which is to observe any angle whose vertex is at the centre of the instrument in any plane (though it is most commonly horizontal, or nearly so,) and to find how many degrees it contains. The graphometer is a graduated semicircle, ACB, (Plate LXXVIII. fig. 9 and 10,) made of wood, brass, or the like, and so fixed on a fulcrum, GH, by means of a brass-ball and socket, that it easily turns about, and retains any situation. It has two sights fixed on its diameter, AC, and at the centre there is commonly a magnetical needle and compass in a box. There is likewise a moveable ruler or index, ED, with two sights, P, P, which turns round the centre, and retains any situation given it. To measure by this instrument an angle, ACB, in any plane, and comprehended between the right lines AC and BC, drawn from two points, A and B, to the place of station, C, (fig. 11.) Let the graphometer be placed at C, supported by its fulcrum; and let the immovable sights on the diameter of the instrument, DE, be directed towards the point, A; and likewise while the instrument remains immovable, let the sights of the ruler, FG, which is moveable about the centre, C, be directed to the point, B. Now it is evident, that the moveable ruler cuts off an arch, DG, which is the measure of the angle, ACB, sought. Moreover, by the same method, the inclination of DE, or of FG, may be observed with the meridian-line, which is pointed out by the magnetic needle inclosed in the box, and moveable about the centre of the instrument.

GRAPNELS, a sort of anchor with four flukes, serving for boats to ride by. There is also a kind called fire and chain-grapnels, made with four-barbed claws, instead of flukes; and used to catch hold of the enemy's rigging, or any other part, in order for boarding them. A fire-grapnel, in some respects, resembles the former, but differing in the construction of its flukes, which are furnished with strong barbs on its points. These machines are usually fixed on the yard-arms of a ship, to grapple any adversary whom she intends to board.

GRASHOPPER, or more properly **GRASSHOPPER**, in entomology. See **GRYLUS**.

GRASON, an island in the gulf of Bothnia, near the coast of Sweden, 15 miles long, and 2 broad. Lon. 18. 20. E. Lat. 60. 22. N.

GRASS, in botany, is defined to be a plant having simple leaves, a stem generally jointed and tubular, a husky calyx, called Gluma, and the seed single. Hence wheat, oats, barley, &c. are properly grasses, while clover and some other similar plants are not grasses, though so frequently called by that name. Of grass

the leaves are food for cattle, the small seeds for birds, and the larger grain chiefly for man. And it is observable, that nature has so provided, that cattle (in grazing) seldom eat the flower intended to produce seed, unless compelled by hunger. For the culture of the principal sorts of grasses, see **HUSBANDRY**.

GRASSE, a town of France, in the department of Var, and late province of Provence. Lon. 6. 56. E. Lat. 43. 39. N.

GRATINGS, in a ship, are small edges of sawed plank, framed one into another like a lattice or prison grate, lying on the upper deck, between the main-mast and fore-mast, serving for a defence in a close fight, and also for the coolness, light, and convenience, of the ship's company.

GRATIOLA, **HEDGE-HYSSOP**; a genus of the monogynia order, and diandria class of plants; natural order, Personatæ. Corolla irregular; stamina, two, barren; capsule bilocular; calyx seven-leaved, with the two exterior ones patulous. It has twelve species.

GRATIOSA, or **GRACIOSA**, one of the Canary islands. Also one of the Azores.

GRATITUDE, in ethics, is a virtue disposing the mind to an inward sense and outward acknowledgement of benefits received. Examples of ingratitude, Mr. Paley observes, check and discourage voluntary beneficence; hence the cultivation of a grateful temper is a consideration of public importance. A second reason for cultivating in ourselves that temper is: that the same principle which is touched with the kindness of a human benefactor, is capable of being affected by the divine goodness, and of becoming, under the influence of that affection, a source of the purest and most exalted virtue. The love of God is the sublimest gratitude. It is a mistake, therefore, to imagine, that this virtue is omitted in the Scriptures; for every precept, which commands us "to love God, because he first loved us," pre-supposes the principle of gratitude, and directs it to its proper object.

GRATZ, or **GRAZ**, a handsome town of Germany, capital of Stiria. Lon. 15. 26. E. Lat. 47. 4. N.

GRATZ, a town of Silesia, four miles S. of Trappau.

GRAUDENTZ, or **GRUDFIANDS**, a town of the late Polish Prussia, and present duchy of Warsaw, in the palatinate of Culm, thirty miles N. of Thorn.

GRAVE, [*gravis*,] in grammar, a species of accent opposite to acute. The grave accent is expressed thus ('); and shews, that the voice is to be depressed, and the syllable over which it is placed pronounced in a low deep tone.

GRAVE, in music, is applied to a sound which is in a low or deep tone. The thicker the chord or string, the more grave the tone or note, and the smaller the acuter. Notes are supposed to be the more grave, in proportion as the vibrations of the chord are less quick.

GRAVE, in the Italian music, serves to denote the slowest movement.

GRAVE, in geography, a city of Batavia, in the department of the Dommel and Scheldt, and late province of Dutch Brabant, eight miles S. of Nimeguen.

GRAVEL, in medicine, is a disorder affecting chiefly the bladder and ureters; it is occasioned by a sandy or gritty substance which collects in those parts, produces considerable pain, and at length obstructs the due secretion and excretion of the urine.

GRAVEL, in agriculture and gardening, is a congeries of pebbles; which, if mixed with stiff loam, make excellent and durable gravel-walks. For this purpose, the bottom should be laid with lime-rubbish, large flints, or any other hard substance, to the depth of six or eight inches, in order to prevent any weeds from shooting through the surface. Over this stratum, the gravel is to be strewed six or eight inches thick, and somewhat sloping, that all the larger stones may roll off to the sides. The next operation is that of raking, when the large stones are to be removed, and the walks carefully rolled in every direction, especially during or after hard showers: thus they will bind, and become very firm. The most proper gravel for walks, is that which abounds with smooth round pebbles; for these, when mixed with a small portion of loam, are not so liable to be turned up by the feet in walking, as those of a rough and irregular shape.

GRAVELLY LANDS, or **SOILS**, are such as abound with gravel or sand, which easily admit both heat and moisture. They receive but little benefit from the latter, if there be a loose bed at the bot-

tom, because it easily evaporates; but, if the stratum be firm, for instance, clay or stone, the moisture is too long retained, so as to chill the soil and render it unfruitful. The best method of counteracting this inconvenience, is to manure such land with chalk, which is slightly to be ploughed in, that it may not sink too deep into the ground.

GRAVELINES, a very strong town of France, in the department of the North, and late French Flanders, twelve miles E. of Calais. Latitude $50^{\circ} 59' 10''$ N. Longitude from Greenwich $2^{\circ} 7' 35''$ E. It is high water here at the time of the full and change of the moon precisely at noonday.

GRAVENAC, a county of Suabia.

GRAVENAC, the capital of the county, thirty miles W. of Ulm. Lon. 9. 28. E. Lat. 48. 22. N.

GRAVER. See **ENGRAVING**.

GRAVESANDE, **WILLIAM JAMES**, LL. D. and F. R. S. an eminent mathematician, born of an ancient family at Delft in Holland, in 1688. He studied the civil law at Leyden, but mathematical learning was his favourite amusement. When he had taken his degree in 1707, he settled at the Hague, and practised at the bar, in which situation he cultivated an acquaintance with learned men; with a society of whom, he published a periodical review, intitled *Le Journal Littéraire*, which was continued without interruption from 1713 to 1742, when he died. The most considerable of his works are, 1. A Treatise on Perspective: 2. An Introduction to the Newtonian Philosophy, or a Treatise on the Elements of Physics, Confirmed by Experiments: 3. A Treatise on the Elements of Algebra, for the Use of Young Students: and, 4. A Course of Logic and Metaphysics. The ministers of the republic consulted him on many occasions, and his skill in calculation was often of service to them; as well as his address in decyphering the secret correspondence of their enemies. In 1715, he was sent by the States to congratulate king George I. on his accession: and on his return was appointed professor of mathematics and astronomy at Leyden, where he was the first that taught the Newtonian philosophy. He was intimately acquainted with Sir Isaac Newton, as well as with his doctrine.

GRAVESEND, a town of England, in Kent, situated on the banks of the Thames, twenty-three miles from London.

GRAVIMETER, [from *gravis*, weighty, and *metron*, to measure,] an instrument of glass constructed by Citizen Guyton Morveau, for measuring specific gravities: he adopts this name rather than either areometer or hydrometer, because these latter terms are grounded upon the supposition that a fluid is always the thing weighed; whereas, with regard to solids, the liquid is the known term of comparison to which the unknown weight is referred. See **HYDROMETER**, and **HYDROSTATICS**.

GRAVINA, a town of Naples, in the province of Bari. Lon. 17. 0. E. Lat. 41. 0. N.

GRAVITATION, in physiology, a species of attraction, or the tendency of one body towards another, in consequence of a certain power or principle that is found to affect all bodies, but of which the true nature has not yet been discovered. See **PHYSICS**.

GRAVITY, signifies either the force by which bodies are pressed towards the surface of the earth, or the manifest effect of that force; in which last sense the word has the same signification with weight or heaviness. Concerning gravity in the first sense of the word, or that active power by which all bodies are impelled towards the earth, there have been great disputes. Many eminent philosophers, and among the rest Sir Isaac Newton himself, have considered it as the first of all second causes; an incorporeal or spiritual substance; which never can be perceived any other way than by its effects: an universal property of matter, &c. Others have attempted to explain the phenomena of gravitation by the action of a very subtle ethereal fluid. Sir Isaac Newton observes, that bodies immersed in fluids have two kinds of gravity, the one absolute, and the other relative. Absolute gravity is the whole force wherewith a body tends downwards. Relative gravity is the excess of gravity whereby a body tends downwards more than the fluid which surrounds it. See **PHYSICS**, **PNEUMATICS**, and **HYDROSTATICS**.

GRAVITY, SPECIFIC, denotes the weight belonging to an equal bulk of every different substance. Thus the exact weight of a cubic inch of gold, compared with a cubic inch of water, tin, lead, &c. is called its specific gravity. See **HYDROSTATICS**, and **SPECIFIC GRAVITY**.

GRAY, or **GREY**, a mixed colour, partaking of black and white. In the manege they make several sorts of grays; as the branded or blackened gray, which has spots quite black dispersed here and there. The dappled gray, which has spots of a darker colour than the rest of the body. The light or silver gray, wherein there is but a small mixture of black hairs. The sad or iron gray, which has but a small mixture of white. And the brownish or sandy-coloured gray, where there are bay-coloured hairs mixed with the black.

GRAY, THOMAS, an admired English poet, was the youngest and only surviving son of a reputable citizen of London, and was born in Cornhill in 1716. He was educated at Eton, where he contracted a friendship with Mr. Horace Walpole, and with Mr. Richard West, son of the Lord Chancellor of Ireland. Mr. West and Mr. Gray were both intended for the bar; but the latter was diverted from that pursuit by an invitation to accompany Mr. Walpole in his travels; which he accepted without any determined plan for his future life. During his travels, he wrote a variety of letters to Mr. West and to his parents, which are printed with his poems; and when he returned, finding himself in narrow circumstances, yet with a mind not disposed for active employment, he retired to Cambridge, and devoted himself to study. Soon after his return, his friend West died; and the melancholy impressed on him by this event may be traced in his admired elegy written in a country church-yard, which is thought to have been begun at this time. The first impulse of his sorrow for the death of his friend gave birth to a very tender sonnet in English, on the model of Petrarch; and also to a sublime apostrophe in hexameters, written in genuine classical majesty, with which he intended to begin one of his books *De Principiis Cogitandi*. From the winter of 1742, to his death, his principal residence was at Cambridge, where, in 1763, he became professor of modern history. He died of the gout in 1771, and was buried with his family at Stoke Poges, in Buckinghamshire. The odes of Gray possess uncommon merit, and his Elegy in a Country Church-yard has obtained almost an unexampled run. His letters are instructive and entertaining.

GRAYS, or **GRAYS-THURROCK**, a town of England in Essex, twenty-four miles E. of London.

GREAT BEAR LAKE, a water in the N. W. part of North America, which runs W. into M'Kenzie's River, near the Arctic circle. Its mouth is 250 yards wide.

GREAT BRITAIN. See **BRITAIN**, **ENGLAND**, and **SCOTLAND**.

GREAVES, JOHN, an eminent physician and antiquary, the eldest son of John Greaves rector of Colemore, near Alresford in Hampshire. He was born in 1602, and educated at Balliol College in Oxford, from which he removed to Merton. He was afterwards chosen professor of geometry in Gresham College, and was soon afterwards sent by archbishop Laud to the east, where he made a large collection of oriental MSS. coins, and medals. He also took a careful survey and measurement of the Egyptian pyramids, and made many astronomical observations. After his return in 1640 he was chosen Savilian professor of astronomy at Oxford, but was obliged to resign the professorship by the persecution of the parliamentary visitors. He died in 1652. He wrote *Pyramidographia*, or a Description of the Pyramids in Egypt; *A Discourse on the Roman Foot and Denarius*; and other valuable works.

GREECE, in many respects, one of the most deservedly celebrated countries in the world, was anciently bounded on the N. by Macedonia and the river Strymon; on the W. by the Ionian sea; on the S. by the Mediterranean; on the E. by the Egean Sea and the Archipelago. It extended from the Strymon, by which it was parted from Thrace, to the promontory of Tenarus, the southmost point of the Peloponnesus, now the Morea, about $6^{\circ} 20'$ of latitude, or nearly 440 English miles, and in breadth from E. to W. about 359 miles. The general names by which the inhabitants of this country were known to the ancients were those of Graioi, or Graicoi, from whence the name of Greece is plainly derived. These names are thought to come from Græcus, the father, or (according to some) the son, of Thessalus, who gave name to Thessaly; but some modern critics derive it from *Raga*, the same with *Reu*, the son of Peleg, by the transposition of a letter to soften the sound. These names were afterwards changed for Achæi, or Achivi, and Hellenes, the first, as is supposed, from *Achæus*, the son of Xuthus, the son of Hellen, and father of Ion;

or,

or, according to the fable, the son of Jupiter: the other from Helen, above-mentioned, the son of Deucalion, and father of Dorus, from whom came the Doreans, afterwards a famous nation among the Greeks. Another name by which the Greeks were known in some parts of the country, was that of Pelasgi, which the Arcadians, the most ancient people in Greece, deduced from their pretended founder Pelasgus; who is said to have got such footing in Peloponnesus, that the whole peninsula from him was called Pelasgia. But the most ancient name of all is universally allowed to have been that of Iones, which the Greeks themselves derived from Ion the son of Xuthus; or, as the fable hath it, of Apollo, by Creusa the daughter of Erechtheus the grandson of Deucalion. Josephus, however, affirms, that their original is of much older date; and that Javan, the son of Japhet, and grandson of Noah, was the first who peopled these countries; which Bochart has also rendered very probable. It is true, indeed, that among the Greeks themselves, only the Athenians, and such colonies as sprung from them, were called Iones; but it is also plain, beyond exception, that other nations gave this name to all the inhabitants of Greece.

GREECE, MODERN, now called **EUROPEAN TURKEY**, and by the Turks **RUMELIA**, comprehends Macedonia; Albania, now called **Arnaut**; Epirus, Thessaly, now **Jana**; Achaia, now **Livadia**; the Peloponnesus, now **Morea**; together with the islands on its coasts, and in the Archipelago. The air is extremely temperate and healthy: and the soil fruitful, though badly cultivated; yielding corn, wine, delicious fruits, and abounding with cattle, fowls, and venison.

GREEK CHURCH, is that part of the Christian church which is established in Greece; extending likewise to some other parts of Turkey. It is so called, in contradistinction from the Latin or Romish church; also the Eastern Church, in distinction from the Western. The Romanists call the Greek church the Greek Schism; because the Greeks do not allow the authority of the pope, but depend wholly, as to matters of religion, on their own patriarchs. They have treated them as schismatics ever since the revolt, as they call it, of the patriarch Photius.

GREEK LANGUAGE, as preserved in the writings of the celebrated authors of antiquity, Homer, Hesiod, Demosthenes, Aristotle, Plato, Xenophon, &c. has a great variety of terms and expressions, suitable to the genius and occasions of a polite and learned people, who had a taste for arts and sciences. In it, proper names are significant; which is the reason that the modern languages borrow so many terms from it. When any new invention, instrument, machine, or the like, is discovered, recourse is generally had to the Greek for a name to it; the facility wherewith words are there compounded, affording such as will be expressive of its use; such are, barometer, hygrometer, microscope, telescope, &c. But of all sciences, medicine most abounds with such terms; as diaphoretic, diagnosis, diarrhoea, hæmorrhage, hydrophobia, phthisis, atrophy, &c.

GREEK ORDERS, in architecture, are the Doric, Ionic, and Corinthian; in contradistinction to the two Latin orders, the Tuscan and Composite. See **ARCHITECTURE**.

GREEN, is one of the original prismatic colours, exhibited by the refraction of the rays of light. See **COLOUR**, and **OPTICS**. The green colour of plants has been shewn, by the French chemists, to depend upon the absorption of carbonic acid, and it is supposed that the leaves of plants have the power of decomposing the carbonic acid and water also; the oxygen they emit, while the carbon and hydrogen enter into the composition of the inflammable parts of the plant.

GREEN, among painters and dyers. See **COLOUR-MAKING** and **DYING**.

GREEN BRIAR, a fertile and extensive county of Virginia, surrounded by those of Bath, Randolph, Harrison, Kanhaway, Botetourt, and Montgomery.

GREENCASTLE, a flourishing town of Pennsylvania, in Franklin county.

GREEN-CLOTH, a board or court of justice, held in the computing-house of the king's household, composed of the lord steward, and officers under him, who sit daily. To this court is committed the charge and oversight of the king's household in matters of justice and government, with a power to correct all offenders, and to maintain the peace of the verge, or jurisdiction of the court royal; which is every way about two hundred yards

from the last gate of the palace where his majesty resides. It takes its name, board of green cloth, from a green cloth spread over the board where they sit. Without a warrant first obtained from this court, none of the king's servants can be arrested for debt.

GREEN-FINCH, in ornithology. See **FRINGILLA**.

GREENHOUSE, or **CONSERVATORY**, a house in a garden, contrived for sheltering and preserving the most curious and tender exotic plants, which in our climate will not bear to be exposed to the open air, especially during the winter-season. These are generally large and beautiful structures, equally ornamental and useful. Their length must be proportioned to the number of plants intended to be preserved in them, and cannot therefore be reduced to rule: but their depth should never be greater than their height in the clear; which, in small or middling houses, may be sixteen or eighteen feet, but in large ones from twenty to twenty-four feet; and the length of the windows should reach from about one foot and a half above the pavement, and within the same distance of the ceiling, which will admit of a cornice round the building over the heads of the windows.

GREENLAND, a general name given to the most easterly parts of America, stretching towards the north pole, and comprehending some islands to the north of Europe, lying in very high latitudes. This country is divided into West and East Greenland.

i. **GREENLAND, EAST**, was long considered as a part of the continent of West Greenland, but is now discovered to be an assemblage of islands lying between $76^{\circ} 46'$ and $80^{\circ} 30'$ lat. N. and between 9° and 20° lon. E. It was discovered by sir Hugh Willoughby in 1553, who called it Groenland; supposing it to be a part of the western continent. In 1595, it was again visited by William Barentz and John Cornelius, two Dutchmen, who pretended to be the original discoverers, and called the country Spitzbergen, or Sharp Mountains, from the many sharp-pointed and rocky mountains with which it abounds. They alleged that the coast discovered by sir Hugh Willoughby was some other country; which according to the Hollanders was delineated on their maps and charts by the name of Willoughby land; whereas, in fact, no such land ever existed; and long before the voyage of these Dutchmen, Stephen Barrows, an English shipmaster, had coasted along a desolate country from lat. 78° to $80^{\circ} 11'$ N. which was undoubtedly Spitzbergen. The sea in the neighbourhood of the islands of Spitzbergen abounds very much with whales. It is the common resort of the whale-fishing ships from different countries, and the country itself is frequently visited by these ships; but till the late voyage of captain Phipps, by order of his Majesty, the situation of it was erroneously laid down. It was imagined that the land stretched to the northward as far as 82° N. lat. but captain Phipps found the most northerly point of land, called Seven Islands, not to exceed $81^{\circ} 30'$. Towards the east he saw other lands at a distance, so that Spitzbergen plainly appeared to be surrounded by water on that side, and not joined to the continent of Asia, as former navigators had supposed. He also explored the north and west coasts, but was prevented by the ice from sailing so far north as he wished. The coast appeared neither habitable nor accessible. It is formed of high, barren, black rocks, without the least marks of vegetation; in many places bare and pointed; in others covered with snow appearing even above the clouds. The valleys between the high cliffs were filled with snow and ice. "This prospect," says captain Phipps, "would have suggested the idea of perpetual winter, had not the mildness of the weather, the smooth water, bright sun-shine, and constant day-light, given a cheerfulness and novelty to the whole of this romantic scene." The current ran along this coast half a knot an hour north. The height of one mountain seen here was found by geometrical mensuration to be the $1503\frac{1}{2}$, or $1503\frac{3}{5}$ feet. By a barometer constructed after De Luc's method, the height was found to be $1588\frac{1}{2}$ feet. On this occasion captain Phipps remarks, "I cannot account for the great difference between the geometrical measure and the barometrical according to M. de Luc's calculation, which amounts to $84\cdot7$ feet. I have no reason to doubt the accuracy of Dr. Irving's observations, which were made with great care. As to the geometrical measure, the agreement of so many triangles, each of which must have discovered even the smallest error, is the most satisfactory proof of its correctness. Since my return I have tried both the theodolite and barometer, to discover whether

whether there was any fault in either; and find them, upon trial, as I had always done before, very accurate."

ii. **GREENLAND, WEST**, is now determined by our latest maps to be a part of the continent of America. That part of it which the Europeans have any knowledge of is bounded on the west by Baffin's Bay, on the south by Davis's Straits, and on the east by the northern part of the Atlantic Ocean. It is very mountainous, and some parts of it are so high, that they can be discerned thirty leagues off from sea. The inland mountains, hills, and rocks, are covered with perpetual snow; but the low lands on the sea-side are clothed with verdure in summer. The coast abounds with inlets, bays, and large rivers, and is surrounded with a vast number of islands of different dimensions. Greenland is thought to contain many mines of metal, though none of them are wrought. To the southward of the Danish colony are some appearances of a mine of copper. This country produces rock-crystals both red and white, and whole mountains of the asbestos, or incombustible flax. Around the colony, which is called Good Hope, they find a kind of bastard marble of various colours, which the natives form into bowls, lamps, pots, &c. The animals which abound most in Greenland are, rein-deer, foxes, hares, dogs, and white bears. The hares are white, and very fat; the foxes are white, greyish, and blueish; and smaller than those of Denmark and Norway. The natives keep a great number of dogs, which are large, white, or speckled, and rough, with upright ears. They are timorous and stupid; and neither bay nor bark, but sometimes howl dismally. The natives yoke them in sledges; which, though heavy laden, they will draw on the ice at the rate of seventy miles in a short winter's day. These poor animals are very ill rewarded for their service; being left to provide for themselves, except when their masters happen to catch a great number of seals, when they are regaled with the blood and entrails. Greenland is frequented by great numbers of ravens, eagles of a prodigious size, falcons, and other birds of prey; besides a kind of linnets, which warble very melodiously. Whales, sword-fish, porpoises, sea-cows, sea-wolves, &c. abound on the coasts; also holybuts, turbot, cod, haddock, &c.

GREENOCK, a sea-port town of Scotland, in Renfrewshire, and one of the ports of Glasgow, 22 miles W. of that city.

GREENSBOROUGH, a post-town of Georgia, 30 miles from Lexington, and 71 W. by S. of Augusta.

GREENSBURG, a post-town of Pennsylvania, capital of Westmoreland county, 31 miles S.E. by E. of Pittsburg.

GREENSICKNESS. See **MEDICINE**.

GREENSVILLE, a county of Virginia, bounded on the west, north, and east, by Brunswick, Southampton, and Sussex counties.

GREENVILLE, a county of South Carolina, in Washington district, bounded on the east and south by Spartanburg and Pendleton counties.

GREENVILLE, or **GREENSVILLE**, a town of South Carolina, in Darlington county, 135 miles N. by E. of Charlestown.

GREENVILLE, a post-town of North Carolina, 23 miles from Washington.

GREEN WAX, is used where estates are delivered to the sheriffs out of the exchequer, under the seal of that court, made in green wax, to be levied in the several counties. It is mentioned in the 43d stat. Ed. III. c. 9, and 7 Hen. IV. c. 4.

GREENWICH, a town of England in Kent, pleasantly situated on the banks of the Thames, 5 miles E. of London. It had formerly a royal palace, built by Humphry, duke of Gloucester, enlarged by Henry VII. and completed by Henry VIII. The latter often chose this town for his place of residence; as did also queen Mary and Elizabeth, who were born in it. D. Humphrey began a tower on the top of the steep hill in the park, which was finished by Henry VII. but afterwards demolished, and a royal observatory erected in its place by Charles II. furnished with mathematical instruments for astronomical observations, and a deep dry well for observing the stars in the day-time. Lat. of the Observatory, 51° 28' 40" N. Lon. from St. Paul's, London, 0° 5' 47" E.

GREGOIE, an island of Africa, in the Jaquin, on the Gold Coast, where the Europeans have factories; 3 miles from the sea.

GREGORIAN CALENDAR, that which shews the new and full moon, with the time of Easter, and the moveable feasts depending thereon, by means of epacts disposed through the several months of the Gregorian year. See **CHRONOLOGY**.

GREGORIAN STYLE, the New Style, now used, which succeeded the Julian style, in Britain in 1752. See **CHRONOLOGY**.

GREGORIAN TELESCOPE. See **OPTICS**.

GREGORIAN YEAR. See **CHRONOLOGY**.

GREGORIO, St. an island of Maritime Austria, in the province of Quarnaro, three miles long, and half a mile broad. The natives deal chiefly in sheep, of which there are 2,500 on the island.

GREGORY XIII. was a native of Bologna, and succeeded Pius V. in 1572. He was the most deeply versed in the canon and civil law of any in his time. He ornamented Rome with many fine buildings, and several fountains. He corrected Gratian's Decretals, and wrote learned notes on them. But his chief merit lies in bringing about the reform of the Calendar, which was effected under his orders by Lewis Lilio, a Roman physician. See **CHRONOLOGY**. A short time before he died he received ambassadors from Japan, acknowledging the authority of the Holy See. He died in 1585, aged 83.

GREGORY, DAVID, F. R. S. Savilian professor of astronomy at Oxford, whom Dr. Smith has termed "subtilissimi ingenii mathematicus," the nephew of James Gregory abovementioned, was born at Aberdeen in 1661, and received the earlier parts of his education in that city. He completed his studies at Edinburgh; and, being possessed of the mathematical papers of his uncle, soon distinguished himself likewise as the heir of his genius. In the 23d year of his age, he was elected professor of mathematics in the university of Edinburgh; and published, in the same year, *Exercitatio Geometrica de Dimensione Figurarum sive Specimen Methodi generalis dimetiendi quasvis Figuras*, Edinburgh; 1684; 4to. He saw very early the excellence of the Newtonian philosophy; and had the merit of being the first who introduced it into the schools by his public lectures at Edinburgh. "He had (says Mr. Whiston) already caused several of his scholars to keep acts, as we call them, upon several branches of the Newtonian philosophy; whilst we at Cambridge, poor wretches, were ignominiously studying the fictitious hypothesis of the Cartesians." In 1691, on the report of Dr. Bernard's intension of resigning the Savilian professorship of astronomy at Oxford, David Gregory went to London; and being patronised by Sir Isaac Newton, and warmly befriended by Mr. Flamsteed, he obtained the vacant professorship, for which Dr. Halley was a competitor. This rivalry, however, instead of animosity, laid the foundation of friendship between these eminent men; and Halley soon after became the colleague of Gregory, by obtaining the professorship of geometry in the same university. Soon after his arrival in London, Mr. Gregory had been elected F. R. S. and, previously to his election into the Savilian professorship, had the degree of M. D. conferred on him by the university of Oxford. In 1693, he published in the *Philosophical Transactions* a resolution of the Florentine problem de Testudine veliformi quadrabili; and he continued to communicate to the public, from time to time, many ingenious mathematical papers by the same channel. In 1695, he printed at Oxford "*Catoptrica et Dioptrica Spherica Elementa*," a work which contains the substance of some of his public lectures at Edinburgh. This valuable treatise was republished first with additions by Dr. William Brown, with the recommendation of Mr. Jones and Dr. Desaguliers; and afterwards by the latter, with an appendix containing an account of the Gregorian and Newtonian telescopes, together with Mr. Hadley's tables for the construction of both those instruments. In the end of this treatise, there is an observation which shews, that what is generally believed to be a discovery of a much later date, the construction of achromatic telescopes, which has been carried to great perfection by Mr. Dollond and Mr. Ramsden, had occurred to the mind of David Gregory, from the reflection on the admirable contrivance of nature in combining the different humours of the eye. See *Catopt. et Dioptr. Sphær. Elem.* Oxon. 1695, p. 98. In 1702, our author published at Oxford, "*Astronomiæ Physicæ et Geometricæ Elementa*," a work which is accounted his master-piece. It is founded on the Newtonian doctrines, and was esteemed by Sir Isaac Newton himself as a most excellent explanation and defence of his philosophy. In 1703, he published a folio edition of Euclid in Greek and Latin. In this work, although it contains all the treatises attributed to Euclid, Dr. Gregory has been careful to point out such as he found reason, from internal evidence, to be the production of some inferior geometrician. Dr. Gregory engaged, soon after, with his colleague

Halley,

Halley, in the publication of Apollonius's Conics, but he had not proceeded far in this undertaking when he died, in the 49th year of his age, at Maidenhead in Berkshire, A. D. 1710. To the genius and abilities of David Gregory, the most celebrated mathematicians of the age, Sir Isaac Newton, Dr. Halley, and Dr. Keill, have given ample testimonies. Besides those works published in his lifetime, he left in MS. "A Short Treatise of the Nature and Arithmetic of Logarithms," which is printed at the end of Dr. Keill's translation of Commandine's Euclid; and "A Treatise of Practical Geometry," which was afterwards translated, and published in 1745, by Mr. Maclaurin. He married, in 1695, Elisabeth, the daughter of Mr. Oliphant of Langtown. By this lady he had four sons, of whom, the eldest, David, was appointed regius professor of modern history at Oxford by king George I. and died in 1767, in an advanced age, after enjoying for many years the dignity of dean of Christ church in that university.

GREGORY, JAMES, F. R. S. one of the most eminent mathematicians of the 17th century, was the second son of the Rev. Mr. Gregory, and was born at Aberdeen in 1638. His mother was a daughter of Mr. David Anderson of Finzaugh, a gentleman who possessed a singular turn for mathematics. This mathematical genius seems to have been hereditary in the family. Alexander Anderson, cousin-german of David, was professor of mathematics at Paris, and published there in 1612, "*Supplementum Apollonii Redivivi, &c.*" The mother of James Gregory inherited the genius of her family; and observing in her son, while yet a child, a strong propensity to mathematics, she instructed him herself in the elements of that science. He received his education in the languages at Aberdeen, and went through the usual course of academical studies in the Marischal college. At the age of 24 he published his treatise, entitled, "*Optica Promota, seu abdita Rationum Reflexorum et Refractorum Mysteria, Geometrice enucleata; cui Subnectitur Appendix Subtilissimorum Astronomice Problematorum Resolutionem Exhibens*;" London, 1663: a work of great genius, in which he gave the world an invention of his own, and one of the most valuable of the modern discoveries, the construction of the reflecting telescope. This discovery attracted the attention of the mathematicians, who were soon convinced of its great importance to the sciences of optics and astronomy. The manner of placing the two specula upon the same axis appearing to Sir Isaac Newton to be attended with the disadvantage of losing the central rays of the larger speculum, he proposed an improvement on the instrument, by giving an oblique position to the smaller speculum, and placing the eye-glass in the side of the tube. But the Newtonian construction of that instrument has been long abandoned for the original or Gregorian, which is now universally employed where the instrument is of a moderate size; though Mr. Herschel has preferred the Newtonian form for the construction of those immense telescopes, which of late years he has so successfully employed in observing the heavens. The university of Padua being then in high reputation for mathematical studies, James Gregory went thither soon after the publication of his first work; and fixing his residence there for some years, he published in 1667, "*Vera Circuli et Hyperbolæ Quadratura*;" in which he propounded another discovery of his own, the invention of an infinitely converging series for the areas of the circle and hyperbole. To these, when republished in 1668, he added a new work, intitled, "*Geometriæ Pars Universalis, inserviens Quantitatum Curvarum Transmutationi et Mensuræ*;" in which he is allowed to have shewn, for the first time, a method for the transmutation of curves. These works attracted the notice, and the correspondence, of the greatest mathematicians of the age, Newton, Huygens, Halley, and Wallis; and their author being soon after chosen F. R. S. of London, contributed to enrich the Philosophical Transactions by many valuable papers. Through this channel, he carried on a dispute with Mr. Huygens, occasioned by his treatise on the quadrature of the circle and hyperbole, to which that able mathematician had started some objections. Of this controversy, it is sufficient to say, that, in the opinion of Leibnitz, (who however allows Mr. Gregory the highest merit,) Mr. Huygens has pointed out, though not errors, some considerable deficiencies in the treatise above mentioned, and shewn a much simpler method of attaining the end in view. In 1668, Mr. Gregory published at London his "*Exercitationes Geometricæ*," which contributed still to extend his reputation. About this time he was elected pro-

fessor of mathematics in the university of St. Andrew's; an office which he held for six years. During his residence there, he married, in 1669, Mary, the daughter of George Jameson the celebrated painter, whom Mr. Walpole has termed the Vandyke of Scotland. In 1674, he was called to fill the mathematical chair in the university of Edinburgh. This place he had held for little more than a year, when, in October 1675, being employed in shewing the satellites of Jupiter through a telescope to some of his pupils, he was suddenly struck with total blindness, and died a few days after, at the early age of 37. He was a man of an acute and penetrating genius. His temper seems to have been warm, as appears from his dispute with Mr. Huygens; and, conscious perhaps of his own merits as a discoverer, he seems to have been jealous of losing any portion of his reputation by the improvements of others upon his inventions.

GREGORY, JOHN, a physician, was born in 1724, at Aberdeen, where his father, Dr. James Gregory, was professor of medicine in King's college. After studying at his native place he removed to Edinburgh, and from thence to Leyden. In 1745 he obtained the degree of doctor of physic, and became professor of philosophy at Aberdeen, which he exchanged in 1749 for that of physic. About 1751 he settled in London, and was chosen a fellow of the Royal Society. In 1764 he removed to Edinburgh, where in 1766 he was elected professor of physic. He died in 1773. His works are, on the "*Duties and Offices of a Physician*," 8vo.; "*Elements of the Practice of Physic*," 8vo.; "*A Father's Legacy to his daughters*," 12mo. All his pieces have been collected into four vols. 8vo.

GRIEFSWALD, a town of Swedish Pomerania, on the Rik, 15 miles S. E. of Stralsund.

GRENADA, one of the Caribbee islands. It is the last of the Windward Caribbees; and lies 30 leagues N. of New Andalusia, on the continent. According to some, it is 24 leagues in compass; according to others, only 22. It is 28 miles long, and in some places 15 broad. The chief port, formerly called Louis, now St. George's, stands on the W. side of the island, in the middle of a large bay, with a sandy bottom. It is said that 1000 barks, from 300 to 400 tons, may ride secure from storms; and that 100 ships, of 1000 tons each, may be moored in the harbour. The island abounds with game, fish, and very fine timber. A lake on a high mountain, about the middle of the island, supplies it with streams of fresh water. On the 10th June 1796, the French commandant, Jossey, surrendered all the French posts in this island by capitulation to the British under Gen. Abercrombie. At this time the British obtained complete possession on the 19th June; since to this island, which before had been in a distracted state, tranquillity has been restored. Lat. of Fort Royal in this island, 12° 2' 54" N. Lon. from Greenwich, 61° 51' 15" W.

GRENADÉ, [from *pomum granatum*, Lat.] a little hollow globe or ball of iron, or other metal, about two inches and a half in diameter, which, being filled with fine powder, is set on fire by means of a small fusee fastened to the touch-hole; as soon as it is kindled, the case flies into many shatters, much to the damage of all that stand near it. Grenades, or Grenadoes, are thrown by the grenadiers into those places where the men stand thick, particularly into trenches and other lodgements made by the enemy. They were invented about 1594. The author of the Military Dictionary has the following remark on the use of Grenades: "Grenades have unaccountably sunk into disuse, but I am persuaded there is nothing more proper than to have grenades to throw among the enemy who have jumped into the ditch. During the siege of Cassel, under Count de La Lippe, in the campaign of 1762, a young engineer undertook to carry one of the outworks with a much smaller detachment than one which had been repulsed, and succeeded with ease from the use of grenades; which is a proof that they should not be neglected, either in the attack or defence of posts." The word Grenado takes its rise from the shell being filled with grains of powder as a pomegranate is with kernels.

GRENADIERS are armed with a sword, a firelock, a bayonet, and a pouch full of hand-grenades. They wear high caps, are generally the tallest and briskest fellows, and are always the first upon all attacks. Every battalion of foot has generally a company of them; or else four or five grenadiers belong to each company of the battalion, which, on division, are drawn out, and form a company of themselves. These always take the right of the battalion.

GRENAILLE, a name given by the French writers to a preparation of copper, which the Chinese use as a red colour in some of their finest china, particularly for that colour which is called oil-red or in red-oil.

GRENOBLE, a town of France, in the department of Isere, and late province of Dauphiny, anciently called Accusium Colonia. Lat. 45° 11' 42" N. Lon. from Greenwich 5° 43' 34" E.

GRESHAM, SIR THOMAS, an opulent merchant in London, descended from an ancient family of Norfolk. He was born in 1519. His father was king's agent at Antwerp, for taking up money of the merchants. Being appointed to the same office, he, in 1551, removed to that city with his family. This employment was suspended on the accession of queen Mary, but, on proper representation, was restored to him again. Queen Elizabeth knighted him, and made him her agent in foreign parts. About this time, he built a large mansion-house on the W. side of Bishopsgate-street, since named Gresham College. His father had proposed building a house or exchange for the merchants to meet in, instead of walking in the open street; but Sir Thomas went beyond his father: he offered, if the citizens would provide a proper piece of ground, to build a house at his own expence; which being accepted, he fulfilled his promise after the plan of the exchange at Antwerp. On the 29th of Jan. 1570, when the new edifice was opened, the queen came and dined with the founder; and caused a herald with a trumpet to proclaim it by the name of the Royal Exchange. In pursuance also of a promise to endow a college for the profession of the seven liberal sciences, he made a testamentary disposition of his house in London for that purpose, now Gresham College. He left several other benefactions, and died in 1579. He had a mind every way suited to his fortune, generous and benign; ready to perform good actions, and encourage them in others. He was a great friend and patron of the celebrated martyrologist, John Fox. He was well acquainted with the ancient and several modern languages; he had a very comprehensive knowledge of all affairs relating to commerce, foreign and domestic; and his success was equal to it, being esteemed the highest commoner in England, in his time. He transacted queen Elizabeth's mercantile affairs so constantly, that he was called "the royal merchant;" and his house was sometimes appointed for the reception of foreign princes, upon their first arrival in London.

GRETNA GREEN. See **GRAITNEY**.

GREWIA, in botany, a genus of the polyandria order, and gynandria class of plants; natural order, Colunniferae. Calyx pentaphyllous; petals five, each with a nectariferous scale at the base; berry quadrilocular. There are thirteen species.

GREY, Lady JANE, a most illustrious and unfortunate lady, descended of the blood royal of England by both parents, was the eldest daughter of Henry Grey marquis of Dorset, and Frances the daughter of Charles Brandon lord Suffolk, by Mary the dowager of Lewis XII. king of France, who was the youngest daughter of Henry VII. king of England. She was born in 1537, at Broadgate, her father's seat in Leicestershire. She discovered an early propensity to all kinds of literature; and having a fine genius, improved under the tuition of Mr. Elmer, she made a most surprising progress in the languages, arts, and sciences. She understood perfectly both kinds of philosophy, and could express herself very properly in Latin and Greek; and Sir Thomas Chaloner (in Strype's Memorials, Vol. III. p. 93.) says, that she was well versed in Hebrew, Chaldee, Arabic, French, and Italian. He adds, that "she played well on instrumental music, writ a curious hand, and was excellent at the needle;" and that she accompanied her musical instruments with a voice exquisitely sweet, assisted by all the graces that art could bestow. In 1553, the dukes of Suffolk and Northumberland, who were now, after the fall of Somerset, arrived at the height of power, began, on the decline of king Edward's health, to think how to prevent that reverse of fortune which, as things then stood, they foresaw must happen upon his death. To obtain this end, no other remedy was judged sufficient but a change in the succession of the crown, and transferring it into their own families, by rendering Lady Jane queen. Those most excellent and amiable qualities, which had rendered her dear to all who had the happiness to know her, joined to her near affinity to the king, subjected her to become the chief tool of an ambition not her own. With this view she was married to lord Guildford Dud-

ley, fourth son of the duke of Northumberland, without discovering to her the real design of the match; which was celebrated with great pomp in the end of May; and was so much to the king's satisfaction, that he contributed bounteously to the expence of it from the royal wardrobe. Edward VI. died in July following; and Lady Jane, with infinite reluctance, overpowered by the solicitations of her ambitious friends, allowed herself to be proclaimed queen of England, on the strength of a deed extorted from that prince by her father-in-law the duke of Northumberland, which set aside the succession of queen Mary, queen Elizabeth, and Mary queen of Scots. Her regal pageantry continued but a few days. Queen Mary's hereditary right prevailed; and the unfortunate Lady Jane Grey and her husband were committed to the Tower, and on the 13th Nov. arraigned and found guilty of high treason. On the 12th February following they were both beheaded on Tower-hill. Her magnanimity in this dreadful scene was astonishing. Immediately before her execution, she addressed herself to the weeping multitude with amazing composure and coherency; and died in charity with that wretched world which she had so much reason to execrate. Thus did the pious Mary begin her reign with the murder of an innocent young creature of 18; who, for simplicity of manners, purity of heart, and extensive learning, was hardly ever equalled in any age or country. But, alas! Jane was an obstinate heretic! Fleckenham, Mary's chaplain, visited her in the tower and tried to convert her to the catholic faith, but found her far his superior in argument. Her writings are, 1. Four Latin Epistles; three to Bullenger, and one to her sister lady Catharine. The last was written the night before her execution, in a blank leaf of a Greek Testament. These letters are printed in a work entitled *Epistolæ Helveticæ Reformatioribus, vel ad eos scriptæ*, &c. Tiguri, 1742, 8vo. 2. Her Conference with Fleckenham. Ballard. 3. A letter to Dr. Harding, her father's chaplain. Printed in the Phoenix, vol. ii. p. 28. 4. A Prayer for her own Use during her Confinement. In Fox's Acts and monuments. 5. Four Latin verses; written in prison with a pin. They are as follows:

Non aliena putes, homini quæ abtingere possunt :
Sors hodierna mihi, tunc erit illa tibi.

Jane Dudley.

Deo juvante, nil nocet livor malus :

Et non juvante, nil juvat labor gravis.

Post tenebras spero lucem.

9. Her speech on the Scaffold. Ballard. It began thus: "My Lords, and you good Christian people who come to see me die; I am under a law, and by that law, as a never-erring judge, I am condemned to die: not for any thing I have offended the queen's majesty; for I will wash my hands guiltless thereof, and deliver to my God a soul as pure from such trespass as innocence from injustice; but only for that I consented to the thing I was enforced unto, constraint making the law believe I did that which I never understood." &c.—Hollingshed, Sir Richard Baker, Bale, and Fox, tell us that she wrote several other things, but do not mention where they are to be found.

GREY, RICHARD, D. D. a learned English divine, born in 1693, and educated at the university of Oxford, where he took the degree of M. A. in 1719. He obtained the rectories of Kilnecote in Leicestershire and Hindon in Northamptonshire, with other benefices. He published many sermons and religious tracts; besides the following: 1. *Memoria Technica*, or a New Method of Artificial Memory; of which the first edition was printed in 1730, and a fourth in 1756. 2. *A System of English Ecclesiastical Law*, 8vo. 1741. 3. *The miserable and distracted State of Religion in England, upon the Downfall of the Church established*; 8vo. 1736. 4. *A new and easy Method of learning Hebrew without Points*, 1738. 5. *Historia Josephi*, and 6. *Paradigmata Verborum*, 1739. 7. *Liber Jobi*, 1742. 8. *Answer to Warburton's Remarks*, 1744. 9. *Nova Methodus Hebraicæ discendi*, &c. 1751. 10. *A Translation of Mr. H. Browne's poem, De Animi Immortalitate*. He was married; and died Feb. 23, 1771, aged 78, leaving several daughters.

GREY-HOUND. See **CANIS**.

GRIS, in botany, a genus of the monogynia order, and polyandria class of plants: corolla four-petaled; calyx four-cleft; stigma sessile, cross-shaped; drupe with an eight-furrowed nucleus. There is but one species, viz. *G. cauliflora*, anchovy-pear.

pear. This tree is about fifty feet in height, branching at the top; leaves on short petioles, pendulous, two or three feet long; flowers from the stem, on short, scaly, many-flowered peduncles. It is a native of Jamaica.

GRIEF, one of the passions, the influence of which on the body is very great. Its effects resemble in several instances those of fear, with, however, some variations, owing perhaps to its being in general of longer duration. Grief diminishes the bodily strength in general, and particularly the force of the heart and circulation; as appears by the frequent sighs and deep respirations which attend it, which seem to be necessary exertions, in order to promote the passage of the blood through the lungs. It diminishes perspiration, obstructs the menstrual discharge, produces paleness of the skin, and oedematous complaints, and scirrhus of the glandular parts. It aggravates the scurvy, and the malignity of putrid and contagious distempers; and renders people more apt to receive the infection of them. When it comes on suddenly, and in a great degree, it causes a palpitation of the heart, and renders the pulse irregular. Blindness, gangrene, and sudden death, have followed the excess of this sensation. Its effects of changing the colour of the hair are well known. Opiates in small doses, are good cordials in this case.

GRIELUM, in botany, a genus of the pentagynia order, and decandria class of plants. Calyx quinquefid; petals five, filaments persisting. One species, a Cape plant.

GRIERSON, **CONSTANTIA**, a native of the county of Kilkenny in Ireland, was one of the most learned women on record, though she was born of poor parents, and died at the age of 27, in 1733. She was an excellent Greek and Latin scholar; and understood history, divinity, philosophy, and mathematics. She proved her skill in Latin by her dedication of the Dublin edition of Tacitus to Lord Carteret, and by that of Terence to his son; to whom she also addressed a Greek epigram. She wrote many elegant English poems, several of which were inserted by Mrs. Barber among her own. When Lord Carteret was lord lieutenant of Ireland, he obtained a patent for Mr. Grierson to be the king's printer; and to reward the uncommon merit of his wife, caused her life to be included in it.

GRIFENHAKEN, a town of Prussian Pomerania, in the duchy of Stettin, on the Oder. Lon. 14. 42. E. Lat. 53. 25. N.

GRIFIN, or **GRIFTON**, [this should rather be written *gryfon*, or *gryphon*; *gryps*, γρυψ,] a fabled animal said to be generated between the lion and eagle, and to have the head and paws of the lion, and the wings of the eagle. The Griffin, Gryphus, by the ancients, was supposed to have four legs, wings, and a beak; the upper part representing an eagle, and the lower a lion; and to watch over gold-mines, hidden treasures, &c. This imaginary animal was consecrated to the sun; and the ancient painters represented the chariot of the sun as drawn by griffons. M. Spanheim observes the same of those of Jupiter and Nemesis. The griffin is commonly seen on ancient arms; and is borne in coat-armour. Guillim blazons it rampant; alleging, that any very fierce animal may be blazoned as well as the lion. Sylvester, Morgan, and others, use the terms segreiant instead of rampant. The griffin is also an ornament of architecture in constant use among the Greeks, and was copied from them, with the other elegancies of architectural enrichments, by the Romans.

GRIFON in Scripture is that species of the eagle called in Latin *ossifraga*, the osprey; and פֶּרֶס, of the verb פָּרַס, *para*, to break. See **FALCO**.

GRIMBERGEN, a town of France, in the department of Dyle, and late province of Austrian Brabant, six miles N. of Brussels.

GRIMM, or **GRIMMA**, a town of Upper Saxony, in Leipsic, 42 miles W. N. W. of Dresden.

GRIMMEN, or **GRIMN**, a town of Pomerania, 14 miles S. of Stralsund. Lon. 13. 27. E. Lat. 54. 12. N.

GRIMSBY, a large sea-port town of England, in Lincolnshire, 169 miles from London.

GRIND, an island near the coast of Friesland, 9 miles N. N. W. of Harlingen.

GRINDING, or **TRITURATION**, the act of breaking or comminuting a solid body, and reducing it into powder. See **LEVIGATION**, and **PULVERISATION**. The painters' colours are ground on a marble or porphyry, either with oil or gum-water.

GRINDING is also used for rubbing or wearing off the irregular parts of the surface of a body, and reducing it to the destined figure, whether that be flat, concave, or the like. The grinding and polishing of glass is a considerable art; for which see **GLASS-MAKING**; and, for grinding of optical glasses, see **OPTICS**.

GRINSTED, **West**, a town in Sussex, 43 miles from London.

GRINSTED, **EAST**, a borough in Sussex, 29 miles S. of London.

GRIPE, in the sea-language, is a piece of timber fayed against the lower piece of the stern, from the fore-mast end of the keel joining with the knee of the head: its use is to defend the lower part of the stern from any injury; but it is often made the larger, to make the ship keep a good wind.

GRIPE OF A SHIP, is also the compass or sharpness of the stern under water, chiefly towards the bottom of it.

GRIPE, is also a sea-term, for a ship's turning her head more to the wind than she should; this is caused either by over-loading her a-head, the weight of which presses her down, so that she will not readily fall off from the wind; or by staying or setting her masts too much aft; which is always a fault in short ships that draw much water, since it causes them to be continually running into the wind: though in floating ships, if the masts be not stayed very far aft, they will never keep a good wind.

GRIPES, in medicine, a sort of colic or painful disorder of the lower belly, occasioned by some sharp pungent matters vellicating the parts, or by wind pent up in the intestines. See **MEDICINE**.

GRISGRIS, a superstition greatly in vogue among the negroes in the interior parts of Africa. The grisgris, according to Le Maire, are certain Arabic characters mixed with magical figures drawn by the Marabuts or priests upon paper. Labat affirms, that they are nothing else than scraps of the alcoran in Arabic. The poorest negro never goes to war without his grisgris, as a charm against wounds; and if it prove ineffectual, the priest transfers the blame on the immorality of his conduct.

GRISLEA, in botany, a genus of the monogynia order, and octandria class of plant; natural order, Calycanthemæ. Calyx quadrifid; petals four, one from each incisure of it; capsule, globose, superior, unilocular, and polyspermous. There are two species.

GRISONS, a people situated among the Alps, and long allies of the Swiss, but now united with the Helvetic republic. Their country is bounded on the N. by the late countries of Sargans and Bludenz, and the canton of Glaris. The length is about 70 miles, and the breadth about 60. The inhabitants are said to have been named Grisons, from the grey coats they wore in former times. This country, lying among the Alps, is very mountainous; but the mountains yield good pasture for the cattle, sheep, and goats, with some rye and barley; in the vallies there is plenty of grain, pulse, fruits, and wine. It abounds also with hogs and wild fowl; but there is a scarcity of fish and salt, and their horses are mostly purchased of foreigners. The principal rivers are the Rhine, the Inn, and the Adda. It has also several lakes, most of which lie on the tops of the hills. The language of the Grisons is either a corrupt Italian or the German.

GRIT, a genus of argillaceous earths. Its texture is more or less porous, equable, and rough to the touch. It does not give fire with steel, nor effervesce with acids. When fresh broken and breathed upon, it exhales an earthy smell. Its specific gravity is from 2, to 2.6; and so unfusible as to be used for fire-stones. It is also used for millstones and whetstones; and sometimes for filtering stones and for buildings.

GROAIX, an isle in the Atlantic, on the W. coast of France, four miles long and $1\frac{1}{2}$ broad; 18 miles N. N. W. of Belle-isle.

GROCERS anciently were such persons as engrossed all merchandize that was vendible; but now they are incorporated, and make one of the companies of the city of London.

GRODNO, a large town of Lithuania, in the palatinate of Wilna, 140 miles N. E. of Warsaw.

GROIN, among builders, is the angular curve made by the intersection of two semi-cylinders or arches; and is either regular or irregular. A regular groin is when the intersecting arches, whether semicircular or semielliptical, are of the same diameters and heights.

heights. An irregular groin is where one of the arches is semi-circular, and the other semielliptical.

GROLL, a town of Batavia, in the department of the Rhine, and late county of Zutphen, 19 miles E. of Zutphen, and 19 S.S.W. of Oldenzael.

GROMETS, in the sea-language, small rings formerly fastened with staples to the yards, to make fast the gaskets, but now never used.

GRONINGEN, the most northerly of the late Seven United Provinces, was about 47 miles long, and 33 miles broad. It has rich pastures, large herds of cattle, plenty of sea and river fish, and of turf, with some forests and corn-land.

GRONINGEN, a strong city of Batavia, in the department of Eems, and late capital of the above province.

GRONOVIA, in botany, a genus of the monogynia order, and pentandria class of plants; natural order, Cucurbitaceæ. Petals five, together with the stamens inserted into the bell-shaped corolla; berry dry, inferior, containing one seed. There is but one species, viz. *G. scandens*, climbing gronovia, an annual plant.

GRONOVIVS, JOHN FREDERIC, a very learned critic, was born at Hamburgh in 1613; and having travelled through Germany, Italy, and France, was made professor of polite learning at Deventer, and afterwards at Leyden, where he died in 1671. He published, 1. *Diatrise in Statii*, &c. 2. *De Sestertiis*. 3. *Correct editions of Seneca, Statius, Livy's, Pliny's Natural History, Tacitus, Aulus Gellius, Phædrus*, &c. with notes; and other works.

GRONOVIVS, JAMES, son of the preceding, and a very learned man, was educated first at Leyden, then went over to England, where he visited the universities, consulted the curious MSS. and formed an acquaintance with several learned men. He was chosen by the grand duke to be professor at Pisa, with a considerable salary. He returned into Holland, after he had resided two years in Tuscany, and consulted the MSS. in the Medicean library. In 1679, he was invited by the curators of the university to a professorship; and his inaugural dissertation was so highly approved of, that the curators added 400 florins to his stipend, and continued it to his death in 1716. His principal works are, "*The Treasure of Greek Antiquities*," in 13 vols. folio; and a great number of dissertations and editions of ancient authors. He was compared to Schioppus for the virulence of his style; and the severity, with which he treated other great men who differed from him, exposed him to just censure.

GROOM, a name particularly applied to several superior officers belonging to the king's household, as groom of the chamber, groom of the stole.

GROOM-PORTER, an officer of the king's household, who provides chairs, stools, and firing, for the king's lodging, and also furnishes cards, dice, &c. and decides the disputes which arise at play.

GROOM is more particularly used for a servant appointed to attend on horses in the stable. It is his business to feed and water them, to curry and rub them down, and to keep a watchful eye over them, that they may have no inward or outward disorder, without his discovering it, and using his endeavours to remove it.

GROOVE, among miners, is the shaft or pit sunk into the earth, sometimes in the vein, and sometimes not.

GROOVE, among joiners, the channel made by their plough in the edge of a moulding, style, or rail, to put their pannels in, in wainscotting.

GROOVE also denotes a gardener's tool for transplanting plants.

GROSE, FRANCIS, Esq. F. A. S. an eminent English antiquary, the son of Francis Grose, Esq. jeweller, of Richmond, who fitted up the coronation-crown of king George II. He was born in 1731, and was left an independent fortune; but had not a disposition to preserve it. He wrote, 1. *The Antiquities of England and Wales*, in 8 vols. 4to. and 8vo, which he began in 1773; and completed in 1787; containing 589 views, besides 40 plans, &c. 2. *The Antiquities of Scotland*, 2 vols. 4to. and 8vo, containing 190 views with a map. 3. *The Antiquities of Ireland*, 2 vols. 4to. and 8vo. 4. *A Treatise on Ancient Armour and Weapons*, 4to. 1785; with a supplement in 1789. 5. *A Classical Dictionary of the Vulgar Tongue*; 8vo. 1785. 6. *Military Antiquities*; 2 vols. 4to. 1786—88. 7. *The History of Dover Castle*; 4to. 1786. 8. *A*

Provincial Glossary, with a collection of Local Proverbs and Popular Superstitions; 8vo. 1788. 9. *A Guide to Health, Beauty, Honour, and Riches*; 8vo. 10. *Rules for Drawing Caricatures*; 8vo. 1788. 11. *The Olio*; a collection of Essays; 8vo. In summer, 1789, he set out on a tour in Scotland, and began to communicate his observations in folio numbers, with four plates each, in 1790. Before he had completed this work, he went to Dublin, with the intention of executing a similar work, with views and descriptions of the antiquities of Ireland, executed in the same elegant manner with those of Great Britain: but being seized with an apoplectic fit, at the house of Mr. Hone in Dublin, he died on the 12th May, 1791, aged about 60. He had a great talent for drawing, which peculiarly qualified him for executing the works in which he engaged; and, being of an agreeable, humorous, and communicative disposition, he was much esteemed in the extensive circle of his friends. He visited almost every part of the three kingdoms, and was every where well received. His humour was of that genuine kind, which exhilarates without offending either against virtue or good manners.

GROSS, a foreign money, in divers countries, answering to our groat.

GROSS, [GROSSUS,] in our ancient law-writers, denotes a thing absolute, and not depending on another. Thus, villain in gross, villanus in grosso, was a servant, who did not belong to the land, but immediately to the person of the lord; or a servile person not appendant or annexed to the land or manor, and to go along with the tenures as appurtenant to it; but like other personal goods and chattels of his lord, at his lord's pleasure and disposal.

GROSS WEIGHT, the weight of merchandizes and goods, with their dust and dross, as also of the bag, cask, chest, &c. wherein they are contained; out of which gross weight, allowance is to be made of tare and tret.

GROTESQUE, or **GROTESK**, in sculpture and painting, something whimsical, extravagant, and monstrous; consisting either of things that are merely imaginary or so distorted, as to raise surprise and ridicule. The word owes its derivation from figures of this kind, being anciently much used to adorn the grottos wherein the tombs of eminent persons were inclosed. Such was that of Ovid, whose grotto was discovered near Rome about 100 years ago.

GROTIUS, HUGO, or more properly HUGH DE GROOT, one of the greatest men of his age, was born at Delft in 1583. He made so rapid a progress in his studies, that at 15 he had attained great knowledge in philosophy, divinity, and civil law; and a yet greater proficiency in polite literature, as appeared by the commentary he had made at that age on Martians Capella. In 1598, he accompanied the Dutch ambassador into France, and was honoured with several marks of esteem by Henry IV. He took his degree of LL. D. in that kingdom; and at his return to his native country, pleaded at the bar before he was 17 years of age. He was not 24 when he was appointed attorney-general. In 1613 he settled at Rotterdam, and was nominated syndic of that city; but did not accept of the office, till a promise was made him that he should not be removed from it. This prudent precaution he took from his foreseeing, that the quarrels of the divines on the doctrine of grace, which had already given rise to many factions in the state, would occasion revolutions in the chief cities. The same year he was sent to England, on account of the divisions that reigned between the traders of the two nations, on the right of fishing in the northern seas; but he could obtain no satisfaction. He was afterwards sent to England, to persuade the king and the principal divines to favour the Arminians; and he had several conferences with K. James I. on that subject. On his return to Holland, his attachment to Barneveldt involved him in great trouble; for he was seized, and sentenced to perpetual imprisonment in 1619, and to forfeit all his goods and chattels. But after having been treated with great rigour for above a year and a half in his confinement, he was delivered by the advice and artifice of his wife, who having observed that his keepers had often fatigued themselves with searching and examining a great trunk full of foul linen, which used to be washed at Gorkum, but now let it pass without opening it, she advised him to bore holes in it to prevent his being stifled, and then to get into it. He complied with this advice, and was carried to a friend's house in Gorkum; where dressing himself like a mason, and taking a rule and trowel, he passed

passed through the market-place, and stepping into a boat went to Valvet in Brabant. Here he made himself known to some Arminians, and hired a carriage to Antwerp. At first there was a design of prosecuting his wife, who staid in the prison; and some judges were of opinion that she ought to be kept there in her husband's stead: however, she was released by a plurality of voices, and universally applauded for her behaviour. He now retired into France, where he met with a gracious reception from that court, and Lewis XIII. settled a pension upon him. Having resided there 11 years, he returned to Holland, on his receiving a very kind letter from Frederic Henry prince of Orange; but his enemies renewing their persecution, he went to Hamburgh; where, in 1634, Q. Christina of Sweden made him her counsellor, and sent him ambassador into France. After having discharged the duties of this office above 11 years, he returned to give an account to Q. Christina of his embassy; when he took Holland in his way, and received many honours at Amsterdam. He was introduced to her at Stockholm; and there begged that she would grant his dismissal, that he might return to Holland. This he obtained with difficulty; and the queen gave him many marks of her esteem, though he had many enemies at her court too. As he was returning, the ship in which he embarked was cast away on the coast of Pomerania; and being sick, he continued his journey by land; but he was forced to stop at Rostock, where he died on the 28th Aug. 1645. His body was carried to Delft, to be interred in the sepulchre of his ancestors. Notwithstanding the embassies in which he was employed, he composed a great number of excellent works; the principal of which are, 1. *De Jure Belli et Pacis*, which is esteemed a master-piece: 2. *A Treatise on the Truth of the Christian Religion*: 3. *Commentaries on the holy Scripture*: 4. *The History and Annals of Holland*: and 5. *A great number of letters*: All written in Latin.

GROTSKAW, or **GROTSKAW**, a town of European Turkey in the province of Servia.

GROTSKAW, a province of Silesia.

GROTSKAW, a strong town, capital of the above province, seated in a fruitful plain.

GROTTGAU, or **GROTTKAU**, a town and territory of Silesia, in the principality of Neisse, 14 miles N. of Neisse.

GROTTO, [*grotte*, French; *grotta*, Italian,] a cavern or cave made for coolness.

GROTTO, or **GROTTA**, in natural history, a large deep cavern or den in a mountain or rock. The word is formed, according to Menage, &c. from the Latin *crypta*. Du Cange observes, that *grotta* was used in the same sense in the corrupt Latin. The ancient anchorites retired into dens and grottos, to apply themselves the more attentively to meditation. Elden Hole, Okey-hole, Peake's Hole, and Pool's Hole, are famous among the natural caverns or grottos of England. In grottos are frequently found crystals of the rock, stalactites, and other natural congelations, and those of an amazing beauty.

GROTTO, is also used for a little artificial edifice made in a garden, in imitation of a natural grotto. The outsides of these grottos are usually adorned with rustic architecture, and their inside with shell-work, fossils, &c. finished likewise with jets d'eau or fountains, &c. A cement for artificial grottos may be made thus: Take two parts of white rosin, melt it clear, and add to it four parts of bees wax; when melted together, add two or three parts of the powder of the stone you design to cement, or so much as will give the cement the colour of the stone; to this add one part of flower of sulphur: incorporate all together over a gentle fire, and afterwards knead them with your hands in warm water. With this cement the stones, shells, &c. after being well dried before the fire, may be cemented. Artificial red coral-branches, for the embellishment of grottos, may be made in the following manner: Take clear rosin, dissolve it in a brass-pan; to every ounce of which add two drachms of the finest vermilion: when you have stirred them well together, and have chosen your twigs and branches, peeled and dried, take a pencil, and paint the branches all over whilst the composition is warm; afterwards shape them in imitation of natural coral. This done, hold the branches over a gentle coal-fire, till all is smooth and even as if polished. In the same manner white coral may be prepared with white-lead, and black coral with lamp-black. A grotto may be built with little expence, of glass, cinders, pebbles, pieces of large flint, shells, moss, stones,

counterfeit coral, pieces of chalk, &c. all bound or cemented together with the above described cement.

GROTTO DEL CANI, a little cavern near Pozzuoli, 12 miles from Naples, the steams whereof are of a noxious quality; whence also it is called *bocca venenosa*, the poisonous mouth. "Two miles from Naples (says Dr. Mead), just by the Lago de Agnano, is a celebrated mofeta, commonly called la Grotta del Cani, and equally destructive to all within the reach of its vapours. It is a small grotto about eight feet high, 12 long, and 6 broad; from the ground arises a thin, subtle, warm fume, visible enough to a discerning eye, which does not spring up in little parcels here and there, but in one continued stream, covering the whole surface of the bottom of the cave; having this remarkable difference from common vapours, that it does not like smoke disperse into the air, but quickly after its rise falls back again, and returns to the earth; the colour of the sides of the grotto being the measure of its ascent: for so far it is of a darkish green, but higher only common earth. And as I myself found no inconveniency by standing in it, so no animal, if its head be above this mark, is the least injured. But when, as the manner is, a dog, or any other creature, is forcibly kept below it; or, by reason of its smallness, cannot hold its head above it, it presently loses all motion, falls down as dead, or in a swoon; the limbs convulsed and trembling, till at last no more signs of life appear than a very weak and almost insensible beating of the heart and arteries; which, if the animal be left a little longer, quickly ceases too, and then the case is irrecoverable; but if it be snatched out, and laid in the open air, it soon comes to life again, and sooner, if thrown into the adjacent lake." The fumes of the grotto, the same author argues, are no real poison, but act chiefly by their gravity; else the creatures could not recover so soon, or if they did, some symptoms, as faintness, &c. would be the consequence of it. He adds, "that in creatures killed therewith, when dissected, no marks of infection appear; and that the attack proceeds from a want of air, by which the circulation tends to an entire stoppage; and this so much the more, as the animal inspires a fluid of a quite different nature from the air, and so in no respect fit to supply its place. Taking the animal out, while yet alive, and throwing it into the neighbouring lake, it recovers: this is owing to the coldness of the water, which promotes the contraction of the fibres, and so assists the retarded circulation; the small portion of air which remains in the vesiculae, after every expiration, may be sufficient to drive out the noxious fluid."

GROTTO, or **GROTTA DEL SERPI**, a subterraneous cavern near the village of Safia, 8 miles from Braccano in Italy, is described by Kircher thus: "The grotta del serpi is big enough to hold two persons. It is perforated with several fistular apertures, somewhat in the manner of a sieve; out of which, at the beginning of the spring-season, issues a numerous brood of young snakes of divers colours but all free from any particular poisonous quality. In this cave they expose their lepers, paralytics, arthritics, and elephantiac patients, quite naked; where, the warmth of the subterraneous stream resolving them into a sweat, and the serpents clinging variously all around, licking and sucking them, they become so thoroughly freed of all their vitious humours, that, upon repeating the operation for some time, they become perfectly restored." This cave Kircher visited himself; and found it warm, and every way agreeable to the description given of it.

GROVE, in gardening, a small wood impervious to the rays of the sun. Groves are not only great ornaments to gardens; but also afford great relief against the violent heats of the sun, affording shade to walk under in the hottest parts of the day, when the other parts of the garden are useless; so that every garden is defective which has not shade.

GROVES have been in all ages held in great veneration. The proseuchae, and high places of the Jews, whither they resorted for the purposes of devotion, were probably situated in groves: see Joshua xxiv. 26. The proseuchae in Alexandria, mentioned by Philo, had groves about them because he complains that the Alexandrians, in a tumult against the Jews, cut down the trees of their proseuchae. The ancient Romans had a sort of groves near several of their temples, which were consecrated to some god, and called *luci*, by an antiphrasis, a *non lucendo*, as being shady and dark. The veneration which the ancient Druids had for groves is well known.

GROUND, in etching, denotes a gumous composition smeared

ed over the surface of the metal to be etched, to prevent the aquafortis from eating except in such places where this ground is cut through with the point of a needle. See ETCHING.

GROUND, in painting, is properly understood of such parts of the piece, as have nothing painted on them, but retain the original colour upon which the other colours are applied to make the representations. A building is said to serve as a good ground to a figure when the figure is painted on the building. The ground behind a picture in miniature, is commonly blue or crimson imitating a curtain of satin or velvet.

GROUND-ANGLING, fishing under water without a float, only with a plumb of lead, or a bullet, placed about nine inches from the hook; which is better, because it will roll on the ground. This method of fishing is most proper in cold weather, when the fish swim very low. The morning and evening are the chief seasons for the ground-line in fishing for trout; but if the day prove cloudy, or the water muddy, you may fish at ground all day.

GROUND-IVY, in botany. See GLECHOMA.

GROUND-NUTS. See ARACHIS.

GROUND-PINE, in botany. See TEUCURIUM.

GROUNDSEL. See BACCHARIS and SENECIO.

GROUND-TACKLE, a ship's anchors, cables, &c. and in general whatever is necessary to make her ride safe at anchor.

GROUPE, [*groupe*, Fr. *gropo*, Ital.] in painting and sculpture, is an assemblage of two or more figures of men, beasts, fruits, or the like, which have some apparent relation to each other. See PAINTING.

GROUP ISLANDS, or the **GROUFS**, a cluster of islands lately discovered in the South Sea. They lie in about S. Lat. 18. 12. and W. Lon. 142. 42.

GROUTHEAD, or **GREATHEAD**, **ROBERT**, a learned bishop of Lincoln, born at Stow, in Lincolnshire, or Stradbrook, in Suffolk, in the end of the 12th century. His parents were so poor, that when a boy he was obliged to do the meanest offices, and even to beg his bread; till the mayor of Lincoln, struck with his appearance and the quickness of his answers to certain questions, took him into his family, and put him to school. Here his ardent love of learning, and admirable capacity for acquiring it, soon appeared, and procured him many patrons, who enabled him to prosecute his studies, first at Cambridge, afterwards at Oxford, and at last at Paris. In these three famous seats of learning, he spent many years in the most indefatigable pursuit of knowledge, and became one of the best and most universal scholars of the age. He was master not only of the French and Latin, but also of the Greek and Hebrew languages, which was a very rare accomplishment in those times. Roger Bacon, who was intimately acquainted with him, says, that he spent much of his time for almost forty years in the study of geometry, astronomy, optics, and other branches of mathematical learning, in all which he very much excelled. Theology was his favourite study, in which he read lectures at Oxford with great applause. In the mean time, he obtained several preferments in the church, and was at length elected and consecrated bishop of Lincoln, A. D. 1235. In this station he soon became very famous, by the purity of his manners, the popularity of his preaching, the vigour of his discipline, and the boldness with which he reprov'd the vices and opposed the arbitrary mandates of the court of Rome; of this last we shall give one example. Pope Innocent IV. had granted to one of his own nephews, named Frederic, who was but a child, a provision to the first canon's place in the church of Lincoln that should become vacant; and sent a bull to the Archbishop of Canterbury, and Innocent, then papal legate in England, commanding them to see the provision made effectual; which they transmitted to the Bishop of Lincoln. But that brave and virtuous prelate boldly refused to obey this unreasonable mandate, and sent an answer to the papal bull containing the following severe reproaches against his holiness for abusing his power: "If we except the sins of Lucifer and Antichrist, there neither is nor can be a greater crime, nor any thing more contrary to the doctrine of the gospel, or more odious and abominable in the sight of Jesus Christ, than to ruin and destroy the souls of men, by depriving them of the spiritual aid and ministry of their pastors. This crime is committed by those who command the benefices intended for the support of able pastors, to be bestowed on those who are incapable of performing

the duties of the pastoral office. It is impossible therefore that the holy apostolic see, which received its authority from the Lord Jesus Christ, for edification, and not for destruction, can be guilty of such a crime, or any thing approaching to such a crime, so hateful to God and so hurtful to men. For this would be a most manifest corruption and abuse of its authority, which would forfeit all its glory, and plunge it into the pains of hell." Upon reading this letter, his holiness became frantic with rage, and threatened to make the bishop an object of terror and astonishment to the whole world. "How dare (said he) this old, deaf, doating fool, disobey my commands? Is not his master the King of England my subject, or rather my slave? Cannot he cast him into prison, and crush him in a moment?" But the cardinals brought the pope to think more calmly, and to take no notice of this letter. "Let us not (said they) raise a tumult in the church without necessity, and precipitate that revolt and separation from us, which, we know, must one day take place." Remarkable words, when we reflect when and by whom they were spoken! The bishop did not long survive this noble stand against the gross corruptions and tyranny of the church of Rome. He fell sick at his castle of Bugden that same year; and sensible that his death was drawing near, he called his clergy into his apartment, and made a long discourse to them, to prove that the reigning pope Innocent IV. was Antichrist. With this exertion his strength was so much exhausted, that he expired soon after, Oct. 9, 1253. A contemporary historian says, "He was a free and bold reprimander of the pope and the king; an admonisher of the prelates; a corrector of the monks; an instructor of the clergy; a supporter of the studious; a censurer of the incontinent; a scourge and terror to the court of Rome; a diligent searcher of the scriptures; and a frequent preacher to the people. At his table he was hospitable, polite, and cheerful. In the church he was contrite, devout, and solemn; and in performing all the duties of his office he was venerable, active, and indefatigable." The illustrious Roger Bacon, who had the best opportunities of forming a true judgement of the extent of his learning, by perusing his works, and by frequently conversing with him, hath given this honourable testimony in his favour. "Robert Grouthead, bishop of Lincoln, and his friend friar Adam de Marisco, are the two most learned men in the world, and excel all the rest of mankind both in divine and human knowledge." This excellent prelate was a very voluminous writer, and composed a prodigious number of treatises on a great variety of subjects in philosophy and divinity, a catalogue of which is given by Bale.

GRUB, in zoology, is the English name of the hexapode worms, produced from the eggs of beetles, &c. and which at length are transformed into winged insects of the same species with their parents.

GRUBSTREET, originally the name of a street near Moorfields in London, much inhabited by writers of small histories, dictionaries, and temporary poems; whence any mean production is called grubstreet.

Χυρῖς Ἰδακκὶ μὲν ἀεθλα, μὲν ἀλγυῖα πικρὰ
Ἀπασίως ἰσὺν ἔδας μαρομήν.

GRUME, [*grumus*, Lat.] in medicine, denotes a concreted clot of blood, milk, or other substance. Hence grumous blood is that which approaches to the nature of grume, and by its viscosity, and stagnating in the capillary vessels, produces several disorders.

GRUND, or **GRUNDE**, a town of Brunswick, in the Hartz Forest, 12 miles S. W. of Goslar.

GRUNINGEN, a town of the Helvetic republic, 12 miles E. of Zurich.

GRUNINGEN, a town in Halberstadt, on the Boden, 15 miles E. of Halberstadt.

GRUPPO, or **TURNED SHAKE**, a musical grace, defined by Playford to consist in the alternate prolotion of two tones in juxtaposition to each other, with a close on the note immediately beneath the lower of them.

GRUS, in antiquity, a dance performed yearly by the young Athenians around the temple of Apollo, on the day of the Delia.

GRUS, in astronomy, a southern constellation, not visible in our latitude. The number of stars in this constellation, according to Mr. Sharp's Catalogue, is 13.

GRUS,

GRUS, in ornithology. See ARDEA.

GRUYERES, GRUYERS, or GRUYIRES, a town, and late county and bailiwick, of the Helvetic republic, in the canton of Friburg, famous for cheese, 15 miles S. of Friburg.

GRY, [γρυ,] any thing of little value; as, the paring of the nails. A measure containing one-tenth of a line. A line is one-tenth of a digit, and a digit one-tenth of a foot, and a philosophical foot one-third of a pendulum, whose diadromes, or vibrations, in the latitude of 45 degrees, are each equal to one second of time, or one-sixtieth of a minute.

GRYLLUS, the LOCUST, GRASSHOPPER, and CRICKET, in entomology, a genus of insects belonging to the order hemiptera. The generic character is, head inflexed, armed with jaws, and furnished with feelers. Antennæ, in most species, either filiform or setaceous. Wings four, deflex, convoluted: lower wings plaited. Hind legs formed for leaping: claws double on all the feet. There are 61 species, of which the following are most worthy of notice:

1. Among the most numerous species is the *GRYLLUS MIGRATORIUS* of Linnæus, or COMMON MIGRATORY LOCUST, which of all the insects capable of injuring mankind seems to possess the most dreadful powers of destruction. Legions of these animals are from time to time observed in various parts of the world, where the havoc they commit is almost incredible: whole provinces are in a manner desolated by them in the space of a few days, and the air is darkened by their numbers: nay, even when dead, they are still terrible; since the putrefaction arising from their inconceivable numbers is such that it has been regarded as one of the probable causes of pestilence in the Eastern regions. This formidable locust is generally of a brownish colour, varied with pale red, or flesh-colour, and the legs are frequently bluish. In the year 1748, it appeared in irregular flights in several parts of Europe, as in Germany, France, and England; and in the capital itself and its neighbourhood great numbers were seen: they perished, however, in a short time, and were happily not productive of any material mischief, having been probably driven by some irregular wind out of their intended course, and weakened by the coolness of our climate. From a paper published in the 18th volume of the Philosophical Transactions we find, that in the year 1693, swarms of this species of locust settled in some parts of Wales. Two vast flights were observed in the air not far from the town of Dolgalken, in Merionethshire: the others fell in Pembrokeshire. From a letter published in the 38th volume of the same work, it appears, that some parts of Germany, particularly in the march of Brandenburg, &c. suffered considerable injury from the depredations of these animals. They made their appearance in the spring of the year 1732, from flights which had deposited their eggs in the ground the preceding year. They attacked and devoured the young spike of the wheat, &c. and this chiefly by night, and thus laid waste many acres at a time beyond all hope of recovery. In the 46th volume of the same Transactions we find a description of the ravages of these animals in Wallachia, Moldavia, Transylvania, Hungary, and Poland, in the years 1747 and 1748. They multiply more speedily than any animal in the creation, but are chiefly to be dreaded in the countries where they breed; being unable to live in cold climates. If, however, at any future period, they should again invade this island, it will be advisable to burn, previously to their approach, such combustibles as emit a thick and offensive smoke; for instance, turf, wet straw, &c. sprinkled with sulphur. An instance occurred many years since, in Germany, where a swarm of locusts was driven from one district to another, by the noise of bells, spades, hammers, and other metallic instruments. The ravages of locusts in various parts of the world, at different periods, are recorded by numerous authors. In the year 593 of the Christian æra, after a great drought, these animals appeared in such vast legions as to cause a famine in many countries. In 677 Syria and Mesopotamia were over-run by them. In 852, immense swarms took their flight from the Eastern regions into the West, flying with such a sound that they might have been mistaken for birds: they destroyed all vegetables, not sparing even the bark of trees and the thatch of houses; and devoured the corn so rapidly, as to destroy, on computation, a hundred and forty acres in a day: their daily marches or distances of flight were computed at twenty miles; and these were regulated by leaders or kings, who flew first, and settled on the

spot which was to be visited at the same hour the next day by the whole legion: these marches were always undertaken at sunrise. These locusts were at length driven by the force of the winds into the Belgic ocean, and being thrown back by the tide and left on the shores, caused a dreadful pestilence by their smell. In 1271, all the corn-fields of Milan were destroyed; and in the year 1339 all those of Lombardy. In 1541, incredible hosts afflicted Poland, Wallachia, and all the adjoining territories, darkening the sun with their numbers, and ravaging all the fruits of the earth.

2. *G. CRISTATUS* is one of the largest species of locust yet known, being five or six times the size of the *gryllus migratorius*, and, together with some others of the larger kind, is made use of in some parts of the world as an article of food: they are eaten both fresh and salted, in which last state they are publicly sold in the markets of some parts of the Levant. The quantity of edible substance which they afford is but small, especially in the male insects; but the females, on account of the ovaries, afford a more nutritious sustenance. The *gryllus cristatus* is a highly beautiful animal; being of a bright red, with the body annulated with black; and the legs varied with yellow: the upper wings tessellated with alternate variegations of dark and pale green; the lower with transverse undulated streaks: the length of the animal from head to tail is about four inches, and the expanse of wings from tip to tip, when fully extended, hardly less than seven inches and a half.

3. *G. GRYLLOALPA*, or MOLE-CRICKET, is by far the most curious of this genus; and in its colour and manners differs greatly from the rest. It is of an uncouth, and even formidable aspect, measuring more than two inches in length; and is of a broad and slightly flattened shape, of a dusky brown colour, with a ferruginous cast on the under parts, and is readily distinguished by the extraordinary structure of its fore-legs, which are excessively strong, and furnished with very broad feet, divided into several sharp, claw-shaped, segments, with which it is enabled to burrow under ground in the manner of a mole. The mole-cricket lives entirely on vegetables, devouring the young roots of grasses, corn, and various esculent plants, and commits great devastation in gardens. It is found in most parts of Europe, and in the northern parts of Asia and America. See Plate LXXXVI.

4. The *TETTIGONIA*, or GRASSHOPPER, well known in our meadows, belongs to this genus.

5. The *ACHETA*, or CRICKET, of which there are two varieties, the hearth and the field cricket.

6. The *GRISEUS* is found in Italy. See Plate LXXXVI.

7. The *STRIDULUS* inhabits most parts of Europe. See Plate LXXXVI.

GRYPHITES, or CROW'S STONE, in natural history, an oblong fossile-shell, very narrow at the head, and becoming gradually wider to the extremity, where it ends in a circular limb; the head or beak of this is very hooked, or bent inward. They are frequently found in our gravel or clay-pits in many counties.

GUADALAJARA, or *GUADALAXARA*, a town of Spain, in the province of New Castile, 22 miles N. E. of Madrid.

GUADALAJARA, a province, town, and river, of Mexico.

GUADALAVIAR, a river of Spain, which rises on the confines of Arragon and New Castile, and falls into the Mediterranean sea, a little below Valencia.

GUADALOUPE, a town of Spain, in Estremadura, 45 miles S. W. of Toledo.

GUADALOUPE, a river of Spain, in Estremadura.

GUADALOUPE, one of the Caribbee or Leeward Islands, lying about midway between Antigua and Martinico. It is 45 miles long, 38 broad, and, being of an irregular figure, is about 240 miles in circumference. It is now in possession of the British.

GUADALQUIVER, one of the most famous rivers of Spain, rises in Andalusia, near the confines of Granada, and running quite through Andalusia, by the towns of Baiza, Andaxar, Cordova, and Seville, falls at last into the Bay of Cadiz.

GUADARAMA, a town of Spain, on the above river, 18 miles N. W. of Madrid; famous for cheese.

GUADIANA, a large river of Spain, which rises in New Castile, passes by Calatrava, Medelin, Merida, and Badajox, and falls into the bay of Cadiz.

GUADIX, a town of Spain, in Granada, with a bishop's see.

GUAIAACUM,

GUAIACUM, LIGNUM VITÆ, or POCKWOOD, in botany, a genus of the monogynia order, and decandria class of plants; natural order, Gruinales. Calyx five-cleft, unequal; petals five, inserted into the receptacle; capsule angular, five-celled. There are four species.

G. OFFICINALE, the **COMMON LIGNUM VITÆ** used in medicine, is a native of the West India islands and the warmer parts of America. There it becomes a large tree, having a hard, brittle, brownish bark, not very thick. The wood is firm, solid, ponderous, very resinous, of a blackish yellow colour in the middle, and of a hot aromatic taste. See Plate LXV. From this species is obtained a resin which exudes spontaneously, and is also driven out artificially by means of heat. This substance has been long known and celebrated as a medicine in various cases; and in the Transactions of the Royal Society for the year 1806, we have a very complete analysis of it: by distillation 100 parts yielded

Acidulous water	5.5
Thick brown oil	24.5
Thin empyreumatic oil	29.0
Charcoal	30.5
Gases consisting of carbonic acid and } carbureted hydrogen	10.5
	100.0

GUALEOR, GUALIOR, or GOWALIER, a province of Asia, situated in the middle of Hindostan.

GUALEOR, or GUALIOR, a large town of the above province, with a celebrated fortress of great strength. It is 8 miles from Reypour, and 80 S. of Agra.

GUALTEIRI, or GUALTERO, a town of the late Cisalpine republic, in the department of Crostolo, and late duchy of Reggio, 13 miles N. of Reggio.

GUAM, or GUAHAN, the largest of the Ladrone islands. It is about 120 miles in circumference; and is the only one among the innumerable islands in the South Sea, which has a town built in the European style, with a regular fort, a church, and civilized inhabitants. See **LADRONE**.

GUAMANCA, or GUAMANGA, a province of Peru, which begins 240 miles E. of Lima, and extends along the centre of the Cordilleras. The air is temperate; the soil fertile; and the mines abound with gold, silver, copper, lead, iron, quicksilver, loadstone, and sulphur.

GUAMANGA, the capital of the above province.

GUANZAVELICA, a town of South America in Peru, and in the audience of Lima. It abounds in mines of quicksilver. Lou. 71. 59. W. Lat. 12. 40. S.

GUARANTEE, or WARRANTEE, in law, a term signifying him whom the warranter undertakes to indemnify or secure from damage.

GUARANTEE, or GUARANTY, in matters of polity, the engagement of neutral states, whereby they plight their faith that certain treaties shall be inviolably observed, or that they will make war against the aggressor.

GUARD, in a general sense, signifies the defence or preservation of any thing; the act of observing what passes, to prevent surprise; or the care used to prevent any thing from happening contrary to our intentions or inclinations.

GUARD, in fencing, a posture proper to defend the body from the sword of the antagonist.

GUARD, in the military art, is a duty performed by a body of men, to secure an army or place from being surprised by an enemy. In garrison the guards are relieved every day: hence every soldier mounts guard once every day in time of peace, and much oftener in time of war. See **HONOURS**.

GUARD, ADVANCED, or VAN-GUARD. See **ADVANCE-GUARD**.

GUARD, ARTILLERY. See **ARTILLERY**.

GUARD, ARTILLERY QUARTER, is frequently a non-commissioned officer's guard from the royal regiment of artillery, whose corps de garde is always in the front of their incampment.

GUARD, ARTILLERY REAR, consists in a corporal and six men, posted in the rear of the park.

GUARD, BAGGAGE, is always an officer's guard, who has the care of the baggage on a march. The waggons should be num-

bered by companies, and follow one another regularly: vigilance and attention in the passage of hollow-ways, woods, and thickets, must be strictly observed by this guard.

GUARD, FORAGE, a detachment sent out to secure the foragers, and who are posted at all places, where either the enemy's party may come to disturb the foragers, or where they may spread too near the enemy, so as to be in danger of being taken. It consists both of horse and foot, who must remain on their posts till the foragers are all come off the ground.

GUARD, GRAND, three or four squadrons of horse, commanded by a field-officer, posted at about a mile or a mile and a half from the camp, on the right and left wings, towards the enemy, for the better security of the camp.

GUARD, MAIN, is that from which all other guards are detached. Those who are mounting guard assemble at their respective captain's quarters, and march from thence to the parade in good order; where, after the whole guard is drawn up, the small guards are detached to their respective posts: then the subalterns throw lots for their guards, who are all under the command of the captain of the main-guard. This guard mounts in garrison at different hours, as the governor pleases.

GUARD, PIQUET, a number of horse and foot, always in readiness in case of an alarm: the horses are generally saddled, and the riders booted. The foot drawn up at the head of the battalion, frequently at the beating of the tat-too; but afterwards return to their tents, where they hold themselves in readiness to march. This guard is to resist in case of an attack, until the army gets ready.

GUARD, PROVOST, is always an officer's guard that attends the provost in his rounds, either to prevent dissention, or marauding, rioting, &c. See **PROVOST**.

GUARD, QUARTER, is a small guard commanded by a subaltern officer, posted in the front of each battalion, 222 feet before the front of the regiment.

GUARD, REAR, that part of the army which brings up the rear on a march, generally composed of all the old grand guards of the camp. The rear-guard of a party is often eight or ten horse, about 500 paces behind. Hence the advance-guard going out upon a party, form the rear-guard in their retreat. Rear-guard is also a corporal's guard placed in the rear of a regiment, to keep good order.

GUARD, STANDARD, a small guard under a corporal, out of each regiment of horse, who mount on foot in the front of each regiment, at the distance of 20 feet from the streets, opposite the main street.

GUARD, TRENCH, only mounts in the time of a siege, and sometimes consists of three, four, or six battalions, according to the importance of the siege. This guard must oppose the besieged when they sally out, protect the workmen, &c.

GUARDS also imply the troops kept to guard the king's person, and consist both of horse and foot.

GUARDS, FOOT, are regiments of foot appointed for the guard of his majesty and his palace. There are three regiments of them, numerically titled.

GUARDS, HORSE, in Britain, are gentlemen chosen for their bravery, to be entrusted with the guard of the king's person; and were formerly divided into four troops named numerically.

GUARDS, EXTRAORDINARY, or DETACHMENTS, are only commanded on particular occasions; either for the security of the camp, to cover the foragers, or for convoys, escorts, or expeditions.

GUARDA, or GUARDIA, a strong city of Portugal, in the province of Beira, 18 miles S. W. of Almeida.

GUARDAMAR, a sea-port town of Spain, in Valencia, on the Segura, 17 miles S. S. W. of Alicante.

GUARD-BOAT, a boat appointed to row the rounds amongst the ships of war which are laid up in any harbour, &c. to observe that their officers keep a good looking-out, calling to the guard-boat as she passes, and not suffering her crew to come on board, without having previously communicated the watch-word of the night.

GUARDIA ALFEREZ, a town of Naples, in the province of Molise, 21 miles N. E. of Molise.

GUARDIAN, in law, signifies one who has the custody and education of such persons as have not sufficient discretion to take care

care of themselves and their own affairs, as children and ideots. The guardian's business is to take the profits of the minor's lands to his use, and to account for the same; to sell all moveables within a reasonable time, and to convert them into land or money, unless the minor is near of age, and may want such things himself; and to pay interest for the money in his hands, that might have been so placed out; in which case it will be presumed that the guardian made use of it himself. He is to sustain the lands of the heir, without making destruction of any thing thereon, and to keep it safely for him: if he commit waste on the lands, it is a forfeiture of the guardianship: 3 Edward I. And where persons, as guardians, hold over any land, without the consent of the person who is next entitled, they shall be adjudged trespassers, and shall be accountable; 6 Ann. cap. xviii.

GUARDIAN OF THE SPIRITUALITIES, he to whom the spiritual jurisdiction of any diocese is committed, during the vacancy of the see. He may be either guardian in law, or jure magistratus, as the archbishop is of any diocese within his province; or guardian by delegation, as he whom the archbishop or vicar-general doth for the time depute.

GUARDIARA, a river of Spain which rises in New Castile, runs through the provinces of La Mancha and Estremadura; and falls into the Atlantic between Ayamonte and Castromarin.

GUARD-SHIP, is a vessel of war appointed to superintend the marine in a harbour or river, and to see that the ships which are not commissioned have their proper watchward kept duly, by sending her guard-boats round them every night. She is also to receive seamen who are impressed in the time of war.

GUAREA, in botany, a genus of the monogynia order, and octandria class of plants. Calyx quadrifid; petals four; nectarium cylindric, having the anthers in its mouth; capsule quadrilocular, quadrivalvular; seeds solitary.

GUARGALA, or **GUERGUELA**, a town of Africa, and capital of a small kingdom of the same name, in Biledulgerid, S. of Mount Atlas. Lon. 9. 55. E. Lat. 28. 0. N.

GUARMA, or **GUARMOY**, a sea-port of Peru, with a good harbour, about 130 miles N. W. of Lima. Lon. 77. 49. W. Lat. 10. 10. S.

GUASTALLA, or **GUASTELLA**, a strong town of the late Cisalpine republic, in the department of Mincio, and late duchy of Mantua, 15 miles N. of Reggio.

GUATIMALA, an audience of North America, in New Spain, above 750 miles in length, and 450 in breadth. It abounds in chocolate, which they use instead of money.

GUATIMALA, a province of New Spain, in the above audience.

GUATIMALA, or **ST. JAGO DE GUATIMALA**, a large and rich town of New Spain; capital of the above audience and province.

GUAXACA, a province of North America, in New Spain, which is very fertile in wheat, Indian corn, cochineal, and cassia. It is bounded by the gulph of Mexico on the N. and by the South Sea on the S. It contains mines of gold, silver, and crystal.

GUAXACA, the capital of the above province.

GUBBIO, **GUBIO**, or **EUGUBIO**, a town of Italy, in the duchy of Urbino. Lon. 12. 41. E. Lat. 43. 18. N.

GUBEN, in Lower Lusatia, 62 miles north-east of Dresden.

GUDGEON, in ichthyology, a species of cyprinus. See **CYPRINUS**.

GUDGEON, SEA. See **GOBIOUS**.

GUELDERLAND, a late duchy of Europe, bounded on the N. by Overysse and the Zuyder Zee; E. by the bishopric of Munster and the duchy of Cleves; S. by those of Juliers and Brabant, and W. by the States of Utrecht and Holland. It is now annexed to France.

GUELDERLAND, one of the late United Provinces, which now forms the department of the Rhine in Batavia. Its greatest extent from N. to S. is about forty-seven miles, and from W. to E. near as much; but its figure is very irregular. The air here is much healthier and clearer than in the maritime provinces, the land lying higher.

GUELDRES, a town of France, in the department of the Roer, and late duchy of Prussian Guelderland, ten miles N. W. of Venlo, and seventy-two S. E. of Amsterdam.

GUELPHS, or **GUELFS**, a celebrated faction in Italy, antagonists of the Gibelins. The Guelphs and Gibelins filled Italy with blood and carnage for many years. The Guelphs stood for the Pope, against the emperor.

GUERET, a town of France, capital of the department of Creuse, thirty-five miles N. E. of Limoges and 170 S. of Paris.

GUERICKE, **OTTO**, or **ORHO**, a very eminent German philosopher in the seventeenth century, who, with Torricelli, Pascal, and Boyle, greatly contributed to explain the various properties of the air and their effects, was born in the year 1602. He was counsellor to the Elector of Brandenburg; and burgomaster, or consul, of Magdeburg. To him is to be attributed the invention of the air-pump, for though Mr. Boyle had, about the same time, made some approaches towards a similar discovery, yet he ingenuously acknowledged in a letter to his nephew, Lord Dungarvon, that the information which he received from Schottus's "*Mechanica Hydraulico Pneumatica*," published in 1657, in which was an account of Guericke's Experiments, first enabled him to bring his design to any thing like maturity. Guericke was also the inventor of the two brass-hemispheres, to illustrate the pressure of the air, which, being applied to each other, and the air exhausted, resisted the force of sixteen horses to draw them asunder. He likewise invented an instrument to shew the variations in the state of the atmosphere, consisting of a tube, in which was a little image of glass, that descended in rainy or stormy weather, and rose again when the weather became fine and serene. This last machine fell into disuse on the invention of the barometer, and especially after the improvements made in that instrument by Huygens and Amontons. He died in 1686. He was the author of several treatises in natural philosophy, the principal of which is entitled "*Experimenta Magdeburgica*," 1672, folio, and contains his experiments on a vacuum.

GUERNSEY, an island in the British channel, on the coast of the French department of the channel, (late Normandy,) subject to Britain; but, as well as the adjacent islands, governed by its own laws. See **JERSEY**. It extends from E. to W. in the form of a harp, and is thirteen miles from S. W. to N. E. and twelve and a half where broadest, from E. to W. The air is very healthy, and the soil naturally more rich and fertile than that of Jersey; but the inhabitants neglect the cultivation of the land for the sake of commerce.

GUETTARDA, in botany, a genus of the heptandria order, and monœcia class of plants; natural order, *Tricocca*. The male calyx is cylindrical; the corolla cleft into seven parts, and funnel-shaped. The female calyx cylindrical; the corolla cleft into seven parts; one pistil, and the fruit a dry plum. It has four species, natives of the East and West Indies.

GUIANA, a very extensive country of South America, bounded on the E. and N. E. by the Atlantic ocean, and the Oroonoko; on the S. by the Amazon; and on the W. by Grenada and New Andalusia, in Terra Firma, from which it is separated on the W. and N. by the Oroonoko. It extends above 1200 miles in length from N. E. to S. W.; i. e. from the mouth of the Oroonoko to that of the Amazon, and from 300 to 600 in breadth. Most geographers divide it into two parts, calling the country along the coast Carribeano Proper, and the interior Guiana Proper: the last is also styled El Dorado by the Spaniards, on account of the immense quantity of gold it is supposed to contain. The Portuguese, French, and Dutch, have all formed settlements along the coast. The coast between Cape North and Cape Orange is possessed by the natives. Along the coast, the land is low, marshy, and subject to inundations by the rivers which descend from the inland mountains. Hence the atmosphere is suffocating, hot, moist, and unhealthful, especially where the woods have not been cleared away. The Europeans are forced to live in the most disagreeable situations, and fix their colonies at the mouths of the rivers, amidst stinking marshes, and the putrid ooze of salt morasses, for the convenience of exportation and importation. The inhabitants are either natives, who are of a reddish-brown; or negroes and Europeans; or a mixed progeny of these in various combinations.

GUIAQUIL, a city, bay, and harbour, of Peru, capital of an audience of the same name. Lon. 79. 15. W. Lat. 2. 11. S.

GUIDES, in military language, are usually the country people in the neighbourhood of an encampment; who give the army intelligence

telligence concerning the country, the roads by which they are to march, and the probable route of the enemy.

GUIDON, a flag borne by the king's life-guard, broad at one extreme, and almost pointed at the other, and slit or divided into two. It is the ensign or flag of a troop of horse-guards. See **GUARD**.

GUIDON, the officer who bears the guidon, is that in the horse-guards which the ensign is in the foot; and takes place next below the cornet.

GUIDONS, [*guidones*, or *schola guidonum*,] were a company of priests established by Charlemagne, at Rome, to conduct and guide pilgrims to Jerusalem, to visit the holy places: they were also to assist them in case they fell sick, and to perform the last offices to them in case they died.

GUIDORE, a river of Ireland in Donegal.

GUIENNE, a late province of France: it was bounded on the N. by Saintogne, E. by Limosin, and Languedoc; S. by the Pyrenees; and W. by the ocean. It was 225 miles long and 200 broad; and was divided into the Upper and Lower. This extensive province was anciently called Aquitaine, and is now divided into the departments of Aveiron, Dordogne, Gers, Gironde, Landes, Lot, Lot and Garonne, and Lower and Upper Pyrenees. The principal rivers are, the Garonne, the Adour, the Tarn, the Aveiron, and the Lot. Bourdeaux was the capital.

GUILANDINA, the **NICKAR-TREE**: a genus of the monogynia order, and decandria class of plants; natural order, Lomentaceæ. Calyx monophyllous, salver-shaped; petals, inserted into the neck of the calyx, nearly equal; the seed-vessel a legume. There are six species.

GUILD, [from the Saxon verb *gildan*, to pay,] signifies a fraternity or company, because every one was gildare, *i. e.* to pay something towards the charge and support of the company.

GUILD, **GILD**, or **GELD**, is also used among ancient writers, for a compensation or mulct for a fault committed.

GUILD, in the royal boroughs of Scotland, is still used for a company of merchants, who are freemen of the borough.

GUILDFORD, or **GULDEFORD**, a borough-town of Surrey, on the Wye, thirty miles S. W. of London.

GUILDFORD, a town of the United States in Connecticut, twelve miles E. of Newhaven, and 201 N. E. of Philadelphia.

GUILD-HALL, or **GILD-HALL**, the great court of judicature for London. In it are kept the mayor's-court, the sheriff's-court, the court of hustings, court of conscience, court of common-council, chamberlain's-court, &c. Here also the judges sit upon *nisi prius*, &c.

GUILAIN, a town of France, in the department of Jemappes, and late province of Austrian Hainault; six miles from Mons.

GUILLESTREE, a town of France, in the department of the Upper Alps, nine miles N. N. W. of Embrun.

GUILLOTINE, an engine of decapitation, decreed by the French National Assembly, to be the sole punishment of persons condemned to death, on the 20th of March, 1792; so named from Dr. Guillot, a member of the assembly, who proposed it as an instrument of mercy, by giving the criminal a more expeditious death than any other means can afford. Its effect, it must be allowed, is instantaneous. A minute description of it is unnecessary, as fig. 4, and 5, Plate LXXXV. will convey a sufficient idea of it.

GUIMARAENS, a town of Portugal, in Entre Duero e-Minho, ten miles E. of Braga.

GUINEA, a large tract of country lying on the W. side of the continent of Africa, extends along the coast from 3 to 4000 miles, beginning at the river Senegal, about 17° of lat. N. the nearest part of Guinea to Europe as well as to North America. From that river to the Gambia, and in a S. course to Cape Sierra Leona, is comprehended a coast of about 700 miles; being the same tract for which Queen Elizabeth granted charters to the first traders to that coast. From Sierra Leona, the land of Guinea takes a turn to the E. extending about 1500 miles, including those several divisions called the Grain Coast, the Ivory Coast, the Gold Coast, and the Slave Coast, with the kingdom of Benin. From thence the land runs S. along the coast about 1200 miles, and contains the kingdoms of Congo and Angola. From this to the southmost cape of Africa, called the Cape of Good Hope, the country is settled by Caffres and Hottentots, who have never been concern-

ed in making or selling slaves. As all this country lies between the tropics, the air is excessively hot, especially from the beginning of September to the end of March; which, with the coolness of the nights, the frequent thick, stinking, sulphureous mists, and the periodical rains, when the flat country is overflowed, makes it very unhealthy, especially to Europeans. The natives, however, are little affected with the unwholesome air. According to Barbot, they keep much within doors in tempestuous times; their skins being suppled and pores closed by daily anointing with palm-oil, the weather can make but little impression on them. They generally, therefore, enjoy a good state of health, and are able to procure to themselves a comfortable subsistence, with much less care and toil than is necessary in our more northern climate; which last advantage arises not only from the warmth of the climate, but also from the overflowing of the rivers, whereby the land is regularly moistened and rendered extremely fertile; and being in many places improved by culture, abounds with grain and fruits, cattle, poultry, &c. The earth yields all the year a fresh supply of food: few cloaths are requisite, and little art necessary in making them, or in the construction of their houses, which are very simple, principally calculated to defend them from the tempestuous seasons and wild beasts; a few dry reeds covered with mats serve for their beds. The distempers the Europeans are subject to, on this coast, are fevers, fluxes, and colics, which are occasioned by indifferent water and bad air; their settlements lying near the coast, where the fogs and steams arising from the ooze and salt-marshes, and the stinking fish the natives dry on the beach, corrupt the air, and render it fatal to the foreigners. The most temperate men find it difficult to preserve their health; but many hasten their death by their intemperance, or negligence, exposing themselves to the cold air in the evening, after a very hot day. This sudden change, from one extreme to the other, has often very bad effects in hot climates.

GUINEA, [from *Guinea*, a country in Africa, abounding with gold,] a gold-coin valued at one and twenty shillings. The guinea anciently bore the impression of an elephant. Its value has varied; when first struck it was 20s.; from the scarcity of gold it was afterwards advanced to 21s. 6d. but it is now sunk to 21s. The pound weight troy of gold is cut into 44½ parts; each part makes a guinea.

GUINEA, **NEW**, a long and narrow island of the East Indies, very imperfectly known. It was supposed to be connected with New Holland, until Captain Cook discovered the strait which separates them. New Guinea extends from the equator to 12° lat. S. and from 131° to 150° lon. E. The land is very low, but it is covered with a vast luxuriance of wood and herbage. Cocoa-nut, plantain, and bread fruit-trees, flourish in perfection.

GUINEA-HEN. See **NUMIDA**.

GUINEA-PEPPER. See **CAPSICUM**.

GUINEA-PIG. See **CAVIA**.

GUINGAMP, a town of France, in the department of the North Coasts, 258 miles W. of Paris.

GUIPUSCOA, a province of Spain, bounded on the N. by the Atlantic, E. by France, S. E. by Navarre; S. by Alava, and W. by Biscay; twenty-five miles long, and from fifteen to twenty broad.

GUISE, a town of France, in the department of Aisne, on the Oise, twenty miles N. of Laon.

GUITAR, [*ghitara*, Ital. *guitarre*, Fr.] a stringed instrument of music. The guitar has five double rows of strings; of which those that are brass are in the middle, except it be for the burden, an octave lower than the fourth. It was first used in Spain, where it is still greatly in vogue.

GULA, or **GOLA**, in architecture, a wavy member, the contour of which resembles the letter S, which the Greeks call cymatium, and our architects an ogee. See **ARCHITECTURE**.

GULES, a corruption of the French word *gueules*, which in heraldry signifies red, is represented in engraving by perpendicular lines. It serves to denote martial prowess and hardness: for the ancients used this colour to make themselves terrible to their enemies, to stir up magnanimity, and to prevent the seeing of blood, by the likeness of the colours; for which reason perhaps it is used by the English. This colour is by the generality of the English heralds ranked before azure. But the late French heralds preferred azure.

GULF, a capacious bay between two promontories, sometimes taking the name of a sea, when very extensive; but particularly when it only communicates with the sea by a strait. Such are the Euxine or Black Sea, called the Gulf of Constantinople; the Adriatic Sea, or the Gulf of Venice; the Gulf of Lyons, near France, and the Gulf of Sierra near Barbary. All these are in the Mediterranean. There are the Gulfs of Mexico, St. Lawrence, and California, in North America; the Gulf of Persia, or the Red Sea, between Persia and Arabia; the Gulf of Bengal in India; and the Gulfs of Cochin-china and Kamtschatka, near these countries.

GULL, in ichthyology. See **LARUS**.

GULL ISLE, an isle near Cape St. John.

GULLET. See **ANATOMY**.

GUM, [*gummi*, Latin,] a thick, transparent, tasteless fluid, which sometimes exudes from certain species of trees. It is very adhesive, and gradually hardens without losing its transparency; but easily softens again when moistened with water. The gum most commonly used is that which exudes from different species of the mimosa, particularly the nilotica. It is known by the name of gum-arabic. Gum likewise exudes abundantly from the prunus avium, or common wild cherry-tree of this country. Gum is usually obtained in small pieces like tears, moderately hard, and somewhat brittle while cold, so that it can be reduced by pounding to a fine powder. When pure it is colourless, but has usually a yellowish tinge, and it is not destitute of lustre. It has no smell. Its taste is insipid. Its specific gravity varies from 1.31 to 1.48. Gum undergoes no change from being exposed to the atmosphere; but the light of the sun makes it assume a white colour. Water dissolves it in large quantities. The solution, which is known by the name of mucilage, is thick and adhesive: it is often used as a paste, and gives stiffness and lustre to linen. When spread out thin it soon dries, and has the appearance of a varnish; but it readily attracts moisture, and becomes glutinous. Water washes it away entirely. When mucilage is evaporated the gum is obtained unaltered. This mucilaginous solution may be kept for years without undergoing putrefaction. Scarcely any vegetable substance is less liable to decomposition. At last, however, the odour of acetic acid becomes perceptible in it. When gum is exposed to heat it softens and swells, but does not melt; it emits air-bubbles, blackens, and at last, when nearly reduced to charcoal, emits a low blue flame. This flame appears sooner if a flaming substance is held just above the gum. After the gum is consumed, there remains a small quantity of white ashes, composed chiefly of the carbonates of lime and potass. It does not appear that gum is acted upon by oxygen gas. A solution of gum and water, when exposed to the air, soon becomes mouldy on the surface, but undergoes no farther change for a long time. The action of the simple combustibles on gum has scarcely been examined. Azotic gas seems to have no action on it whatever. Gum does not act upon metals; but it has the property of combining with several of the metallic oxides, and forming compounds; at least, some of the salts occasion precipitates when dropped into solutions of gum. The most curious effect is that produced by the oxy muriate of iron. When this salt, concentrated, is dropt into a very strong mucilage, the whole becomes a brown semitransparent jelly, which is not readily dissolved by water. When dried, the jelly becomes lighter coloured, and assumes nearly the appearance of gum. Its taste is that of gum mixed with iron. The species of gum at present known amount to four; though it is likely that a more rigid examination of the vegetable kingdom will discover a greater number. These are gum-arabic, gum-tragacanth, cherry-tree gum, and the mucilage which is contained in the roots and leaves of many plants.

GUM RESINS, are certain substances that have long been used in medicine. They are solid, generally brittle and opaque, have a strong smell, and a pungent and bitter taste. They consist chiefly of gum and resin, the proportions varying with the particular substance. They are never obtained by means of spontaneous exudation, but are procured by wounding the plants which contain them. The principal of the gum-resins are, 1. **AMMONIAC**; 2. **ASSAFETIDA**; 3. **EUPHORBBIUM**; 4. **GALBANUM**; 5. **GAMBOGE**; 6. **MYRRH**; 7. **OPOPONAX**; 8. **SAPAGENUM**. See those articles.

GUN, [perhaps from *canne*, the original of cannon,] a weapon of

offence, which forcibly discharges a ball, or other hard solid matter, through a cylindric tube, by means of inflamed gunpowder. See **GUNPOWDER**. The word gun now includes most species of firearms; pistols and mortars being almost the only ones excepted from this denomination. They are divided into great and small guns: the former including all that we also call cannon, ordnance, or artillery; the latter including **MUSQUETS**, **CARABINES**, **MUSQUETOONS**, **BLUNDERBUSSSES**, **FOWLING-PIECES**, &c. See these articles. It is not known when these weapons were first invented. Though, comparatively speaking, the introduction of guns into the western part of the world is but of a modern date; yet it is certain that in some parts of Asia they have been used, though in a very rude and imperfect manner, for many ages. Philostratus mentions a city near the Hyphasis in the Indies, which was said to be impregnable, and that its inhabitants were relations of the gods, because they threw thunder and lightning upon their enemies. Hence some imagine that guns were used by the eastern nations even in the time of Alexander the Great; but however this may be, many of our modern travellers assert, that they were used in China as far back as A.D. 85, and have continued in use ever since. The first hint of the invention of guns in Europe is in the works of Roger Bacon, who flourished in the thirteenth century. In a treatise written by him about 1280, he proposes to apply the violent explosive force of gunpowder for the destruction of armies. See **GUNPOWDER**, and **PROJECTILES**. Great Guns, or cannon, were formerly dignified with uncommon names. In 1503, Lewis XII. had twelve brass-cannon cast, of an extraordinary size, called after the names of the twelve peers of France. The Spanish and Portuguese called them after their saints. The emperor Charles V. when he marched before Tunis, founded the twelve Apostles. At Milan there is a 70 pounder, called the Pimontelle; and one at Bois-le-duc, called the Devil. A 60 pounder at Dover Castle, called Queen Elizabeth's Pocket-Pistol. An 80 pounder in the Tower of London (many years in Edinburgh Castle,) called Mons Meg. An 80 pounder in the royal arsenal at Berlin, called the Thunderer. An 80 pounder at Malaga, called the Terrible. Two curious 60 pounders in the arsenal at Bremen, called the Messengers of Bad News. And, lastly, an uncommon 70 pounder in the castle of St. Angelo at Rome, made of the nails that fastened the copperplates which covered the ancient Pantheon, with this inscription upon it: "Ex clavis trabalibus porticus Agrippæ." In the beginning of the fifteenth century the following more universal names took place, viz. Cannon royal, or carthoun = 48 pounders, about 90 cwt. Bastard cannon, or $\frac{3}{4}$ carthoun = 36 pounders, 79 cwt. $\frac{1}{2}$ Carthoun = 24 pounders, 60 cwt. Whole culverins = 18 pounders, 50 cwt. Demi-culverins = 9 pounders, 30 cwt. Falcon = 6 pounders, 25 cwt. Sacker = 5, 6, and 8 pounders, 13, 15, and 18 cwt. Basilisk = 48 pounders, 85 cwt. Serpentine = 4 pounders, 8 cwt. Aspik = 2 pounders, 7 cwt. Dragon = 6 pounders, 12 cwt. Syjen = 60 pounders, 81 cwt. Falconet = 3, 2, 1 pounders, 15, 10, and 5 cwt. Moyens, which carried a ball of ten or twelve ounces, &c. Rabinet, which carried a ball of sixteen ounces. At present cannon take their names from the weight of the ball they discharge. Thus a piece that discharges a ball of 24 pounds is called a 24 pounder; one that carries a ball of 12 pounds is called a 12 pounder, and so of the rest, divided into the following sorts, viz. ship-guns, consisting of 42, 36, 32, 24, 18, 12, 9, 6, and 3 pounders. Garrison-guns, in 42, 32, 24, 18, 12, 9, and 6 pounders. Battering guns, in 24, 18, and 12 pounders. Field-pieces, in 12, 9, 6, 3, 2, $1\frac{1}{2}$, 1, and $\frac{3}{4}$ pounders.

GUNDELFINGEN, a town of Bavaria in Neuburgh, on the Brentz, 19 miles N.E. of Ulm, and 38 W. of Neuburg.

GUNDELIA, in botany, a genus of the polygama segregata order, syngenesia class of plants; natural order Compositæ. Calyx scarcely any, five-flowered; corolla tubular, male and hermaphrodite; receptacle chaffy; down none. There is but one species, viz.

G. TOURNEFORTII, a milky plant, with alternate prickly leaves; a native of the Levant.

GUNNER, an officer appointed to fire the guns, either by sea or land. In the Tower of London, and other garrisons, as well as in the field, this officer carries a field-staff, and a large powder-horn in a string over his left shoulder. He marches by the guns; and when there is any apprehension of danger, his field-staff is armed

armed with match. His business is to lay the gun, to pass, and to help to load and traverse her.

GUNNER, MASTER, a patent-officer of the ordnance, who is appointed to teach all such as learn the art of gunnery, and to certify to the master-general the ability of any person recommended to be one of the king's gunners. To every scholar he administers an oath not to serve, without leave, any other prince or state; or teach any one the art of gunnery but such as have taken the said oath.

GUNNERA, in botany, a genus of the diandria order, and gynandria class of plants. The amentum consists of uniflorous scales; there is neither calyx nor corolla; the germen is bidentated with two styles and one seed. It has but one species.

GUNNERY is the art of charging, directing, and exploding, fire-arms, as cannons, mortars, muskets, &c. to the best advantage; and of determining the course, velocity, time of flight, momentum, &c. of the projected body. This branch of science belongs to the subject of **PROJECTILES**, since it treats of projected bodies, and the means of projecting them; we shall therefore refer the reader to that article.

GUNPOWDER, a composition of nitre, sulphur, and charcoal, mixed together, and usually granulated. This easily takes fire, and when fired it rarefies or expands with great vehemence, by means of its elastic force. It is to this powder that we owe all the effect and action of guns, and ordnance of all sorts, so that fortification, with the modern military art, &c. in a great measure depends upon it. The invention of gunpowder is ascribed by Polydore Virgil to a chemist, who having accidentally put some of his composition in a mortar, and covered it with a stone, it happened to take fire, and blew up the stone. Thevet says, that the person here spoken of was a monk of Fribourg, named Constantine Anelzen; but Belleforet, and other authors, with more probability, hold it to be Bartholdus Schwartz, or the black, who discovered it, as some say, about the year 1320. The name mortars, given to a species of ancient artillery, and their application in throwing stone-bullets, strongly favours this account of the discovery, of at least the application of gunpowder. But it appears that Roger Bacon knew of gunpowder near one hundred years before Schwartz was born; and M. Dutens carries the antiquity of gunpowder still much higher, and refers to the writings of the ancients themselves for the proof of it. It appears too, from many authors and many circumstances, that this composition has been known to the Chinese and Indians for thousands of years. The modern proportion of the ingredients for gunpowder is six parts of nitre to one of each of the other two: though Mr. Napier says, he finds the strength commonly to be the greatest when the proportions are, nitre three pounds, charcoal about nine ounces, and sulphur about three ounces. See his paper on gunpowder in the Transactions of the Royal Irish Academy, vol. ii. The cannon-powder was in meal, and the musket-powder grained; and it is certain, that the graining of powder, which is a very considerable advantage, is a modern improvement. To make gunpowder due regard is to be had to the purity or goodness of the ingredients, as well as the proportions of them, for the strength of the powder depends much on that circumstance, and also on the due working or mixing of them together. After the materials have been reduced to fine dust, they are mixed together, and moistened with water, or vinegar, or urine, or spirit of wine, &c. and then beaten together for twenty-four hours, either by hand or by mills, and afterwards pressed into a hard, firm, solid, cake. When dry, it is grained or corned, which is done by breaking the cake of powder into small pieces, and so running it through a sieve; by which means the grains may have any size given them, according to the nature of the sieve employed, either finer or coarser; and thus also the dust is separated from the grains, and again mixed with other manufacturing powder, or worked up into cakes again. Powder is smoothed or glazed, as it is called, for small arms, by the following operation: a hollow cylinder or cask is mounted on an axis, turned by a wheel; this cask is half filled with powder, and turned for six hours, and thus by the mutual friction of the grains of powder it is smoothed or glazed. The fine mealy part, thus separated or worn off from the rest, is again granulated. The velocity of expansion of the flame of gunpowder, when fired in a piece of artillery, without either bullet or other body before it, is prodigiously great, viz. seven thousand feet per second, or upwards, as appears from

the experiments of Mr. Robins. But M. Bernoulli and M. Euler suspect it is still much greater; and Dr. Hutton supposes it may not be less, at the moment of explosion, than four times as much. It is this prodigious celerity of expansion of the flame of gunpowder which is its peculiar excellence, and the circumstance in which it so eminently surpasses all other inventions, either ancient or modern; for as to the momentum of these projectiles only, many of the warlike machines of the ancients produced this in a degree far surpassing that of our heaviest cannon-shot or shells; but the great celerity given to these bodies cannot be in the least approached by any other means but the flame of powder.

GUNPOWDER, METHOD OF RECOVERING DAMAGED. The powder-merchants put part of the powder on a sail-cloth, to which they add an equal weight of what is really good; and with a shovel mingle it well together, dry it in the sun, and barrel it up, keeping it in a dry and proper place. Others again, if it be very bad, restore it by moistening it with vinegar, water, urine, or brandy; then they beat it fine, searce it, and to every pound of powder add 1oz. 1½ or 2oz. according as it is decayed, of melted salt-petre. Afterwards, these ingredients are to be moistened and mixed well, so that nothing can be discerned in the composition, which may be known by cutting the mass; and then granulated as at first. If the powder be in a manner quite spoiled, the only way is to extract the salt-petre with water by boiling, filtrating, evaporating, and crystallizing; and then with fresh sulphur and charcoal to make it up anew.

GUNPOWDER, METHODS OF TRYING. There are two general methods of examining gunpowder; 1st, with regard to its purity: 2d, As to its strength. 1. Its purity is known by laying two or three little heaps near each other upon white paper, and firing one of them. For if this takes fire readily, and the smoke rises upright, without leaving any dross or feculent matter behind, and without burning the paper, or firing the other heaps, it is esteemed a sign that the sulphur and nitre were well purified, that the coal was good, and that the three ingredients were thoroughly incorporated together: but if the other heaps also take fire at the same time, it is presumed that either common salt was mixed with the nitre, or that the coal was not well ground, or the whole mass not well beat and mixed together; and if either the nitre or sulphur be not well purified, the paper will be black or spotted. 2. Several instruments have been invented to try the strength of gunpowder; but they have generally been complained of as inaccurate. Count Rumford in the Philosoph. Trans. Vol. 71, gives an account of an exact method of trying the strength of it. "As the force of the powder (says he) arises from the action of an elastic fluid that is generated from it in its inflammation, the quicker the charge takes fire, the more of this fluid will be generated in any given short space of time, and the greater of course will its effect be upon the bullet. But in the common method of proving gunpowder, the weight by which the powder is confined is so great in proportion to the quantity of the charge, that there is time quite sufficient for the charge to be all inflamed, even when the powder is of the slowest composition, before the body to be put in motion can be sensibly removed from its place. The experiment therefore may shew which of the two kinds of powder is the strongest, when equal quantities of both are confined in equal spaces, and both completely inflamed; but the degree of inflammability, which is a property essential to the goodness of the powder, cannot by these means be ascertained. Hence it appears how powder may answer to the proof, such as is commonly required, and may nevertheless turn out very indifferent when it comes to be used in service. But though the common powder-tries, may shew powder to be better than it really is, they can never make it appear to be worse than it is; it will therefore always be the interest of those who manufacture the commodity to adhere to the old method of proof, but the purchaser will find his account in having it examined in a method by which its goodness may be ascertained with greater precision." To determine the goodness of powder by Count Rumford's method, it is necessary to have a barrel suspended by two iron-rods, that it can easily move backward or forward by the vibration of the rods; and the space it moves through ascertained by marking it on a piece of ribbon. The barrel being then charged with powder, and fitted with a proper bullet, is to be fired, and the recoil marked upon the ribbon. The experiment is to be repeated three or four times, or oftener if there is any difference in the recoil; the extremes

extremes of which may be marked with black lines on the ribbon, and the word *proof* written in the middle-line betwixt the two. But if the experiments are made with sufficient accuracy, there will commonly be very little difference in the length to which the ribbon is drawn out. Thus the comparative goodness of powder may easily be ascertained; for the stronger the powder is, the greater will be the recoil, and consequently the greater length to which the ribbon will be drawn out: and if care is taken in proportioning the charge to the weight of the bullet, to come as near as possible to the medium proportion that obtains in practice, the determination of the goodness of gunpowder from the result of this experiment cannot fail to hold good in actual service. That which is found to answer best is a small cannon, the bore of which is about one inch in diameter, and it is usually charged with two ounces of powder, and with powder only, as a ball is not necessary, and the strength of the powder is accurately shown by the arc of the gun's recoil.

GUNPOWDER, STATUTES RESPECTING. No person shall make gunpowder, but in the regular manufactories established at the time of making the statute 12 George III. c. 61, or licensed by the sessions, pursuant to certain provisions, under forfeiture of the gunpowder, and two shillings per pound; nor are pestle-mills to be used under a similar penalty. Only forty pounds of powder is to be made at one time under one pair of stones, except Battle-powder, made at Battle and elsewhere in Sussex. Not more than forty hundred weight to be dried at one time in one stove; and the quantity only required for immediate use to be kept in or near the place of making, except in brick or stone magazines, fifty yards at least from the mill. Not more than twenty-five barrels to be carried in any land-carriage, nor more than two hundred barrels by water, unless going by sea or coastwise, each barrel not to contain more than one hundred pounds. No dealer to keep more than two hundred pounds of powder, nor any person not a dealer, more than fifty pound in the cities of London and Westminster, or within three miles thereof, or within any other city, borough, or market-town, or one mile thereof, or within two miles of the king's palaces, or magazines, or half a mile of any parish-church; on pain of forfeiture, and two shillings per pound, except in licensed mills, or to the amount of three hundred pounds for the use of collieries, within two hundred yards of them.

GUNTER, EDMUND, M. A. and B. D. an excellent mathematician, born in Hertfordshire in 1581. He studied at Westminster and Oxford, where he graduated in 1606, and 1615. Being eminent for his knowledge in the mathematics, he was in 1613, chosen professor of astronomy in Gresham-college, where he distinguished himself by his lectures and writings. He improved the trigonometrical tables then in use, by adapting them to the solution of spherical triangles without the aid of secants. In 1622 he made the important discovery that the variation of the needle varies. Soon after he invented the rule for working questions in proportion instrumentally, which is an easy and excellent method of combining arithmetic and geometry, adapted to the understanding of persons of the most ordinary capacities. The lines on which the operation is performed, is called Gunter's line. He also invented a quadrant, and greatly improved the sector and other instruments. We are indebted to him for many other inventions and improvements, most of which are printed in his works. He died at Gresham-college in 1626. His first publication was entitled "Canon Triangulorum." His works have been collected, and various editions of them have been published. The fifth is by William Leybourn, in 1673, 4th., containing the description and use of the sector, cross-staff, bow, quadrant, and other instruments; with several pieces added by Samuel Foster, Henry Bond, and William Leybourn.

GUNTER'S CHAIN, the chain in common use for measuring land, according to true or statute measure; so called from Mr. Gunter, its reputed inventor. The length of the chain is 66 feet, or 22 yards, or four poles, of $5\frac{1}{2}$ yards each; and it is divided into 100 links, of 7.92 inches each. This chain is the most convenient of any thing for measuring land, because the contents thence computed are so easily turned into acres. The reason of which is, that an acre of land is just equal to 10 square chains, or 10 chains in length and one in breadth, or equal to 100,000 square links. Hence, the dimensions being taken in chains, and multiplied together, it gives the content in square chains, which therefore being

divided by 10, or a figure cut off for decimals, brings the content to acres; after which the decimals are reduced to roods and perches, by multiplying by 4 and 40. But a better way is to set the dimensions down in links, as integers, considering each chain as 100 links; then, having found the content in square links, divide these by 100,000, that is, cut off five places for decimals, the rest are acres, and the decimals are reduced to roods and perches as before. Suppose a rectangular field to be measured be 624 links in length, and 550 in breadth, to find its area we say

624
550
31200
3120
3.43200
4
1.72800
40
29.12

The area, or quantity of surface, is 3 A. 1 R. 29P.

GUNTER'S LINE, a logarithmic line, usually graduated upon scales, sectors, &c. It is also called the line of lines, and line of numbers; being only the logarithms graduated upon a ruler, which therefore serves to solve problems instrumentally in the same manner as logarithms do arithmetically. It is usually divided into an hundred parts, every tenth whereof is numbered, beginning with 1, and ending with 10; so that if the first great division, marked 1, stand for one-tenth of any integer, the next division, marked 2, will stand for two-tenths; 3, three-tenths, and so on; and the intermediate divisions will, in like manner, represent 100th parts of the same integer. If each of the great divisions represent 10 integers, then will the less divisions stand for integers; and if the great divisions be supposed each 100, the subdivisions will be each 10.

GUNTER'S LINE, USE OF. 1. To find the product of two numbers. From 1. extend the compasses to the multiplier; and the same extent, applied the same way from the multiplicand, will reach to the product. Thus, if the product of 4 and 8 be required, extend the compasses from 1 to 4, and that extent laid from 8 the same way, will reach to 32, their product. 2. To divide one number by another. The extent from the divisor to unity will reach from the dividend to the quotient: thus to divide 36 by 4, extend the compasses from 4 to 1, and the same extent will reach from 36 to 9, the quotient sought. 3. To three given numbers, to find a 4th proportional. Suppose the numbers 6, 8, 9; extend the compasses from 6 to 8, and this extent, laid from 9 the same way, will reach to 12, the fourth proportional required. 4. To find a mean proportional between any two given numbers. Suppose 8 and 32: extend the compasses from 8 in the left hand part of the line to 32 in the right; then bisecting this distance, its half will reach from 8 forward, or from 32 backward, to 16, the mean proportional sought. 5. To extract the square root of any number. Suppose 25: bisect the distance between one on the scale and the point representing 25; then the half of this distance, set off from 1, will give the point representing the root 5. In the same manner the cube root, or that of any higher power, may be found by dividing the distance on the line, between 1 and the given number, into as many equal parts as the index of the power expresses; then one of those parts, set from 1, will find the point representing the root required.

GUNTER'S QUADRANT, one made of wood, brass, &c. containing a kind of stereographic projection of the sphere, on the plane of the equinoctial; the eye being supposed placed in one of the poles. See QUADRANT.

GUNTER'S SCALE, usually called by seamen the Gunter, is a large plain scale, having various lines upon it, of great use in working the cases or questions in navigation. This scale is usually two feet long, and about an inch and a half broad, with various lines upon it, both natural and logarithmic, relating to trigonometry, navigation, &c. On the one side are the natural lines, and on the other the artificial or logarithmic ones. The former side is first divided into inches and tenths, and numbered from one to twenty-

four inches, running the whole length near one edge. One half the length of this side consists of two plain diagonal-scales, for taking off dimensions to three places of figures. On the other half or foot of this side, are contained various lines relating to trigonometry, in the natural numbers, and marked thus, viz.

Rumb, the rumb or points of the compass;

Chord, the line of chords;

Sine, the line of sines;

Tang, the tangents;

S. T. the semi-tangents; and at the other end of this half are,

Leag. leagues, or equal parts;

Rumb, another line of rumb;

M. L. miles of longitude;

Chor. another line of chords.

Also in the middle of this foot are L, and P, two other lines of equal parts: and all these lines on this side of the scale serve for drawing or laying down the figures to the cases in trigonometry and navigation. On the other side of the scale, are the following artificial or logarithmic lines, which serve for working or resolving those cases; viz.

S. R. the sine-rumbs;

T. R. the tangent-rumbs;

Numb. line of numbers;

Sine, sines;

V. S. the versed sines;

Tang. the tangents;

Mer. Meridional parts;

E. P. Equal parts.

GUNTOOR, a circar of Hindostan, N. of the Carnatic, and S. of the Kistnah, extending 40 miles along the bay of Bengal. It belongs to Britain.

GUNWALE, or **GUNNEL OF A SHIP**. That piece of timber which reaches on either side of the ship from the half-deck to the fore-castle, being the uppermost bend which finishes the up-works of the hull in that part, and wherein they put the stanchions which support the waste trees; and this is called the gunwale, whether there be guns in the ship or no; and the lower part of any port, where any ordnance are, is also termed the gunwale.

GURNARD. See **TRIGLA**.

GURRAH MONDELLA, a circar of Hindostan, between Allahabad and Berar; 120 miles long, and from 40 to 80 broad.

GURRAH, the capital of the above.

GUSSAGO, a town and district of the late Cisalpine republic, in the department of the Mela.

GUSSET, in heraldry, is formed by a line drawn from the dexter or sinister chief points, and falling down perpendicularly to the extreme base.

GUSTAVIA, in botany, a genus of the polyandria order, and monadelphia class of plants. Calyx none; petals very numerous; berry multilocular; seeds appendaged. It has only one species, a tree of Surinam and Cayenne.

GUSTAVUS I. king of Sweden, son of Eric Vasa, duke of Gripsholm. Christian II. king of Denmark having made himself master of Sweden, confined Gustavus at Copenhagen; but he making his escape, wandered long in the forests, till the cruelties of the tyrant having occasioned a revolution, he was first declared governor of Sweden, and then, in 1513, elected king. He introduced Lutheranism into his dominions, and died in 1560.

GUSTAVUS ADOLPHUS, THE GREAT, king of Sweden, was born at Stockholm in 1594, and succeeded his father Charles IX. in 1611. He espoused the cause of the Protestants in Germany, who were oppressed by Ferdinand I. He was a great warrior, and gained many victories, but was killed in the battle of Lutzen, where his troops got the victory, and defeated two of the emperor's armies, in Nov. 1632.

GUTTÆ, in architecture, are ornaments in the form of little cones, used in the plafond of the Doric cornice, or on the architrave underneath the triglyphs, representing a sort of drops or bells. They are usually six in number. See **ARCHITECTURE**.

GUTTÆ ANGLICANÆ, ENGLISH DROPS, a chemical preparation esteemed of great virtue against vapours and lethargic affections, and purchased at 5000l. by king Charles II. from the inventor, Dr. Goddard. It is a spirit drawn by the retort from raw milk, and rectified with an essential oil.

GUTTA ROSACEA, in medicine, a red or pimpled face; a

distemper which, though not always owing to hard drinking, is most incident to tipplers.

GUTTA SERENA, a disease in which the patient, without any apparent fault in the eye, is deprived of sight. See **MEDICINE**.

GUTTERS, in architecture, a kind of canals in the roofs of houses, serving to receive and carry off the rain.

GUTTURAL, [*gutturalis*, Latin,] a term applied to letters or sounds pronounced or formed as it were in the throat. There are four guttural letters in the Hebrew, viz. ק, ח, ע, ג, which, for memory's sake, are termed ahachah.

GUTTY, in heraldry, a term used when any thing is charged or sprinkled with drops. In blazoning, the colour of the drops is to be named.

GUY, [from *guide*,] a rope used to lift any thing into the ship.

GUY is also a large slack rope, extending from the head of the main-mast to the head of the fore-mast, and having two or three large blocks fastened to the middle of it; to sustain the tackle used to hoist in and out the cargo of a merchant-ship.

GUZ, an Indian measure, = 1 yard English.

GUZERAT, a peninsula of Hindostan, 170 miles long, and 140 broad, formed by the Arabian sea, and the gulf of Cambay. It was the richest province in the Mogul's empire.

GUZES, in heraldry, roundless of a sanguine or murry colour. These, from their bloody hue, are by some supposed to represent wounds.

GYARUS, one of the Cyclades, E. of Delos, 12 miles in compass. It was a desert island, and allotted for a place of banishment by the Romans.

GYBING, the act of shifting any boom-sail from one side of the mast to the other. By a boom-sail is meant any sail whose bottom is extended by a boom, the fore-end of which is hooked to its respective mast; so as to swing occasionally on either side of the vessel, describing an arch, of which the mast will be the centre. As the wind or the course changes, it becomes necessary to change the position of the boom, with its sail, which is accordingly shifted to the other side of the vessel as a door turns upon its hinges. The boom is pushed out by the effort of the wind upon the sail, and is restrained in a proper situation by a strong tackle communicating with the vessel's stem, called the sheet. It is also confined on the fore-part by the Guy.

GYMNANTHES, in botany, a genus of the monoecia monadelphia class and order. Male ament naked; perianth and corolla none; stamina pedicels three-parted or three-forked, another-bearing; female ament or germ pedicelled; corolla none; style trifid; capsule trilocular, three-celled. It has two species, natives of the West-Indies.

GYMNASIARCHA, in antiquity, the director of the gymnasium. He had two deputies under him; the Xystarcha, and the Gymnastes.

GYMNASIUM, [from *γυμνος*, naked,] in Grecian antiquity, a place fitted for performing the exercises of the body, &c. so called because they put off their clothes, to practise with the more freedom. Gymnasia were first used at Lacedæmon, but were afterwards common in all parts of Greece; and imitated, augmented, and improved, at Rome. There were three principal gymnasia at Athens; the Academy, the Lyceum, and the Cynosarges. Vitruvius describes the structure and form of the ancient gymnasia, lib. v. c. 11. They were called *Palæstræ*, from wrestling, which was one of the most usual exercises; and the Romans also called them *Therma*, because the baths made a principal part of them. They performed these exercises in Homer's time in drawers; which were not laid aside before the 32d Olympiad. One Orsippus is said to have been the first who introduced the practice: for having been worsted by his drawers entangling him, he threw them aside, and the rest afterwards imitated him. The gymnasia were a knot of buildings united, sufficiently capacious to hold many thousands of people at once; and having room for philosophers, rhetoricians, and the professors of all other sciences to read their lectures; and wrestlers, dancers, and all others who had a mind to exercise; at the same time without the least disturbance or interruption. They consisted of 12 parts, viz. 1. The exterior porticos, where the philosophers, rhetoricians, mathematicians, physicians, and other virtuosi, read public lectures, and where they also disputed and rehearsed their performances. 2.

The ephebeum, where the youth assembled very early, to learn their exercises in private without any spectators. 3. The coryceum, apodyterion, or gymnasterion, a kind of wardrobe, where they stripped, either to bathe or exercise. 4. The elæothesium, alipterion, or nuctuarium, appointed for the unctions, which either preceded or followed the use of the bath, wrestling, pancratia, &c. 5. The conisterium or conistra, in which they covered themselves with sand or dust, to dry up the oil or sweat. 6. The palastra, properly so called, where they practised wrestling, the pugillate, pancratia, and other exercises. 7. The sphæristerium or tennis-court, reserved for exercises wherein they used balls. 8. Large unpaved alleys, which comprehended the space between the porticos and the walls wherewith the edifice was surrounded. 9. The xysti or porticos for the wrestlers in winter or bad weather. 10. Other xysti or open alleys, some of which were quite open, and others planted with trees. 11. The baths, consisting of several different apartments. 12. The stadium, a large space of a semicircular form, covered with sand, and surrounded with seats for the spectators. For the administration of the gymnasia, there were different officers: the principal were, 1. The gymnasiarcha. 2. The xystarcha. 3. The gymnastes. And, 4. The pædotriba. See these articles. Under these four officers were a number of subalterns. The gymnastic exercises may be reduced to two general classes; as they depend either on the action of the body alone, or as they require external agents or instruments. The latter consisted chiefly in mounting the horse, driving the chariot, and swimming. The former were chiefly of two kinds; Orchestice, and Palæstrice; which see.

GYMNASTES, a deputy under the gymnasiarch, who was master of the ceremonies.

GYMNASTICS, **GYMNASTICÆ**, or the **GYMNASTIC**, [*γυμναστική*], the art of performing exercises of the body, whether for defence, health, or diversion. See **GYMNASIUM**. Several modern writers have treated of this art. M. Burette has given the history of gymnastics in the Mem. of the R. Acad. of Inscript. On the first establishment of society, men, being apprised of the necessity of military exercises, for repelling the insults of their neighbours, instituted games, and proposed prizes to animate their youth to combats of divers kind. And as running, leaping, throwing the javelin, driving a ball, tossing a quoit, wrestling, &c. were exercises suited to the manner of fighting in those days; so the youth vied to excel in them, in the presence of the aged, who sat as judges, and dispensed prizes to the conquerors; till what was originally amusement, became at length a matter of such importance, as to interest great cities and entire nations in its practice. Hence arose an eagerness to excel, in hopes of being one day crowned conquerors in the public games, which was the highest honour a mortal could arrive at: nay, they imagined, that even the gods were not insensible of what men were so captivated with; and, in consequence, introduced the greatest part of these exercises into their religious and funeral ceremonies. The gymnastic art, as appears from Homer's Iliad, lib. 23, where he describes the games at the funeral of Patroclus, was known at the time of the Trojan war. From that description, it appears, that they had chariot-races, boxing, wrestling, foot-races, gladiators, throwing the discus, drawing the bow, and hurling the javelin; and that even then the gymnastic art wanted little of perfection. When Galen says there was no gymnastic art in Homer's days, and that it began to appear no earlier than Plato, he is to be understood of medicinal gymnastics only.

GYMNASTICS, MEDICINAL. According to Plato, one Herodicus, a little prior to Hippocrates, was the first who introduced this art into physic; and his successors, convinced of its usefulness improved it. Hippocrates has given instances of it, where he treats of exercise in general, and of the particular effects of walking with regard to health; also of the different sorts of races on foot or horseback; leaping, wrestling, the exercise of the suspended ball, chironomy, unctions, frictions, rolling in the sand, &c. But as physicians did not adopt all the gymnastic exercises in their practice, it came to be divided between them and the masters of martial and athletic exercises, who kept schools, the number of which was greatly increased in Greece. The Romans, adopting the military and athletic exercises of the Greeks, advanced them to the utmost pitch of magnificence. But the declension of the empire involved the arts in its ruin, and, among

others gymnastics and medicine; which last unhappily then relinquished the title it had to the former, and has neglected to resume it ever since.

GYMNOSOPHISTS, [*Γυμνοσophισται*, Greek, i. e. a naked philosopher,] a set of Indian philosophers, famous in antiquity, so called from their going naked. They, however, did not absolutely go naked: but only clothed themselves no farther than modesty required. There were some of these sages in Africa; but the most celebrated of them were in India. In general, the Gymnosophists were wise and learned men; their maxims and discourses, recorded by historians, do not savour of a barbarous education, but are the result of great sense and deep thought. They kept up the dignity of their character to so high a degree, that it was never their custom to wait upon any body, not even upon the princes. They believed the immortality and transmigration of the soul: they placed the chief happiness of man in a contempt of the goods of fortune and the pleasures of sense, and gloried in having given faithful and disinterested counsels to princes and magistrates. Apuleius describes the Gymnosophists thus: "They are all devoted to the study of wisdom, both the elder masters and the younger pupils: and what to me appears the most amiable thing in their character is, that they have an aversion to idleness and indolence: accordingly, as soon as the table is spread, before a bit of victuals be brought, the youths are all called together from their several places and offices, and the masters examine them what good they have done since the sunrise: here one relates something he has discovered by meditation; another has learned something by demonstration; and as for those who have nothing to allege why they should dine, they are turned out to work fasting."

GYMNOSPERMIA, in botany, from *γυμνός*, naked, and *σπέρμα*, seed; the first order in Linnæus's class of didynamia. It comprehends those plants of that class which have naked seeds. The seeds are constantly four in number, except in one genus, viz. phryma, which is monospermous.

GYMNOTHORAX, the *murana*, in natural history, a genus of fishes of the order Apodes. Body eel-shaped, no pectoral fins; spiracle single, on each side of the neck, small oval, and uncovered. There are four species according to Gmelin, but Shaw enumerates eleven. The *G. romana* abounds on the Mediterranean coasts, and attains nearly the size of the common eel.

GYMNOTUS, *gymnote*, a genus of fishes, of the order apodes. The generic character is, head with lateral opercula; tentacula two on the upper lip; eyes covered by the common skin; gill-membrane five-rayed; body compressed, without dorsal fin (in most species), but carinated by a fin beneath. It has nine species.

GYMNOTUS ELECTRICUS, or **ELECTRICAL GYMNOTE**, is a native of the warmer regions of Africa and America, where it inhabits the larger rivers, and is particularly found in those of Surinam. In Africa it is said chiefly to occur in the branches of the river Senegal. It is a fish of a disagreeable appearance; bearing a general resemblance to a larger eel, though somewhat thicker in proportion, and of a much darker colour, being commonly of an uniform blackish-brown. It is usually seen of the length of three or four feet, but is said to arrive at 10 feet in length. It was first made known to the philosophers of Europe about the year 1671, when its wonderful properties were announced to the French Academy by Mons. Richer. This account however seems to have been received with a degree of cautious scepticism by the major part of European naturalists; and it was not till towards the middle of the last century that a full and general conviction appears to have taken place; the observations of Mons. Condamine, Mr. Ingram, Mr. Gravesend, and others, then conspiring to prove that the power of this animal consists in a species of real electricity, being conducted by similar conducting substances, and intercepted by others of an opposite nature. Thus, on touching the fish with the fingers, the same sensation is perceived as on touching a charged phial; being sometimes felt as far as the elbows; and if touched by both hands, an electric shock is conveyed through the breast in the usual manner. Fermin, in particular, who, during his residence in Surinam, had frequent opportunities of examining the animal, demonstrated by experiment that 14 slaves, holding each other by the hands, received the shock at the same instant; the first touching the fish with a stick, and the last dipping his hand into the water in which it was kept. The experiments of Dr. Bancroft

croft were equally satisfactory. It is by this extraordinary faculty that the gymnotus supports its existence: the smaller fishes and other animals which happen to approach, being instantly stupefied, and thus falling an easy prey to the electrical tyrant. So powerful is the shock which this fish in its native waters, is capable of exerting, that it is said to deprive almost entirely of sense and motion those who are exposed to its approach, and is therefore much dreaded by those who bathe in the rivers which it inhabits; yet it is used as an article of food. It has been affirmed that the gymnotus electricus, even for some time after its death, cannot be touched without feeling its electric shock. This is by no means incredible, when we consider the effect of the Galvanic pile, so well known to modern philosophers. See Plate LV.

GYNÆCEUM, in antiquity, the apartment of women, a separate room in the inner part of the house, where they employed themselves in spinning, weaving, and needle-work.

GYNÆOCOCRATUMENI, [from *gynē*, woman, and *κρατος* (AEVOG, vanquished,)] an ancient people of Sarmatia Europæa, inhabiting the E. banks of the Tanais, near its influx into the Palus Mæotis: thus called because they were under the dominion of women.

GYNANDRIA, [from *gynē*, a woman, *andros*, a man,] the 20th class in the sexual system, consisting of plants with hermaphrodite flowers, in which the stamina are placed upon the style, or, a pillar-shaped receptacle, resembling a style, which rises in the middle of the flower, and bears both the stamina and pointal. See BOTANY. The flowers of this class, says Linnæus, have a monstrous appearance, arising from the unusual situation of the parts of fructification.

GYNOPOGON, a genus of the pentandria monogynia class and order. Calyx half five-cleft; corolla five-parted; stigma globular, two-lobed; berry pedicelled, sub-globular; seed cartilaginous. There are three species, herbs of the South Sea islands.

GYPSIES, or **EGYPTIANS**, an outlandish tribe of vagabonds, called Bohemians in France, and Gittanos in Spain; who, disguising themselves in uncouth habits, smearing their faces and bodies, and speaking a canting language, wander up and down, under pretence of telling fortunes, curing diseases, &c. abuse the people, trick them out of their money, and steal all they can come at. They are a strange kind of commonwealth of wandering impostors and jugglers, who made their first appearance in Germany, about the beginning of the 16th century. Munster, who is followed and relied upon by Spelman, fixes the time of their appearance to 1417; but as he owns, that the first whom he ever saw were in 1529, it is probably an error of the press for 1517; especially as, when Sultan Selim conquered Egypt in 1517, several of the natives refused to submit to the Turkish yoke, and revolted under one Zinganeus; whence the Turks called them Zinganees; but being at length surrounded and banished, they agreed to disperse in small parties all over the world, where their supposed skill in the black art gave them an universal reception in that age of superstition and credulity. In a very few years they gained such a number of idle proselytes, (who imitated their language and complexion,) that they became troublesome, and even formidable to most of the states of Europe. Hence they were expelled from France in 1560, and from Spain in 1591. And the government of England took the alarm much earlier. A very circumstantial ac-

count of this singular race of men has been lately given in an Inquiry concerning them, written by H. M. G. Grellman, and translated by Mr. Raper. It is incredible how this swarm of banditti have spread over the earth. They wander about in Asia, and Africa, and most of the European nations. Spain is supposed by Mr. Twiss to contain 40,000, by others 60,000; and by some 120,000. But in Sept. and Oct. 1800, they were almost totally extirpated by the plague. They abound in Italy, and are scattered through France, Germany, Denmark, Sweden, and Russia. Europe contains more than 700,000 of these vagabonds. For near four centuries they have wandered through the world; and in every region, and among every people, whether barbarous or civilized, they have continued unchanged. Their origin has been generally believed to be from Egypt. Thomasius, Salmon, and Sig. Griselin, have endeavoured to prove it. M. Grellman, however, traces it from Hindostan, and the cause of their emigration from the bloody wars of Timur Beg in India, in 1408-9.

GYPSOPHILA, in botany, a genus of the digynia order, and decandria class of plants; natural order, Caryophyllæ. Calyx monophyllous, campanulated, angulated; petals five, ovate, sessile; capsule globose, unilocular. It has twelve species.

GYPSUM, **PLASTER-STONE**: a substance very abundant in nature, and which was well known to the ancients. It is now called the sulphate of lime. It is found in every part of the earth, sometimes composing entire mountains. Sulphate of lime is insipid, white, and soft to the touch. Water will not hold a 500th part of it in solution. Exposed to heat it appears to effervesce, which phenomenon is caused by the expulsion of water. It becomes opaque, and falls into powder. This powder, when its water has been driven off by the application of a red heat, absorbs water rapidly, so that if it be formed into a paste with water, it dries in a few minutes. In this state it is called plaster of Paris, and is employed for forming casts, and for a variety of purposes in the art of statuary.

GYRATION, [*gyro*, Lat.] the turning of any thing about.

GYRINUS, **WATER-FLEA**: in natural history, a genus of insects of the order coleoptera. Antennæ cylindrical; jaws horny, one-toothed, sharp-pointed; eyes four, two above and two beneath; thorax and shells margined, the latter shorter than the body; legs formed for swimming. The insects of this genus are to be found on the surface of waters, on which they run, and describe circles with a great degree of swiftness. There are eleven species. The most remarkable European species is the *gyrinus natator*, a small insect, about a quarter of an inch in length, of an oval shape, with somewhat sharpened extremities, and of a black or grey-black colour, with so lucid a surface as to shine like a piece of looking-glass in the full sunshine. It is an inhabitant of the waters, and is chiefly found in rivulets, being generally seen in great multitudes, and in very brisk motion. It is difficult to catch, diving with astonishing celerity when disturbed; the hinder legs being very broad, finely webbed with minute hairs, and most curiously formed for exercising the office of fins or oars.

GYROMANCY, [from *gyron*, to turn round, and *μαντις*, magic,] a kind of divination performed by walking round in a circle.

GYRON, in heraldry, an ordinary of two straight lines, issuing from divers parts of the escutcheon, and meeting in the Fesse-point.

H.

H is the eighth letter in our alphabet, and the sixth consonant. It has a distinct sound, formed in a particular manner by the organs of speech, which will appear by the words *all* and *hall*, *cat* and *heat*, *arm* and *harm*, *ear* and *hear*, *at* and *hat*, &c. as pronounced with or without the *h*. It is pronounced by a strong expiration of the breath between the lips, closing, as it were, by a gentle motion of the lower jaw to the upper, and the tongue nearly

approaching the palate. It seems to be agreed, that our *H* which is the same with that of the Romans, derived its figure from the Hebrew ה. The Phœnicians, and most ancient Greeks and Romans, used the same figure with our *H*, which in the series of all these alphabets keeps its primitive place, being the eighth letter; though the Θ afterwards occupied its place in the Greek alphabet, and its form was changed to X; while its former figure, *H*,

H, was used for the seventh letter *Eta*, or long *e*. H subjoined to *c*, sometimes gives it the guttural sound, as in *chaos*, sometimes the sound of *sh*, as in *Charlotte*; but more frequently that of *tsh*, as in *charity*, *chit-chat*, *church*, &c. and not seldom that of *k*, as in *character*, *Achilles*, &c. though the latter and all other Greek proper names ought rather to have the guttural sound, agreeably to their original pronunciation. H, subjoined to *p* and *t*, also alters the sound of these letters; giving the former the sound of *f*, as in *philosophy*, &c. and the latter that of the Greek θ , as in *theology*, *truth*, &c. and in some English words, as *the*, *that*, *these*, &c. a still harder sound. As an abbreviation, H was used by the ancients to denote *homo*, *hæres*, *hora*, &c. Thus H. B. stood for *hæres bonorum*; and H. S. corruptly for L. S. sesterce; and H. A. for Hadrianus. As a numeral, H denotes 200; and with a dash over it, 200,000.

HAAG, or HAG, a town in Bavaria. Lon. 12. 23. E. Lat. 48. 16. N.

HAANO, one of the Hapæe islands discovered by Captain Cook, in 1777, in the S. Pacific Ocean. Lon. 185. 43. E. Lat. 19. 41. S.

HAARBURG, a town and fort of Lunenburg Zell, seated on the Seeve, seven miles S. of Hamburg.

HABAKKUK. [הבקק, Heb. *i. e.* a wrestler,] one of the twelve lesser prophets, whose prophecies are taken into the canon of the Old Testament. There is no precise time mentioned in Scripture when he lived; but from his predicting the destruction of Jerusalem by the Chaldeans, it is evident that he prophesied before Zedekiah, probably about the time of Manasseh. He is reported to have been the author of several prophecies which are not extant; but all that are indisputably his are contained in three chapters. In these he complains pathetically of the vices of the Jews; foretells their punishment by the Chaldeans; the defeat of the vast designs of Jehoiakim; with the conquests of Nebuchadnezzar, his metamorphosis, and death. The third chapter is a prayer to God, whose majesty he describes with the utmost grandeur and sublimity of expression.

HABDALA, [Heb. *i. e.* distinction, from *בדל*, to separate,] a ceremony of the Jews observed on the sabbath evening. When all the family is come home, they light a taper or lamp, with two wicks at least. The master of the family then takes a cup, with some wine, mixed with fragrant spices, and having repeated a passage of scripture, (*e. g.* Psal. cxvi. 13. or Esth. viii. 16,) he blesses the wine and spices. Afterwards he blesses the light of the fire; and then casts his eyes on his hands and nails, as remembering that he is going to work; to signify, that the sabbath is over, and separated from the day of labour which follows. After the ceremony is over, and the company breaks up, they wish one another, not a good night, but a good week.

HABEAS CORPUS, [Lat. *i. e.* a writ, the which, a man indicted of some trespass, being laid in prison for the same, may have out of the king's-bench, thereby to remove himself thither at his own costs, and to answer the cause there. Habeas Corpus is the great remedy in cases of false imprisonment. A general recourse is had, in behalf of persons aggrieved by illegal imprisonment, to this writ, the most celebrated in the English law. Of this there are various kinds made use of by the courts at Westminster, for removing prisoners from one court into another for the more easy administration of justice. Such is the habeas corpus ad respondendum, when a man hath a cause of action against one who is confined by the process of some inferior court; in order to remove the prisoner, and charge him with this new action in the court above. Such is that ad satisfaciendum, when a prisoner hath had judgement against him in an action, and the plaintiff is desirous to bring him up to some superior court to charge him with process of execution. Such are also those ad prosequendum, testificandum, deliberandum, &c.; which issue when it is necessary to remove a prisoner, in order to prosecute or bear testimony in any court, or to be tried in the proper jurisdiction wherein the fact was committed. Such is, lastly, the common writ ad faciendum et recipiendum, which issues out of any of the courts of Westminster-hall, when a person is sued in some inferior jurisdiction, and is desirous to remove the action into the superior court; commanding the inferior judges to produce the body of the defendant, together with the day and cause of his caption and detainer (whence the writ is frequently denominated an habeas corpus cum causa,) to do and

receive whatsoever the king's court shall consider in that behalf. This is a writ grantable of common right, without any motion in court; and it instantly supersedes all proceedings in the court below. But, to prevent the surreptitious discharge of prisoners, it is ordered by stat. 1 & 2 P. & M. c. 13, that no habeas corpus shall issue to remove any prisoner out of any gaol, unless signed by some judge of the court out of which it is awarded. And, to avoid vexatious delays by removal of frivolous causes, it is enacted by stat. 21 Jac. I. c. 23, that, where the judge of an inferior court of record is a barrister of three years standing, no cause shall be removed from thence by habeas corpus or other writ, after issue or demurrer deliberately joined: that no cause, if once remanded to the inferior court by writ of procedendo or otherwise, shall ever afterwards be again removed: and that no cause shall be removed at all, if the debt or damages laid in the declaration do not amount to the sum of five pounds. But an expedient having been found out to elude the latter branch of the statute, by procuring a nominal plaintiff to bring another action for 5*l.* or upwards (and then by the course of the court, the habeas corpus removed both actions together,) it is therefore enacted by stat. 12 Geo. I. c. 29, that the inferior court may proceed in such actions as are under the value of 5*l.* notwithstanding other actions may be brought against the same defender to a greater amount. But the great and efficacious writ, in all manner of illegal confinement, is that of habeas corpus ad subjiciendum; directed to the person detaining another, and commanding him to produce the body of the prisoner, with the day and cause of his caption and detention, ad faciendum, subjiciendum, et recipiendum, to do, submit to, and receive, whatsoever the judge or court awarding such writ shall consider in that behalf. This is a high prerogative writ, and therefore by the common law issuing out of the court of king's-bench, not only in term-time, but also during the vacation, by a fiat from the chief justice, or any other judge, and running into all parts of the king's dominions: for the king is at all times intitled to have an account why the liberty of any of his subjects is restrained, wherever that restraint may be inflicted. If it issues in vacation, it is usually returnable before the judge himself who awarded it, and he proceeds by himself thereon; unless the term should intervene, and then it may be returned in court. The oppression of an obscure individual gave birth to the famous habeas corpus act, 31 Car. II. c. 2, which is frequently considered as another magna charta of the kingdom; and by consequence has also in subsequent times reduced the method of proceeding on these writs (though not within the reach of that statute, but issuing merely at the common law) to the true standard of law and liberty. The statute itself enacts, 1. That the writ shall be returned and the prisoner brought up, within a limited time according to the distance, not exceeding in any case twenty days. 2. That such writs shall be endorsed, as granted in pursuance of this act, and signed by the person awarding them. 3. That on a complaint and request in writing, by or on behalf of any person committed and charged with any crime, (unless committed for treason or felony expressed in the warrant, or for suspicion of the same, or as accessory thereto before the fact, or convicted or charged in execution by legal process,) the lord chancellor, or any of the twelve judges in vacation, upon viewing a copy of the warrant, or affidavit that a copy is denied, shall (unless the party has neglected for two terms to apply to any court for his enlargement) award a habeas corpus for such prisoner, returnable immediately before himself or any other of the judges; and upon the return made shall discharge the party, if bailable, upon giving security to appear and answer to the accusation in the proper court of judicature. 4. That officers and keepers, neglecting to make due returns, or not delivering to the prisoner or his agent within six hours after demand, a copy of the warrant of commitment, or shifting the custody of a prisoner from one to another without sufficient reason or authority, (specified in the act,) shall for the first offence forfeit 100*l.* and for the second 200*l.* to the party grieved, and be disabled to hold his office. 5. That no person, once delivered by habeas corpus, shall be re-committed for the same offence, on penalty of 500*l.* 6. That every person committed for treason or felony shall, if he require it the first week of the next term, or the first day of the next session of oyer and terminer, be indicted in that term or session, or else admitted to bail; unless the king's witnesses cannot be produced at that time: and if acquitted, or if not indicted and tried

in the second term or session, he shall be discharged from his imprisonment for such imputed offence: but that no person, after the assizes shall be opened for the county in which he is detained, shall be removed by habeas corpus, till after the assizes are ended; but shall be left to the justice of the judges of assize. 7. That any such prisoner may move for and obtain his habeas corpus, as well out of the chancery or exchequer, as out of the king's-bench or common-pleas; and the lord-chancellor or judges denying the same, on sight of the warrant, or oath, that the same is refused, forfeit severally to the party grieved the sum of 500*l*. 8. That the writ of habeas corpus shall run into the counties-palatine, cinque-ports, and other privileged places, and the islands of Jersey and Guernsey. 9. That no inhabitant of England (except persons contracting, or convicts praying to be transported; or having committed some capital offence in the place to which they are sent) shall be sent prisoner to Scotland, Ireland, Jersey, Guernsey, or any places beyond the seas, within or without the king's dominions: on pain that the party committing, his advisers, aiders, and assistants, shall forfeit to the party grieved a sum not less than 500*l*. to be recovered with treble costs; shall be disabled to bear any office of trust or profit; shall incur the penalties of *præmunire*; and shall be incapable of the king's pardon. This is the substance of that great and important statute: which extends only to the case of commitments for such criminal charge, as can produce no inconvenience to public justice by a temporary enlargement of the prisoner; all other cases of unjust imprisonment being left to the habeas corpus at common law. But even upon writs at the common law, it is now expected by the court, agreeably to ancient precedents and the spirit of the act of parliament, that the writ should be immediately obeyed, without waiting for any alias or pluries; otherwise an attachment will issue. By which admirable regulations, judicial as well as parliamentary, the remedy is now complete for removing the injury of unjust and illegal confinement. A remedy the more necessary, because the oppression does not always arise from the ill nature, but sometimes from the mere inattention, of government. For it frequently happens in foreign countries (and has happened in England during the temporary suspensions of the statute,) that persons apprehended upon suspicion have suffered a long imprisonment, merely because they were forgotten.

HABERDASHER, in commerce, a seller of hats, or of small wares. The master and wardens of the company of haberdashers in London, calling to their assistance one of the company of cap-pers, and another of the hat-makers, and mayors, &c. of towns, may search the wares of all hatters that work hats with foreign wool, and have not been apprentices to the trade, or who dye them with any thing but copperas and galls, or woad and madder; in which case they are liable to penalties, by stat. 8 Eliz. c. 7, and 3 Geo. II. c. 22.

HABERE FACIAS SASINAM, a writ judicial, which lies where a man has recovered lands, commanding the sheriff to give possession of them.

HABERGEON, or **HABERGETUM**, [from *haut*, Fr. high, and *berg*, armour,] was a coat of mail; an ancient piece of defensive armour, in form of a coat, descending from the neck to the middle, and formed of little iron rings or meshes, linked into each other.

HABILIMENTS OF WAR, in our ancient statutes, signify armour, harness, utensils, or other provisions, for war, without which there is supposed no ability to maintain war.

HABINGTON, WILLIAM, an English poet and historian, was the son of Thomas Habington, Esq. He was born in 1605, at Hendlip in Worcestershire; and educated at St. Omers and Paris. He died in 1654, and left several MSS. in the hands of his son. His printed works are, 1. Poems under the title of *Castura*. 2. The Queen of Arragon, a Tragi-comedy. 3. Observations upon History. 4. The History of Edward IV. King of England, written in a very florid style, and published at the desire of Charles I.

HABIT, [*habitus*, Lat.] in philosophy, an aptitude or disposition either of mind or body, acquired by a frequent repetition of the same act. Custom and habit have such influence upon many of our feelings, by warping and varying them, that their operations demand the attention of all who would be acquainted with human nature. The subject, however, is intricate. Some pleasures are fortified by custom: and yet custom begets familiarity, and conse-

quently indifference. In many instances, satiety and disgust are the consequences of reiteration: again, though custom blunts the edge of distress and of pain, yet the want of any thing to which we have been long accustomed is a sort of torture. Whatever be the cause, it is certain we are much influenced by custom: it has an effect upon our pleasures, upon our actions, and even upon our thoughts and sentiments. Habit makes no figure during the vivacity of youth: in middle age it gains ground; and in old age governs without control. In that period of life, generally speaking, we eat at a certain hour, take exercise at a certain hour, go to rest at a certain hour, all by the direction of habit: nay, a particular seat, table, bed, comes to be essential; and a habit in any of these cannot be controlled without uneasiness. Any slight or moderate pleasure, frequently reiterated for a long time, forms a peculiar connection between us and the thing that causes the pleasure. This connection termed habit, has the effect to awaken our desire for that thing when it does not return as usual. During the course of enjoyment, the pleasure rises insensibly higher and higher till a habit be established; at which time the pleasure is at its height. It continues not, however, stationary; the same customary reiteration which carried it to its height, brings it down again by insensible degrees. Those things which at first are but moderately agreeable, are the aptest to become habitual. Spirituous liquors, at first scarce agreeable, readily produce an habitual appetite: and custom prevails so far, as even to make us fond of things originally disagreeable, such as coffee, assafoetida, tobacco, opium, &c. A walk upon the quarter-deck, though intolerably confined, becomes, however, so agreeable by custom, that a sailor in his walk on shore confines himself commonly within the same bounds. Improper habits are easily acquired, but are not easily given up; hence it is necessary for a man who would conduct himself with propriety, to guard against the appearances of wrong habits; and if they have already taken place, to exert all his powers in order to eradicate them. Lord Kaimes in his *Elements of Criticism* has treated this subject at considerable length. And Dr. Cullen in his *Lectures on the Materia Medica*, (first edition) shews the effects of custom and habit on the animal œconomy.

HABIT, in medicine, denotes the settled constitution of the body, or the habitude of any thing else, as the structure or composition of a body, or the parts thereof.

HABIT is also used for a dress or garb, or the composition of garments, wherewith a person is covered; in which sense we say, the habit of an ecclesiastic, of a religious, &c. a military habit, &c. The principal part of the dress worn by the Jews and Greeks was by the *ἵματιον* and the *χιτών*. The *ἵματιον* was an upper garment, consisting of a loose square piece of cloth wrapped round the body; the *χιτών* was an under-garment or tunic, which was fastened round the body and embraced it closely, falling down to the middle of the thigh. A person divested of the upper garment, in the eastern language, was styled naked, and in this sense David danced naked before the ark. The several sorts of garments in use with both sexes, amongst the Romans, were the toga, tunica, peluna, lacerna, chlamys, paludamentum, lana, stola, pallium, or palla. See **TOGA**, &c. See also **PRIESTS**.

HABITE AND REPUTE, in Scots law, the common opinion of the people, among whom a person lives, with respect to any circumstance relating to him.

HABITUDE, among schoolmen, the respect or relation one thing bears to another. Some consider habitude as a genus, and subdivide it into two species; where it is considered as quiescent, they call it respect; where as moved, relation: to which some add a third species, considered in respect of figure, which they call mode. See **RELATION**, &c.

HABITUDE is also used by philosophers for what we commonly call habit, or a certain disposition or habitude for the performing or suffering of certain things, acquired by repeated acts of the same kind.

HACHA, a sea-port town of Terra Firma, seated at the mouth of the Hacha. Here the Spanish galleons touch at their arrival in S. America, and send expresses to all the settlements to give them notice. Lon. 72 8. W. Lat. 11. 28. N.

HACKNEY-COACHES, coaches exposed to hire in the streets of London, and other great cities, at rates fixed by authority. These first began to ply in London, in 1625, when they were only twenty in number; but in 1635 they were so much increased

creased, that king Charles I. issued out an order of council to restrain them. In 1637, he allowed fifty hackney-coachmen, each of whom might keep twelve horses. In 1652, their number was limited to 200; and in 1654, it was extended to 300. In 1661, 400 were licensed, at 5*l.* each annually. In 1694, 700 were allowed, and taxed by the 5 and 6 of W. and M. at 4*l.* a year each. By 9 Anne c. 23, 800 coaches were allowed in London and Westminster; but by 8 Geo. III. cap. 24, the number is increased to 1000, which are licensed by commissioners, and pay a duty of 5*s.* per week. The fare of hackney-coachmen in London, or within ten miles of it, is, 12*s.* 6*d.* per day. By the hour it is 1*s.* 6*d.* for the first, and 1*s.* for every hour after; and 1*s.* for any distance not exceeding a mile and a half; or 1*s.* 6*d.* two miles. Hackney-coachmen refusing to go at, or exacting more than, their limited hire, are subject to a forfeit of from 10*s.* to 3*l.* which the commissioners have power to determine. Every hackney-coach must have check-strings, and every coachman plying without them incurs a penalty of 5*s.* The drivers must give way to persons of quality and gentlemen's coaches, under the penalty of 5*l.* The duty arising from licences to hackney-coaches and chairs in London, forms a branch of the king's extraordinary and perpetual revenue, governed by commissioners, and is a public benefit; as the expence of it is not felt, and its regulations have established a competent jurisdiction, whereby a very refractory race of men are kept in order. For further information upon this subject, see COACH, HACKNEY.

HADDINGTON, an ancient borough of Scotland in East Lothian, which joins with Juddburgh, Dunbar, Lauder, and North Berwick, in sending a member to Parliament. It lies 17 miles E. of Edinburgh.

HADDINGTON, or **HADDINGTON-SHIRE**. See **LOTHIAN**, EAST.

HADDOCK. See **GADUS**.

HADDON, Dr. **WALTER**, a great restorer of the learned languages in England, was born in 1516. He distinguished himself by writing Latin in a fine style, which he acquired by a constant study of Cicero. He was a strenuous promoter of the reformation under Edward VI. and succeeded bishop Gardiner in the mastership of Trinity-hall, Cambridge. He concealed himself in Mary's reign; but acquired the favour of Queen Elizabeth, who sent him one of the three agents to Bruges in 1566, to restore commerce between England and the Netherlands. He was also engaged with Sir John Cheke in drawing up in Latin that useful code of ecclesiastical law, published in 1571 by the learned John Fox, under the title of "Reformatio Legum Ecclesiasticarum;" his other works are published under the title of "Lucubrations." He died in 1572.

HADERSLEBEN, a sea-port town of Denmark, in Sleswick. Lon. 9. 35. E. Lat. 55. 24. N.

HADES, in Scripture, sometimes signifies the invisible regions of the dead, sometimes the place of the damned, and sometimes the grave. In Greek authors it signifies the regions of the dead. See **HELL**.

HADLEY, a town of Suffolk, seated on the Preston. Lon. 1. 6. E. Lat. 52. 7. N.

HADLEY'S QUADRANT. See **NAVIGATION**.

HADRAMAUT, a fertile province of Arabia Felix, bounded on the W. by Yemen, N. by the Desert, N. E. by Oman, and S. E. by the Sea; containing several large towns and sea-ports.

HADRAMAUT, the capital of the above province, 150 miles W. of Carissen. Lon. 45. 30. E. Lat. 15. 0. N.

HÆMAGOGOS, among physicians, a compound medicine, consisting of fetid and aromatic simples, mixed with black hellebore, and prescribed in order to promote the menstrua and hamorrhoidal fluxes; as also to bring away the lochia.

HÆMANTHUS, the **BLOOD-FLOWER**: a genus of the monogynia order, and hexandria class of plants; natural order, Spatheaceæ. Involute six-leaved, many-flowered; corolla six-parted, superior; berry three-celled. There are eight species.

HÆMATITES, the **BLOOD-STONE**, a hard mineral substance, red, black, or purple, but the powder of which is always red. It is found in masses, spherical, semi-spherical, pyramidal, or cellular, *i. e.* like a honeycomb. It contains a large quantity of iron. The great hardness of hæmatites renders it fit for burnishing metals. See Plate LXVII.

HÆMATOPUS, the **SEA-PYE**, in ornithology, a genus belonging to the order grallæ. Beak compressed, with an equal wedge-shaped point; nostrils linear; toes three, without nails. The only species is the

H. OSTRALÉGUS, or **OYSTER-CATCHER**, a native of Europe and America. It feeds upon shell-fish near the sea-shore, particularly oysters, and limpets. On observing an oyster which gapes wide enough for the insertion of its bill, it thrusts it in, and takes out the inhabitant. The young are said to be hatched in about three weeks. These birds are wild when in flocks; yet are easily tamed, if taken young.

HÆMATOXYLON, or **HÆMATOXYLUM**, **Logwood**, or **CAMPEACHY-WOOD**; a genus of the monogynia order, and decandria class of plants; natural order, Lomentaceæ. Calyx quinquepartite; petals five; capsule lanceolated, unilocular, and bivalved; valves navicular or keeled like a boat. Of this genus there is only one species, which grows naturally in the bay of Campeachy at Honduras, and other parts of the Spanish West Indies, where it rises from 16 to 24 feet high. The trees are cut up into billets or junks, the bark and white sap of which are chipped off, and the red part, or heart, is sent to England for sale. See **Logwood**.

HÆMORRHAGIA, or **HÆMORRHAGY**, [from *αιμα*, blood, and *εσσυει*, to burst forth,] in medicine, a flux of blood at any part of the body; arising either from a rupture of the vessels, when too full or too much pressed; or from an erosion of them, when the blood is too sharp and corrosive. See **MEDICINE** and **SURGERY**.

HÆMORRHOIDAL, an appellation given by anatomists to the arteries and veins going to the intestinum rectum.

HÆMORRHOIDS, or **PILES**, an issue of blood from the hamorrhoidal vessels. See **MEDICINE**.

HÆMUS, in ancient geography, a ridge of mountains running from Illyricum towards the Euxine.

HÆRETICO COMBURENDO, a writ which anciently lay against an heretic, who, having once been convicted of heresy by his bishop, and having abjured it, afterwards falling into it again, or into some other, was thereupon committed to the secular power.

HAERLEM. See **HARLEM**.

HAG, in zoology. See **MYXINE**.

HAGAR, [הָגָר, *i. e.* a stranger,] a native of Egypt, the servant of Sarah, concubine of Abraham, mother of Ishmael, and ancestor of the Arabians. Her history, and the repeated divine interpositions for the preservation of her and her son, are recorded in Gen. xvi. and xxi.

HAGARENES, or **HAGARITES**, a branch or tribe of the descendants of Ishmael, so named from his mother. Some make the name synonymous with Ishmaelites, Arabians, and Saracens; but Asaph, in Psalm lxxxiii. ver. 6, mentions them as distinct from the other Ishmaelites. They dwelt in Arabia Felix, according to Pliny. Strabo joins them with the Nabathæans and Chavlotæans, whose habitation was rather in Arabia Deserta. Others think their capital was Petra, or Agra, and if so, they dwelt in Arabia Petræa. The Reubenites, in the days of Saul, made war with the Hagarites, and became masters of their country E. of Gilead. This therefore was the true country of the Hagarenes.

HAGIAZ, a town of Arabia, in Hedsjas.

HAGIOGRAPHIA, [from *ἅγιος*, holy, and *γραφω*, to write,] those books of Scripture, called by the Jews *Cetuvim*. The name is very ancient. St. Jerom makes mention of it. The Jews divide the sacred writings into three classes: 1. The law, or the five books of Moses: 2. The Prophets, which they call *Neviim*: and the *Cetuvim* כְּתוּבִים, called by the Greeks, &c. *Hagiographa*; comprehending the book of Psalms, Proverbs, Job, Daniel, Ezra, Nehemiah, Chronicles, Canticles, Ruth, Lamentations, Ecclesiastes, and Esther. Kimchi, Maimonides, and Elias Kevita, call these books the Writings, by way of eminence, as being written by immediate inspiration of the Holy Spirit.

HAGUE, a town of Batavia, in the department of Delft; and late province of South Holland. In Latin it is called *Haga Comititis*; in French, *La Haye*; in Dutch, *der Haag*, or *'s Graavenhage*; *i. e.* the Earl's Grove, from the wood near which it is built, and in which the earls of Holland had a country-house. It is one of the most considerable towns in the republic, pleasantly situated,

situated, and exceeding beautiful. It is 12 miles N. W. of Rotterdam, and 32 S. W. of Amsterdam.

HAGUENAU, a town of France, in the department of the Lower Rhine, anciently an imperial town.

HAIL, in natural history, a meteor generally defined frozen rain, but differing from it in that the hailstones are not formed of single pieces of ice, but of many little spherules agglutinated together. Neither are these spherules all of the same consistence; some being hard and solid like perfect ice; others soft, and mostly like snow hardened by a severe frost. Sometimes the hailstone has a kind of core of this soft matter; but more frequently the core is solid and hard, while the outside is formed of a softer matter. Hailstones are of various figures; some round, others pyramidal, crenated, angular, thin, and flat, and some stellated, with six radii like the small crystals of snow. Natural historians record various instances of surprising showers of hail, in which the hailstones were of extraordinary magnitude. Mezeray, speaking of the war of Lewis XII. in Italy, in 1510, relates, that there was for some time a horrible darkness, thicker than that of night; after which the clouds broke into thunder and lightning, and there fell a shower of hailstones, or rather (as he calls them) pebble-stones, which destroyed all the fish, birds, and beasts, of the country. It was attended with a strong smell of sulphur; and the stones were of a blueish colour, some of them weighing 100 lb. *Hist. de France*, Tom. II. p. 339. At Lisle in Flanders, in 1686, hailstones fell of a very large size; some of which contained in the middle a dark brown matter, which, thrown on the fire, gave a very great report. *Philos. Trans.* No. 203. Dr. Halley and others relate, that in Cheshire, Lancashire, &c. April 29, 1697, a thick black cloud, coming from Caernarvonshire, disposed the vapours to congeal in such a manner, that for about the breadth of two miles, which was the limit of the cloud, in its progress for 60 miles, it did inconceivable damage; not only killing all sorts of fowls and other small animals, but splitting trees, knocking down horses and men, and even ploughing up the earth; so that the hailstones buried themselves under ground an inch or an inch and half deep. The hailstones, many of which weighed five ounces and some half a pound, being five or six inches about, were of various figures: some round, others half round; some smooth, others embossed and crenated: the icy substance of them was very transparent and hard, but there was a snowy kernel in the middle of them. In Hertfordshire, May 4, 1697, after a severe storm of thunder and lightning, a shower of hail succeeded, which far exceeded the former: some persons were killed by it, their bodies beat all black and blue; vast oaks were split, and fields of rye cut down as with a scythe. The stones measured from ten to thirteen or fourteen inches about. Their figures were various, some oval, others picked, some flat. *Philos. Trans.* No. 229. On the tops of mountains hailstones, as well as drops of rain, are very small, and continually increase in bulk till they reach the lower grounds. It would seem, therefore, that during their passage through the air, they attract the congealed vapour which increases them in size; or that the vapour they meet with is congealed on them as they fall. Some modern philosophers ascribe the formation of hail to electricity. See **METEOROLOGY**.

HAILBRON, a strong town in Wirtemberg, 5 miles N. E. of Stutgard.

HAINAN, one of the most considerable islands of Asia, subject to China, and belonging to the province of Quang-ton. It has on the N. the province of Quang-si; on the S. the channel between the bank Paracel and the E. coast of Cochinchina; on the W. the same kingdom and part of Tong-king; and on the E. the Chinese sea. Its extent from E. to W. is between 60 and 70 leagues, and from N. to S. 45; and about 480 miles in circumference. Kiun-tcheou-fou is the capital. Hainan lies near San-cian, between 18° and 20° Lat. N.

HAINAULT, a province of the Netherlands, formerly divided between France and Austria, but now wholly belonging to France. It was bounded on the S. by Champagne and Picardy; and extended from N. to S. about 45 miles, and about 48 from E. to W.

HAINBURG, or **HAIMBURG**, a town of Austria, on the Danube, 8 miles W. of Presburgh, and 20 S. S. E. of Vienna.

HAIR, [*har*, Saxon,] 1. One of the common teguments of the body. It is to be found upon all the parts of the body, except

the soles of the feet and palms of the hands. When we examine the hairs with a microscope, we find that they have each a round bulbous root, which lies pretty deep in the skin, and which draws their nourishment from the surrounding humours: that each hair consists of five or six others, wrapt up in a common tegument or tube. Hairs ordinarily appear round or cylindrical; but the microscope also discovers triangular and square ones; which diversity of figure arises from that of the pores, to which the hairs always accommodate their form. Their length depends on the quantity of the proper humour to feed them, and their colour on the quality of that humour: whence, at different stages of life, the colour usually differs. Their extremities split into two or three branches, especially when kept dry, or suffered to grow too long; so that what appears only a single hair to the naked eye, seems a brush to the microscope. The hair of a mouse, viewed by Mr. Derham with a microscope, seemed to be one single transparent tube, with a pith made up of fibrous substances, running in dark lines, in some hairs transversely, in others spirally. The darker medullary lines, he observes, were small fibres convolved, and lying closer together than in the other parts of the hair. They run from the bottom to the top of the hair; and he imagines, may serve to make a gentle evacuation of some humour out of the body. Hence the hair of hairy animals, may not only serve as a fence against cold, &c. but as an organ of insensible perspiration. When a hair is drawn between the fingers from the root towards the point, scarce any friction or resistance is perceived, and no noise is heard; but if it be passed in the same manner between the fingers from the point towards the root, a resistance is felt, a tremulous motion is evident to the touch, and a noise may be distinctly heard. It is obvious therefore, that the texture of the surface of hair is not the same from the root towards the point, as it is from the point towards the root. These observations are equally applicable to the filaments of wool. The ancients held the hair a sort of excrement, fed only with excrementitious matters, and no proper part of a living body. They supposed it generated of the fuliginous parts of the blood, exhaled by the heat of the body to the surface, and there condensed in passing through the pores; and that hair does not feed and grow like the other parts, by a juice circulating within it; but, like the nails, by juxtaposition. But the moderns are agreed, that every hair properly and truly lives, and receives nutriment to fill it like the other parts; which they prove hence, that the roots do not turn grey in aged persons sooner than the extremities, but the whole changes colour at once; which shews that there is a direct communication, and that all the parts are affected alike. In strict propriety, however, it must be allowed, that the life and growth of hairs is of a different kind from that of the rest of the body; and is not immediately derived therefrom, or reciprocated therewith. It is rather of the nature of vegetation. They grow as plants do, or as some plants shoot from the parts of others; from which though they draw their nourishment, yet each has, as it were, its distinct life and economy. They derive their food from some juices in the body, but not from the nutritious juices of the body; whence they may live though the body be starved. Almost the only disease of the hair, besides the remarkable one called *Plica Polonica*, is baldness, or its falling off. For this many remedies have been recommended, but scarce any of them can be depended upon. The juice of burdock, and the lixivial salts of vine-ashes, are said to be efficacious; also the powder of hermodactyls, and the decoction of boxwood. Some authors have given instances of the hair changing, in a short time, its colour, through grief, a fright, &c. &c. Frequent cutting the hair is very beneficial to the ears, eyes, nay, to the whole body; and, if the head be washed or immersed daily in cold water, it will be found an excellent preventive of periodical head-achs. Persons subject to defluxions of humours from the head, to weak eyes and similar complaints, will derive great benefit from shaving the head at certain intervals; as this is the most effectual mode of opening the pores and promoting perspiration. There is no danger of contracting cold from washing or exposing the head, after being rubbed dry, to the open air: and this futile objection should influence only the conduct of those who, from ignorance or prejudice, carry all their exhaled impurities on the surface of the skin, and especially on the head, for a succession of years. Thus, perhaps, arise many states of intellectual derangement, the source of which is seldom suspected. Besides, cleansing

ing the head affords comfortable and pleasing sensations; and the more frequently the hair be cut, it will grow the more speedily; so that this simple expedient may, in some measure, serve as a substitute for a constant blister, or artificial issue. The hair is, by all nations, considered as an ornament to the person, more than as a covering for the head, provided by the beneficent hand of nature. Hence various pomatums, and other secret preparations, have been imposed upon the public, for the purpose of "making the hair grow long and thick." We are no advocates for contrivances, which to our certain knowledge are generally composed of noxious ingredients, such as the calces of lead and mercury. Those persons who cannot be dissuaded from the use of artificial means, may with safety employ a mixture consisting of equal parts of olive oil and spirits of rosemary, to which may be added a few drops of oil of nutmeg. If the hair be rubbed every night with a little of this liniment, and the proportion be very gradually increased, it will answer every purpose to be attained by those boasted preparations which are sold by empirics. Another source of fraud is that of changing the colour of the hair to a darker shade: with this intention various liquid remedies are vended by perfumers, under different alluring appellations. These, however, being likewise prepared from lead, antimony, and other metallic solutions, no prudent person will be induced to purchase them. The only method that can be pursued with impunity, is to cut the hair close to the head, and to pass a leaden comb through it every morning and evening, by which simple practice the hair will assume a darker colour; the perspiration of the head will not be impeded, and, consequently, the health of the individual rather promoted than injured. Hair constitutes a very considerable article of commerce, especially since the fashion of wearing wigs has prevailed among all ranks, and has lately been extended to both sexes. The hair of this, and other northern countries, is preferred to that of the southern climates of Italy, France, &c. The chief quality of hair consists in its being well fed, as it is termed by hair-dressers, so that it be neither too coarse nor too slender. Hence thick hair is less susceptible of the artificial curl, and is disposed to frizzle; but, if it be too delicate, it will retain the curl only for a short time. The length of good hair is usually estimated at 25 inches; and in proportion as it is shorter, it becomes less valuable. There appears to be no stated price for this article; as according to its quality, it is sold at from 5s. to 5l. per ounce: it pays, when imported, a duty of 2s. 4½d. per lb. With respect to the various operations which hair undergoes previously to being manufactured into wigs, we trust the reader will excuse our silence. The hair of beavers, hares, and other animals, is used in various manufactures, especially that of hats, of which they constitute the principal material. If the refuse of the short hair of hides be scattered on arable land, and left there to putrefy, it proves one of the most fertilizing and durable manures. Berthollet found by analysis, that hair yielded from 1152 parts,

Carbonate of ammonia.....	90
Water	179
Oil.....	288
Gases.....	271
Coal.....	324

1152

Sulphuric acid, assisted by heat, dissolves hair. It forms, with the alkalis, an animal soap.

HAIR, in farriery, is commonly called the coat; and, with respect to horses, merits particular consideration. The hair growing on the fetlock, serves as a defence to the prominent part of it, when the animal is travelling on rough, stony roads, or in frosty weather. If the hair on the neck and more exposed parts be close and smooth, it may be concluded that the horse is in health.

HAIR, HORSE, likewise forms a considerable article of trade; it pays on importation a duty of about 11d. per lb. and is partly employed for weaving the covers of the seats of chairs, sofas, &c. but principally for the stuffing of bolsters and mattresses. For the last mentioned purposes, the hair is previously baked, and, in that state, forms one of the most elastic couches, which is incomparably superior to the softer, but enervating, feather-beds.

HAIR OF PLANTS, or DOWN, a general term expressive of all

the hairy and glandular appearances on the surface of plants, to which they are supposed to serve the double purpose of defensive weapons and vessels of secretion. These hairs are minute threads of greater or less length and solidity; some of them visible to the naked eye; whilst others are rendered visible only by the help of glasses. Examined by a microscope, almost all the parts of plants, particularly the young stalks or stems, appear covered with hairs. These appear under various forms; in the leguminous plants, they are generally cylindric; in the mallow-tribe, terminated in a point; in agrimony, shaped like a fish-hook; in nettle, awl-shaped and jointed; and in some compound flowers with hollow or funnel-shaped florets, they are terminated in two crooked points. Probable as some experiments have rendered it, that the hairs on the surface of plants contribute to some original secretion, their principal use seems to be, to preserve the parts in which they are lodged from the bad effects of violent frictions, from winds, from extremes of heat and cold, and such like external injuries.

HAIR-CLOTHS, in military affairs, are large pieces of cloth made with half hair: used for covering the powder in waggons, and upon batteries; also charged bombs, hand-grenades, &c. in magazines.

HAI-TANG, a beautiful Chinese shrub, originally brought from the bottom of the rocks which border the sea-coast. The smell of its leaves has an affinity both to that of the rose and the violet; but it is weaker; and never extends to any great distance.

HAKE, the English name of a fish common in the British sea. See GADUS.

HALBERDS, or HALBERTS, [from *barde*, an axe, and *halle*, a court,] a kind of spears, carried by the sergeants of foot and dragoons. The shaft is about five feet long, and made of ash or other wood. The head is armed with a steel-point, not unlike the point of a two-edged sword. Besides this sharp point which is in a line with the shaft, there is a cross-piece of steel, flat and pointed at both ends; but generally with a cutting edge at one extremity, and a bent sharp point at the other; so that the halbert serves equally to cut down or to push withal. It is also useful in determining the ground between the ranks, and adjusting the files of a battalion. It was anciently a common weapon in the army; where there were companies of halberdiers. It is said to have been used by the Amazons, and afterwards by the Rhätians and Vindélicians about A. D. 570. It was called the Danish axe, because the Danes bore an halbert on the left shoulder. From the Danes it came to the Scots, from the Scots to the English Saxons, and from them to the French.

HALBERSTADT, a late principality of Germany, in the circle of Lower Saxony, bounded on the N.E. by the duchy of Magdeburgh. It was near 40 miles long and 30 broad. The soil is fertile in corn and flax; and there are some woods, though fuel is scarce. The chief towns are Halberstadt, Groningen, Oschersleben, and Osterwick.

HALBERSTADT, the capital of the above late principality, 34 miles S. S. E. of Brunswick.

HALBERT, or HALBARD. See HALBERD.

HALCYON. See ALCEO.

HALCYON DAYS, in antiquity, a name given to seven days before and as many after the winter-solstice; when the halcyon, invited by the calmness of the weather, laid her eggs in nests built in the rocks, close by the brink of the sea. Hence the phrase became proverbial.

HALDE, JOHN BAPTIST DU, a learned French Jesuit, born at Paris in 1674. He was well versed in Asiatic geography, and compiled a work entitled "Grande description de la Chine & de la Tartarie," from original memoirs of the Jesuitical missionaries, in 4 vols. folio. He was also concerned in a collection of letters begun by father Gobien, called "Des Lettres Edifiantes," in 18 vols; and published some Latin poems and orations. He died in 1743.

HALDENSLEBEN, a town of Germany, in Lower Saxony, 12 miles N. of Magdeburgh.

HALE, SIR MATTHEW, lord chief justice of the King's Bench in the reign of Charles II. was the son of Robert Hale, Esq. a barrister of Lincoln's Inn, and was born in 1609. He was educated at Oxford, where he made a considerable progress in learning; but was afterwards diverted from his studies by the levities of youth.

youth. From these he was reformed by Mr. John Glanville, sergeant at law; and applying to the study of the law, entered into Lincoln's Inn. Noy, the attorney general, and Mr. Selden took much notice of him. During the civil wars, he behaved so well as to gain the esteem of both parties. He was employed in his practice by the king's party; and was appointed by the parliament one of the commissioners to treat with the king. King Charles's death gave him very sensible regret. However, he took the engagement; and was appointed with several others, to consider of the reformation of the law. In 1653, he was by writ made sergeant at law, and soon after appointed one of the justices of the Common Pleas. Upon the death of Oliver Cromwell, he refused to accept of the new commission offered him by Richard his successor. He was returned for Gloucestershire in the parliament which called home Charles II. Soon after he was made lord chief baron of the exchequer; but declined the honour of knighthood, till lord chancellor Hyde, sending for him upon business when the king was at his house, said, "There is your majesty's modest chief baron;" upon which he was unexpectedly knighted. He was one of the principal judges that sat in Clifford's Inn, about settling the differences between landlord and tenant, after the fire of London, in which he behaved to the satisfaction of all parties concerned. In his post of chief baron he acted with inflexible integrity. He dismissed a duke, who wished to prejudice him in favour of a cause he was to bring before him, with a proper reprimand. The duke complained of his rudeness to the king, who told him he verily believed he would have used him no better, had he gone to solicit him in his own cause. In one of his circuits, a gentleman who had a trial at the assizes sent him a buck for his table. When judge Hale therefore heard his name, he asked "if he was not the person who had sent him the venison?" and finding he was, told him, "that he could not suffer the trial to go on till he had paid him for his buck." The gentleman answered, that "he never sold his venison; and that he had done nothing to him which he did not do to every judge who had gone that circuit:" which was confirmed by several gentlemen present. The lord chief baron, however, paid for the present; upon which the gentleman withdrew the record. In 1671, he was advanced to be lord chief justice of the king's bench; but about four years after this promotion his health declining, he resigned his post in Feb. 1675-6, and died in Dec. following. This excellent man, who was an ornament to the bench, to his country, and to human nature, wrote, 1. An Essay on the Gravitation and Non-gravitation of Fluid Bodies. 2. Observations touching the Torricellian Experiment. 3. Contemplations, moral and divine. 4. The Life of Pomponius Atticus, with political and moral Reflections. 5. Observations on the Principles of natural Motion. 6. The primitive Origination of Mankind. He also left a great number of M. S. S. in Latin and English, upon various subjects; among which are, his Pleas of the Crown, since published by Mr. Emyln in two volumes folio; and his Original Institution, Power, and Jurisdiction, of Parliaments.

HALEM, or **HALEN**, a town of France, in the department of the Dyle, and late province of Austrian Brabant, 24 miles W. of Maestricht.

HALES, **STEPHEN**, D. D. and F. R. S. a celebrated divine and philosopher, born in 1677. He was the sixth son of Thomas Hales, Esq; the eldest son of Sir Robert Hales, and Mary the heiress of Richard Langley of Abbots-Wood in Hertfordshire. In 1696, he was entered at Bennet college, Cambridge; admitted a fellow in 1703, and became B. D. in 1711. He soon discovered a genius for natural philosophy. Botany was his first study, which he often prosecuted among Gogmagog hills, along with Dr. Stukeley. He also collected fossils and insects, having contrived a curious instrument for catching such of the latter as have wings. He likewise studied astronomy, chemistry, and anatomy; and invented a curious method of obtaining a representation of the lungs in lead. Having made himself acquainted with the Newtonian system, he contrived a machine for shewing the phenomena on much the same principles with that of the Orrery, afterwards made by Mr. Rowley. About 1710 he was presented to the perpetual cure of Teddington near Twickenham; afterwards to the living of Porlock in Somersetshire, which he exchanged for that of Faringdon in Hampshire. Soon after, he married Mary, the daughter and heiress of Dr. Newce. On the 13th March 1718, he was elected F. R. S. and on the 5th March, 1719, he exhibited an account of some experiments he had made on the effect of the

sun's warmth in raising the sap in trees, which procured him the thanks of the society. On the 14th of June 1725, he exhibited a treatise on the same subject, which, being highly applauded by the society, he enlarged and improved; and, in April 1727, published it under the title of Vegetable Statics. This work he dedicated to the prince of Wales; afterwards K. George II.; and he was the same year chosen one of the council of the Royal Society. A second edition of this work was published in 1731; in the preface to which, he promised a sequel, which he published in 1733 under the title of Statical Essays, &c. In 1732 he was appointed one of the trustees for establishing a new colony in Georgia. On the 5th of July 1733, the university of Oxford made him D. D. although he had been educated at Cambridge. In 1734, he published anonymously, A friendly Admonition to the Drinkers of Brandy and other spirituous Liquors; and a sermon preached at St. Bride's before the rest of the trustees for establishing the colony in Georgia. His text was in Gal. vi. 2. In 1739, he printed Philosophical Experiments on Sea-water, Corn, Flesh, and other Substances; 8vo. dedicated to the lords of the admiralty. In 1739, he also exhibited to the Society an account of some experiments towards the discovery of medicines, for dissolving the stone in the kidneys and bladder, and preserving meat in long voyages; for which he received Sir Godfrey Copley's gold-medal. In 1740, he published some account of Experiments and Observations on Mrs. Stephens's Medicines for dissolving the Stone, in which their dissolvent power is enquired into and demonstrated. In 1741, he read before the Society an account of a Ventilator, for conveying fresh air into mines, hospitals, prisons, and the close parts of ships. See **AIR-PIPE**, and **VENTILATOR**. He made besides these numerous and important communications to the Philosophical Transactions and Gentleman's Magazine.

HALESIA, in botany, a genus of the monogynia order, and dodecandria class of plants; natural order, Bicomnes. Calyx quadricdentate, superior; corolla quadrid; nut quadrangular and dispersuous. It has two species.

HALESWORTH, a town of Suffolk, 32 miles N. E. of Ipswich, and 101 of London.

HALF-MOON, in fortification, an outwork composed of two faces, forming a salient angle, whose gorge is in form of a crescent, whence the name. See **FORTIFICATION**.

HALICARNASSUS, in ancient geography, a principal town of Caria, built by the Argives, and situated between two bays, the Ceramicus and Jasius. It was anciently called Zephyra, and was the royal residence of Mausolus. See **ARTEMISTA**.

HALIEUTICA, or **HALIEUTICS**, [**ΑΛΙΕΥΤΙΚΑ**, formed of **αλις**, fisherman, from **αλς**, sea,] books treating of fishes, or the art of fishing. The halieutics of Oppian are still extant.

HALIFAX, a town in Yorkshire on the Calder, among hills, 16 miles S. W. of Leeds.

HALIFAX, the capital of Nova Scotia. It was founded in 1749, to secure the British settlements from the French and Indians. Lon 63. 36. W. Lat. 44. 44. N.

HALIFAX BAY, a bay on the E. coast of Hispaniola. Lon. 61. 20. W. Lat. 15. 40. N.

HALIOTIS, the **EAR-SHELL**, a genus of insects of the order vermes testacei. Animal a limax: shell univalve, dilated, ear-shaped, with a longitudinal row of orifices along the surface; spire lateral, and almost concealed. There are nineteen species. Mr. Donovan describes the H. tuberculata as a native of this country. The shell is subovate, the outside transversely grooved, rugged, and tuberculate, the inside is like mother-of-pearl. See Plate LXVII.

HALITZ, or **HALITZCH**, a town and territory of Poland, in Red Russia, 58 miles S. E. of Lemberg.

HALKETSTEIN, a town of Batavia in the department of the Rhine, and late province of Guelderland; 10 miles S. of Harderwyck.

HALL, **JOHN**, an English surgeon, who flourished in the reign of Q. Elizabeth, at Maidstone in Kent. He was born in 1529, and published; 1. A Compendium of Anatomy; and, 2. A Collection of Hymns, with musical Notes, in 1565: besides several tracts on medicine and surgery.

HALL, **JOSEPH**, an eminent English prelate, born at Ashby de la Zouch, in 1574, and educated at Cambridge. He became professor of rhetoric in that university, and was made rector of Halsted, prebendary of Wolverhampton, dean of Worcester, Bishop of

of Exeter, and lastly of Norwich. His works testify his zeal against Popery, and are much esteemed. He lamented the divisions of the Protestants, and wrote on the means of putting an end to them. In July 1616, he attended lord Doncaster into France, and upon his return was appointed by K. James one of the divines who should attend him into Scotland. In 1618 he was sent to the synod of Dort, and appointed to preach a Latin sermon before that assembly. Being obliged to return before the synod broke up, on account of his health, he was by the states presented with a gold-medal. He wrote, 1. Miscellaneous Epistles. 2. *Mundus alter et idem*. 3. A just Censure of Travellers. 4. The Christian Seneca. 5. Satires, in six books. 6. A Century of Meditations; and many other works, which, besides the satires, make 5 vols. in folio and 4to. He died in 1656.

HALL, [*hal*, Saxon; *halle*, Dutch,] in architecture, a large room at the entrance of a fine house and palace.

HALL is also a public building or court of justice, as Westminster-hall, Guild-hall, a company's hall, &c. In Westminster-hall are held the Courts of King's Bench, Common Pleas, Chancery, and Exchequer.

HALL, or HALLE, an imperial town of Germany, in Suabia, 46 miles S. E. of Heidelberg.

HALL, or HALLE, a town of Tirol, on the Inn, famous for its salt-works, 6 miles E. of Inspruck.

HALLACHORES, an unfortunate tribe in the East Indies, destined to misery from their birth, and termed the refuse of all tribes. They are held in such abomination, that, on the Malabar side of Hindostan, if one of them chance to touch a Hindoo of superior rank, the latter draws his sabre and cuts him down on the spot, without any check, either from his own conscience, or the laws of the country.

HALLAN, a province of Sweden, in the island of Schonen. Helmstadt is the capital.

HALLATON, a town of Leicestershire, seated on a rich soil, 12 miles S. E. of Leicester, and 90 N. by E. of London.

HALLE, a town of France, in the department of Gemappes, and late province of Austrian Hainault.

HALLE, a town in Upper Saxony, 56 miles S. of Magdeburg.

HALLEIN, a town in Bavaria. Lon. 12. 15. E. Lat. 47. 33. N.

HALLELUJAH, [הללויה] a term of rejoicing, first introduced into the church-service, by St. Jerome, from the synagogue. It occurs in several of the Psalms, particularly from Ps. cxlv. to cl. It also occurs in Rev. xix. 1, 3, 4, 6. For a considerable time it was only used once a year in the Latin church, viz. at Easter; but in the Greek church it was much more frequent.

HALLER, ALBERT VAN, an eminent physician, born at Bern, on the 16th Oct. 1708. He was the son of an advocate and the youngest of five. He very early shewed a great genius for literature, but it is surprising that it was not crushed in the bud, for his tutor, Abraham Billod, was such a tyrant, that the accidental sight of him, at any after period of life, excited in Haller almost all his former terrors. Yet the progress of Haller's studies was rapid almost beyond belief. When other children were beginning only to read, he was studying Bayle and Moreri; and at nine, he was able to translate Greek, and beginning to study Hebrew. His poetical essays, published in the German language, were read and admired throughout the empire. In his 16th year, he began to study medicine at Tubingen, under Duvernoy and Camerarius; and continued there for two years, when the great reputation of Boerhaave drew him to Leyden. Here he prosecuted his studies with great applause. From Holland, in 1727, he came to England, where he was honoured with the friendship of Douglas, Cheselden, and Sir Hans Sloane, P. R. S. He next went to France: where, under Winslow and Le Dran, he had new opportunities of prosecuting anatomy. But his zeal was greater than popular prejudice, even in the enlightened city of Paris, could admit of. An information being lodged against him for dissecting dead bodies, he was obliged to make a precipitate retreat to Basil, where he became a pupil to the celebrated Bernoulli. Thus improved by the most distinguished teachers of that period, and endued with uncommon natural abilities, he returned to Bern, in his 26th year, where he stood-candidate, first for the office of physician to an hospital, and afterwards for a professorship. But he was disappointed in both; and it was even with difficulty that he obtained the appointment of

keeper of a public library at Bern. This office, though by no means suited to his great abilities, afforded him an opportunity for that extensive reading by which he has been so justly distinguished. The neglect of his merit neither diminished his ardour for medical pursuits, nor detracted from his reputation at home or abroad. Soon after he was nominated a professor in the university of Gottingen, by king George II. The duties of this important office he discharged, with honour to himself and advantage to the public, for 17 years. Impressed with the great diversity of opinions respecting the æconomy of the human body, and sensible that the only means of investigating truth, was by careful experiments, he undertook the arduous task of exploring the phenomena of the human fabric; and there was hardly any function of the body on which his experiments did not reflect either a new or a stronger light. Nor was it long necessary for him, in this arduous undertaking, to labour alone. The example of the preceptor was followed by his pupils, Zinn, Zimmerman, Caldani, and many others; laboured to complete the discoveries of their great master. The mutual exertions of the teacher and his students, not only forwarded the progress of medical science, but placed the philosophy of the human body on a more sure, and an almost entirely new, basis. But the labours of Dr. Haller, during his residence at Gottingen, were not confined to one department of science. To him, the Anatomical Theatre, the School of Midwifery, the Chirurgical Society, and Royal Academy of Sciences at Gottingen, owe their origin. Such distinguished merit could not fail to meet with a suitable reward. K. George II. not only honoured him with every mark of attention himself, but procured him letters of nobility from the emperor. On the death of Dillenius, he had an offer of the professorship of botany at Oxford; the States of Holland invited him to the chair of the younger Albinus, and the K. of Prussia was anxious that he should be the successor of Maupertuis at Berlin. Marshal Keith wrote to him in the name of his sovereign, offering him the chancellorship of the university of Halle. Count Orlov invited him to Russia, in the name of the empress, offering him a distinguished place at St. Petersburg. The king of Sweden conferred on him an unsolicited honour, by raising him to the rank of knight of the polar stars, and the emperor of Germany honoured him with a personal visit; during which he passed some time with him in the most familiar conversation. Thus honoured and esteemed, he had it in his power to have held the highest rank in the republic of letters. Yet, declining all the offers made to him, he continued at Gottingen, anxious to extend the rising fame of that medical school. But after 17 years residence in that university, an ill state of health rendering him less fit for the important office which he held, he obtained permission from the regency of Hanover to return to Bern. His fellow-citizens were now as sensible as others of his superior merit. A pension was settled upon him for life, and he was elected into the most important offices in the state. These occupations, however, did not diminish his ardour for useful improvements. He was the first president, as well as the greatest promoter, of the Oeconomical Society at Bern; and he may be considered as the founder of the Orphan Hospital there. Declining health, however, restrained his exertions: and for many years he was confined entirely to his own house; where, with indefatigable industry, he continued to write till within a few days of his death: which happened in his 70th year, on the 12th Dec. 1777. His *Elementa Physiologiae* and *Bibliotheca Medicinæ*, afford undeniable proofs of his penetrating genius, and solid judgement. But he was not less distinguished as a philosopher than beloved as a man; and he was not more eminent for his improvement in every department of medical science, than for his piety to God, and benevolence to mankind.

HALLERIA, AFRICAN FLY HONEYSUCKLE; in botany, a genus of the angiospermia order, and didynamia class of plants; natural order, Personate. Calyx trifid; corolla quadrifid; filaments longer than the corolla; berry inferior and bilocular. The only species is *H. lucida*, a Cape plant.

HALLEY, Dr. EDMUND, an eminent astronomer, was the only son of a soap-boiler in London, and was born in 1656. He first studied the languages and sciences, but at length devoted himself entirely to astronomy. In 1677, he went to the island of St. Helena to complete the catalogue of fixed stars, by the addition of those which lie near the S. pole; and having delineated a planisphere

phere, in which he laid them all down in their exact places, he returned to England in 1678. In 1680 he took a tour through Europe, accompanied by the celebrated Mr. Nelson. Between Calais and Paris, he had a sight of the famous comet in its return from the sun. He had in November before seen it in its descent; and now hastened to complete his observations upon it, from the royal observatory of France. His design in this part of his tour was to settle a correspondence between the royal astronomers of Greenwich and Paris; and to improve himself under the great Cassini. He went thence to Italy, where he spent great part of 1681; but his affairs calling him home, he returned to England. In 1683; he published his "Theory of the Variation of the Magnetical Compass;" in which he supposes the globe to be a great magnet, with four magnetical poles, or points of attraction: but afterwards thinking that this theory was liable to great exceptions, he procured an application to be made to king William, who appointed him commander of the Paramour Pink, with orders to seek by observations the discovery of the rule of variations, and to lay down the longitudes and latitudes of his majesty's settlements in America. He set out on this attempt on the 24th Nov. 1698; but having crossed the line, his men grew sickly; and his lieutenant mutinying, he returned home in June 1699. Having got the lieutenant tried and cashiered, he sailed a second time in Sept. following, with the same ship, and another of less bulk, of which he had also the command. He now traversed the vast Atlantic from one hemisphere to the other, as far as the ice would permit him; and having made observations at St. Helena, Brazil, Cape Verd, Barbadoes, the Madeiras, the Canaries, the coast of Barbary, and many other latitudes, arrived in Sept. 1700; and published a general chart, in 1701, shewing at one view the variation of the compass in all those places. Capt. Halley had been at home little more than half a year, when he was sent by the king, to observe the course of the tides, with the longitude and latitude of the principal head-lands in the British channel; which having executed with his usual accuracy, he published a large map of the Channel. Soon after, the Emperor of Germany resolving to make a convenient harbour for shipping in the Adriatic, Capt. Halley was sent by queen Anne to view the two ports on the coast of Dalmatia. He embarked on the 22d Nov. 1702; passed over to Holland; and going through Germany to Vienna, he proceeded to Istria; but the Dutch opposing the design, it was laid aside. The emperor made him a present of a rich diamond-ring from his finger, and honoured him with a letter of recommendation; written with his own hand, to queen Anne. Soon after his return, he was sent again on the same business; when passing through Hanover, he supped with the electoral prince, afterwards king George I. and his sister the queen of Prussia. On his arrival at Vienna, he was the same evening presented to the emperor, who sent his engineer to attend him to Istria, where they repaired and added new fortifications to those of Trieste. Mr. Halley returned to England in 1703; was made professor of geometry in the university of Oxford, and received the degree of L. L. D. He was scarcely settled at Oxford, when he began to translate into Latin from the Arabic, "Apollonius de Sectione Rationis;" and to restore Apollonius's books "De Sectione Spatii," from the account given of them by Pappus; and he published the whole work in 1706. Afterwards he had a share in preparing for the press Apollonius's Conics; and ventured to supply the whole 8th book, the original of which is also lost. He likewise added Serenus on the Section of the Cylinder and Cone, printed from the original Greek, with a Latin translation, and published the whole in folio. In 1713, he was made secretary of the Royal Society; in 1720, king's astronomer at the royal observatory at Greenwich; and, in 1729, a member of the Academy of Sciences at Paris. He died at Greenwich in 1742. His principal works are, 1. *Catalogus Stellarum Austrarium*. 2. *Tabula Astronomica*. 3. An Abridgement of the Astronomy of Comets, &c. He also published several works of Sir Isaac Newton; who had a particular friendship for him, and to whom he frequently communicated his discoveries.

HALLEY'S QUADRANT. See QUADRANT.

HALLIARDS, [corrupted from *haul* and *yard*,] the ropes or tackles usually employed to hoist or lower any sail upon its respective mast or stay. See JEARS.

HALMOTÉ, or HALIMOTÉ, the same with Court-Baron, the word implying a meeting of the tenant of the same hall or manor.

HALO, or CORONA, in optics and meteorology, luminous circle, surrounding the sun, moon, planets, or fixed stars. Sometimes these circles are white, and sometimes coloured, like the rainbow. Sometimes one only is visible, and sometimes several concentric halos appear at the same time. Those which have been seen about Sirius and Jupiter were never more than 3°, 4°, or 5°; in diameter; those which surround the moon are, also, sometimes no more than 3° or 5°; but these, as well as those which surround the sun, are of very different magnitudes, viz. of 12° 0', 22° 35', 30° 0', 38° 0', 41° 2', 46° 24', 47° 0', and 90°, or even larger than this. Their diameters also sometimes vary during the time of observation, and the breadths both of the coloured and white circles are very different, viz. of two, four, or seven degrees. Their colours are more diluted than those of the rainbow; and they are in a different order, according to their size. Mr. Huygens observed red next the sun, and a pale blue outwards. Sometimes they are red on the inside and white on the outside. M. Weidler observed one that was yellow on the inside and white on the outside. In France, one was observed in 1683, the middle of which was white; after which followed a border of red, next to it was blue, then green, and the outermost circle was a bright red. In 1728, one was seen of a pale red outwardly, then followed yellow, and then green, terminated by a white. In Holland, M. Muschenbroeck says, 50 may be seen in the day-time, almost every day; but they are difficult to be observed, except the eye be so situated, that not the body of the sun, but only the neighbouring parts of the heavens can be seen. Mr. Middleton says, that this phenomenon is very frequent in North America; for that there is generally one or two about the sun every week, and as many about the moon every month. Halos round the sun are very frequent in Russia. M. Épinus says, that from the 23d April 1758, to the 20th Sept. he himself had observed no less than 26, and that he has sometimes seen twice as many in the same space of time.

HALOS, ARTIFICIAL. Halos may be produced by placing a lighted candle in the midst of steam in cold weather. If glass-windows be breathed upon, and the flame of a candle be placed some feet from it, while the spectator is also at the distance of some feet from another part of a window, the flame will be surrounded with a coloured halo. And if a candle be placed behind a glass receiver, when air is admitted into the vacuum within it, a certain degree of density, the vapour with which it is loaded will make a coloured halo round the flame. This was observed by Otto Guericke. In Dec. 1756, M. Muschenbroeck observed, that when the glass-windows of his room were covered with a thin plate of ice on the inside, the moon appearing through it was surrounded with a large and variously coloured halo; and, opening the window, he found that it arose intirely from that thin plate of ice; for none was seen except through it. Dr. Kotelnikow, having, like Dr. Halley, made very accurate observations to determine the number of possible rainbows, considers the coloured halo which appears about a candle as the same thing with one of these bows which is formed near the body of the sun, but which is not visible on account of his excessive splendor.

HALOS, DESCARTES AND GASSENDI'S HYPOTHESES OF. M. Descartes observes, that the halo never appears when it rains: from which he concludes that this phenomenon is occasioned by the refraction of light in the round particles of ice, which are then floating in the atmosphere; and though these particles are flat when they fall to the ground, he thought they must be protuberant in the middle, before their descent; and according to this protuberancy he imagined that the diameter of the halo would vary. In treating of meteors, Gassendi supposed, that a halo is of the same nature with the rainbow, the rays of light being in both cases twice refracted and once reflected within each drop of rain or vapour, and that all the difference there is between them arises from their different situation with respect to the observer. For, whereas, when the sun is behind the spectator, and consequently the rainbow before him, his eye is in the centre of the circle: when he views the halo, with his face toward the sun, his eye is in the circumference of the circle; so that according to the known principles of geometry, the angle, under which the object appears in this case, must be just half of what it is in the other.

HALOS, EXPERIMENTS AND THEORY OF DECHALES RESPECTING. M. Dechales endeavours to shew that the generation of the halo is similar to that of the rainbow. If, says he, a sphere of glass or crystal, AB, Plate LXXVIII. fig. 12, full of water, be placed in

in the beams of the sun shining from C, there will not only be two circles of coloured light on the side next the sun, and which constitute the two rainbows; but there will also be another on the part opposite to the sun, the rays belonging to which, meeting at E, afterwards diverge, and form the coloured circle G, as will be visible, if the light that is transmitted through the globe be received on a piece of white paper. The colours also will appear to an eye placed in any part of the surface of the cone FEG. Measuring the angle FEH, he found it to be 23 degrees. They were only the extreme rays of this cone that were coloured like those of the rainbow. This experiment he thought sufficiently illustrated the generation of the halo; so that whenever the texture of the clouds is such, as not entirely to intercept the rays of the sun or moon, and yet have some degree of density, there will always be a halo round them, the colours of the rainbow appearing in those drops which are 23° distant from the sun or moon. If the sun be at A, and the spectator in B, fig. 13, the halo will be the circle DEF, DBE being 46° or twice 23. The reason why the colours of the halo are more dilute than those of the rainbow, he says, is owing principally to their being formed not in large drops of rain, but in very small vapour; for if the drops of water were large, the cloud would be so thick, that the rays of the sun could not be regularly transmitted through them; and, on the other hand, he observed, that when the rainbow is formed by very thin vapours, the colours hardly appear. As for those circles of colours which are sometimes seen round candles, it was his opinion that they are owing to nothing but moisture on the eye of the observer; for that he could never produce this appearance by means of vapour only, if he wiped his eyes carefully; and he had observed that such circles are visible to some persons and not to others, and to the same persons at one time and not at another.

HALOS, HUYGENS'S THEORY OF. The most considerable and generally received theory, respecting halos, is that of Mr. Huygens. Sir Isaac Newton mentions it with respect, and Dr. Smith, in his complete System of Optics, does not hint at any other. M. Huygens takes it for granted that at those times there are in the atmosphere certain bodies of the figure of round balls, opaque in the centre, but covered with a transparent shell. By the help of this he endeavours to account for halos. Those bodies which M. Huygens requires, in order to explain these phenomena, are not, however, a mere assumption; for some such, though of a larger size than his purpose requires, have been actually found, consisting of snow within and ice without. They are particularly mentioned by Descartes. These things premised, he addresses himself to the solution, as follows. Let ABCD, fig. 14, represent such a globule with the opaque nucleus EF in the middle of it; and let us suppose the rays coming from G, H, to fall on the side AD. It is manifest they will be refracted inwards from the surface AD; from whence it follows that a great number of them must strike upon the kernel EF. Let GA, and HD, be the rays which, after refraction, touch the sides of the kernel EF, and let them be refracted again at B and C, emerging in the lines BK, and CK, crossing each other in the point K, whose distance from the globule is somewhat less than its semidiameter. Wherefore, if BK and CK be produced towards M and L, fig. 15, it follows that no light coming from the sun through the globule, can proceed to the eye any where placed within the angle LKM, or rather in the cone which that represents; supposing that the obliquity of the incident rays HD and GA is such as shall make the arc BC the greatest possible: for then all the rays exterior to HD and GA, will be refracted nearer to Q, and after emergence cross each other in a point k, nearer the globule than the former; and therefore cannot come at the eye placed within the said cone LKM. Suppose now the eye placed at N, fig. 15, and let NR, NQ, be drawn parallel to LK, and MK; then it is plain none of the globules, the same as ABCD, within the cone RNQ, can come to the eye at N. Thus the globules at O and P have their refracted rays ak, kc, and dk, kb, including the eye in the cone of obscurity. But other globules which lie without the cone QNR, as S and T, do not involve the eye N by their shadow-cones lkd, and fkm; and therefore some of those rays which are more refracted than kd, or kf, will fall upon the eye, and produce a luminous circular ring or corona, including a dark area within, and whose light outwardly decreases as it is more remote from the centre. To verify this hypothesis, M. Huygens advises us to expose to the sun a thin

glass-bubble, filled with water, and having some opaque substance in the centre of it; and he says we shall find, that we shall not be able to see the sun through it, unless at a certain distance from a place opposite to the centre of it: but as soon as we do perceive the light, the image of the sun will immediately appear the brightest, and coloured red, for the same reason as in the rainbow. These halos, he says, often appear about the moon; but the colours are so weak as to appear only white. Such white coronas he had also seen about the sun, when the space within them appeared scarce darker than that without. This he supposes to happen when there are but few of those globules in the atmosphere; for the more plentiful they are, the more lively the colours of the halo appear; at the same time also the area within the corona will be the darker. The apparent diameter of the corona, which is generally about 45° , depends upon the size of the darker kernel; for the larger it is with respect to the whole globule, the larger will be the dark cone behind it. The globules that form these halos, Huygens supposes to have consisted of soft snow, and to have been rounded by continual agitation in the air, and thawed on the outsides by the heat of the sun. In order to make the diameter of the halo 45° he demonstrates that the semidiameter of the globule must be to the semidiameter of the kernel of snow very nearly as 1000 to 480, and that to make a corona of 100° it must be as 1000 to 680.

HALOS, SIR ISAAC NEWTON'S THEORY OF. This great philosopher considered the larger and less variable appearances of this kind as produced according to the common laws of refraction, but that the less and more variable appearances depend upon the same cause with the colours of thin plates. He concludes his explication of the rainbow with the following observation on halos and parhelia. "The light which comes through drops of rain by two refractions, without any reflexion, ought to appear the strongest at the distance of about 26° from the sun, and to decay gradually both ways as the distance from him increases. And the same is to be understood of light transmitted through spherical hail-stones: and if the hail be a little flattened, as it often is, the transmitted light may be so strong, at a little less distance than that of 26° as to form a halo about the sun or moon; which halo, as often as the hail-stones are duly figured, may be coloured, and then it must be red within by the least refrangible rays, and blue without by the most refrangible ones; especially if the hail-stones have opaque globules of snow in their centres to intercept the light within the halo, as Huygens has observed, and make the inside of it more distinctly defined than it would otherwise be. For such hail-stones, though spherical, by terminating the light by the snow, may make a halo red within, and colourless without, and darker within the red than without, as halos use to be. For of those rays which pass close by the snow, the red-making ones will be the least refracted, and to come to the eye in the straightest lines."

HALOS, WEIDLER'S THEORY OF. Mr. Weidler, in his "Commentary on Parhelia," published at Wirtemberg in 1733, observes that it is very improbable that such globules as Mr. Huygens's hypothesis requires, with nuclei of such a precise proportion, should exist; and if there were such bodies, he thinks they would be too small to produce the effects ascribed to them. Besides, he observes that appearances exactly similar to halos are not uncommon, where fluid vapours alone are concerned; as when a candle is placed behind the steam of boiling water in frosty weather, or in the midst of the vapour issuing copiously from a bath, or behind a receiver when the air is so much rarefied as to be incapable of supporting the water it contains. The rays of the sun twice reflected and twice refracted within small drops of water are sufficient, he says, without any opaque kernel, to produce all the appearances of the halos that have the red light towards the sun, as may be proved by experiment. That the diameter of the halos is generally half of that of the rainbow, he accounts for as Gassendi did before him.

HALORAGUS, in botany, a genus of the tetragynia order, and octandria class of plants. Calyx four-cleft, superior; petals four; drupe dry, inclosing a four-celled nut. There are two species, viz. *H. prostrata* and *H. cercodia*.

HALSTEAD, a town of Essex, 47 miles N. E. of London.

HALTER, [*ἅλτης*, Gr. *halter*, Latin,] a peculiar kind of discus. See *DISC*, *DISCUS*, and *HALTERISTÆ*.

HALTER, in the manege, a head-stall for a horse.

HALTER-CAST, is an excoriation of the pastern, occasioned by the halter's being entangled about a horse's foot, upon his endeavouring to rub his neck with his hinder feet. For the cure, anoint the place morning and evening, with equal quantities of lintseed-oil and brandy, well mixed.

HALTEREN, a town of Germany, 20 miles S. W. of Munster.

HALTERISTÆ, in antiquity, a kind of players at Discus. Some take the discus to have been a leaden weight or ball, which the vaulters bore in their hands, to secure and keep themselves the more steady in their leaping. Others say the halter was a lump of lead or stone, with a hole, or handle fixed to it, by which it might be carried.

HALTON, or HAULTON, *i. e.* High-Town, a town of Cheshire, 13 miles N. E. of Chester, and 186 N. W. of London.

HALTWEZEL, or HALTWHISTLE, a well-built town of England, in Northumberland, on the South Tyne, 37 miles W. of Newcastle, and 314 N. W. of London.

HALYMOTE, properly signifies holy or ecclesiastical court. See HALMOTE. It was anciently held on Sunday before St. Thomas's day, and hence called the Haly Mote or Holy Court.

HALYS, in ancient geography, the noblest river of the Hither Asia, through which it has a long course, was the boundary of Cræsus's kingdom on the east. It separated Paphlagonia from Cappadocia; and received its name *απο του αλως*, from salt, because its waters were of a salt taste; from the soil over which they flowed. It is famous for the defeat of Cræsus king of Lydia, who was misled by this ambiguous response of the oracle; *Χραιοος Αλυν διαδας μεγαλην αρχην διαλυσει*; *i. e.* If Cræsus passes over the Halys he shall destroy a great empire. That empire proved to be his own.

HALYWERCFOLE, anciently persons who enjoyed land, by the pious service of repairing some church, or defending a sepulchre. It also signified persons in the diocese of Durham, who held their lands to defend the corpse of St. Cuthbert, and thence claimed the privilege of not being forced to go out of the bishopric.

HAM, [חם, Heb. *i. e.* crafty,] the youngest son of Noah, and father of Cush, Mizraim, Phut, and Canaan; each of whom possessed the countries peopled by them. Ham, it is believed, had all Africa for his inheritance, and peopled it with his posterity. He himself, it is thought, dwelt in Egypt, but M. Basnage is of opinion, that neither Ham nor Mizraim ever were in Egypt, but that their posterity settled in this country, and called it by the name of their ancestor. He also doubts of his having been worshipped as a god, by the name of Jupiter Hammon. Be that as it may, Africa is called the Land of Ham, in Psalm lxxviii. 51, cv. 23, cvi. 22. In Plutarch, Egypt is called Chemia; and there are traces of the name of Ham or Cham, in Pschemmis, and Psitta chemnis, which are cantons of Egypt. See EGYPT.

HAM, [*ham*, Saxon; *hamme*, Dutch,] the hip; the hinder part of the articulation of the thigh with the knee.

HAM, in commerce, &c. the thigh of a hog salted. Westphalia hams are prepared by salting them with saltpetre, pressing them in a press eight or ten days, then steeping them in juniper-water, and drying them by the smoke of juniper-wood. A ham may be salted in imitation of those of Westphalia, by sprinkling a ham of young pork with salt for one day, to fetch out the blood; then wiping it dry, and rubbing it with a mixture of a pound of brown sugar, a quarter of a pound of saltpetre, half a pint of bay-salt, and three pints of common salt, well stirred in an iron pan over the fire, till moderately hot: let it lie three weeks in this salting; turn it often; and dry it and hang it up.

HAM, in names, whether initial or final, is no other than the Saxon *ham*, a house, farm, or village. Gibson's Camden.

* HAM signifies also a narrow meadow.

HAM, or HAMM, a city in the kingdom of Westphalia. Lon. 7. 53. E. Lat. 51. 42. N.

HAM, a town of France, in the department of Somme, and late province of Picardy, 10 miles N. of Noyons, and 43 of Paris.

HAMADRYADES, [from *αμα*, together, and *δρυς*, an oak,] a kind of inferior deities revered among the ancient heathens, and believed to preside over woods and forests, and to be inclosed un-

der the bark of oaks. They were supposed to live and die with the trees they were attached to; as is observed by Servius on Virgil, Eclog. x. ver. 62. This idea among the ancients, of intellectual beings annexed to trees, accounts for their worship of trees.

HAMAH, a town of Asiatic Turkey, in Syria. By some travellers it is corruptly called Amari and Amant. Some mistake it for the ancient Apamea. Linen is manufactured there, and sent to Tripoli to be exported into Europe. Lon. 36. 15. E. Lat. 35. 15. N.

HAMAMELIS, WITCH-HAZEL, a genus of the digynia order, and tetrandria class of plants. Involucre three-leaved; perianthers four-leaved; petals four; nut two-horned, two-celled. There is only one species, viz. *H. virginica*.

HAMAMET, a town of Barbary, on the E. coast of Tunis, 30 miles S. of Tunis.

HAMAMLEEF, a town 12 miles E. of Tunis, noted for its hot-baths, which are famed for curing rheumatisms and many other complaints. The Bey has a very fine bath, which he permits the consuls and others to use.

HAMAN, [חמן, Heb. *i. e.* making an uproar,] the son of Hammedatha, an Agagite, or Amalekite, the prime-minister of Persia and favourite of King Ahasuerus; was one of the most barbarous and vindictive monsters that ever existed, who, to gratify his haughty vengeance against a single individual, planned the massacre of the whole nation of the Jews. His diabolical scheme, repeated disappointments, and deserved death, are recorded in Esther, ch. iii. vi. and vii.

HAMAR, a town of Norway, in Aggerhuys, 52 miles N. E. of Christiana.

HAMAXOBIANS, HAMAXOBI, or HAMAXOBIÆ, [from *μάχη*, a chariot, and *βίος*, life,] a people who had no houses, but lived in carriages. They were an ancient people of Sarmatia Europæa, inhabiting the southern part of Muscovy, and instead of houses had a sort of tents made of leather, fixed on carriages to be ready for travelling.

HAMBURG, or HAMBURGH, a late imperial city of Germany. Its name is derived from the old German word *Hamme*, signifying a wood, and *Burg*, a castle; and stands on the N. side of Elbe, where it is four miles broad, and forms two spacious harbours. It also runs through most part of it in canals. It lies 38 miles S. W. of Lubec, and 58 N. E. of Bremen. Lon. 9. 55. E. Lat. 53. 35. N.

HAME, [*hama*, Sax.] the collar by which a horse draws in a waggon.

HAMEL, JOHN BAPTISTE DU, a learned French philosopher of the 17th century. At eighteen he wrote a treatise, in which he explained in a very simple manner Theodosius's three books of Spherics; to which he added a tract upon trigonometry; extremely perspicuous, and designed as an introduction to astronomy. Natural philosophy, as then taught, was only a collection of vague, knotty, and barren questions; when he undertook to establish it upon right principles, and published his "*Astronomia Physica*." In 1666, Mr. Colbert proposed to Lewis XIV. a scheme for establishing a royal academy of sciences; and appointed Du Hamel secretary. He was also regius professor of philosophy, and published a great number of books. He died at Paris in 1706, aged 83. He wrote Latin with purity and elegance.

HAMELBURG, a town of Franconia, in Fulda, on the Saab, 16 miles S. of Schweinfurt, 24 S. of Fulda.

HAMELIN, or HAMELN, a town in Lower Saxony, 18 miles S. E. of Minden, and 28 S. W. of Hanover.

HAMELLIA, in botany, a genus of the monogynia order, and pentandria class of plants. Corolla quinquefid; berry quinquelocular, inferior, polyspermous. It has four species, natives of the West Indies.

HAMI, a country of Asia, subject to the Chinese, situated N. E. of China, at the extremity of that desert which the Chinese call Chamô, and the Tartars Cobi; 90 leagues distant from the most westerly point of the province of Chensi.

HAMI, the capital of the above kingdom, is surrounded by lofty walls, half a league in circumference.

HAMILTON, a town of Scotland in Lanarkshire, 11 miles S. E. of Glasgow.

HAMLET, a prince of Denmark, whose history has been rendered

dered interesting, by being the subject of one of the noblest tragedies of Shakespeare. Adjoining to a royal palace, which stands about half a mile from Cronburg in Elsinour, is a garden, which, Mr. Coxe informs us, is called Hamlet's Garden, and is said to be the spot where his father was murdered. The house is of modern date, and is situated at the foot of a sandy ridge near the sea. The garden occupies the side of the hill, and is laid out in terraces rising above each other. The original history, from which the poet derived the principal incidents of his play, is founded upon facts, but so deeply buried in remote antiquity that it is difficult to discriminate truth from fable. Saxo-Græmmaticus, who flourished in the 12th century, is the earliest historian of Denmark who relates the adventures of Hamlet. His account is much altered, by Belleforest, a French author, a translation of whose romance was published under the title of "The History of Hamlet;" from which Shakespeare formed the ground-work of his play.

HAMLET, HAMEL, or HAMSEL, was formerly used for part of a village or parish. Spelman makes a difference between villam integram, villam dimidiam, and hamletam; and Stow expounds it to be the seat of a freeholder. Several county towns have hamlets.

HAMMER, [*hamer*, Saxon; *hammer*, Danish,] a well known tool used by mechanics, consisting of an iron-head fixed crosswise upon a handle of wood. There are several sorts of hammers used by blacksmiths; as, 1. The hand-hammer, which is of such weight that it may be wielded with one hand at the anvil. 2. The up-hand sledge-hammer used with both hands, and seldom lifted above the head. 3. The about sledge-hammer, which is the biggest of all, and held by both hands at the farthest end of the handle; and being swung at arms-length over the head, is made to fall upon the work with as heavy a blow as possible. The smallest hammer used by smiths is called a rivetting-hammer, but is seldom used at the forge unless upon small work.

HAMMERING, in coining. A piece of money or a medal is said to be hammered, when the impression is given with a hammer and not with a mill.

HAMMERMEN, in the polity of the royal boroughs of Scotland, the name of an incorporation, which comprehends most of those artificers who make use of hammers; such as goldsmiths, jewellers, watch-makers, coppersmiths, braziers, blacksmiths, tin-plate workers, cutlers, gun-smiths, founders, saddlers, &c.

HAMMOCK, [*hamaca*, Saxon,] swinging-beds for seamen to sleep in. They are suspended between two trees, posts, hooks, or the like, and are much used throughout the West Indies, as well as on board of ships. The Indians hang their hammocks on trees, to secure themselves from wild beasts and insects.

HAMONT, or HELMONT, a town of France, in the department of the Lower Meuse, and late bishopric of Liege, 17 miles W. of Ruremond.

HAMPDEN, JOHN, Esq. of Hamden, a celebrated patriot, descended of an ancient family in Buckinghamshire, was born at London in 1594. He was cousin-german to Oliver Cromwell, his mother being Oliver's aunt. In 1609 he was sent to Magdalen College, Oxford, whence he went to the inns of court, where he made a considerable progress in the law. He was elected a member of the parliament, which began at Westminster, Feb. 5, 1626; and served in all the succeeding parliaments in the reign of Charles I. In 1636 he became universally known, by his refusal to pay shipmoney, as being an illegal tax; upon which he was prosecuted, and his conduct throughout this transaction gained him a great character. When the long parliament began, the eyes of all men were fixed on him as their pater patriæ. On January 3, 1644, the king ordered articles of high treason and other misdemeanours to be prepared against Lord Kimbolton, Mr. Hampden, and four other members of the House of Commons, and went to that house to seize them: but they had retired. Mr. Hampden afterwards made a speech in the house to clear himself of the charge laid against him. In the beginning of the civil war he commanded a regiment of foot, and was of great service to the parliament at the battle of Edge-hill. He received a mortal wound in the shoulder in an engagement with Prince Rupert, on the 18th of June 1643, at Chalgravefield in Oxfordshire; and died on the 24th. He had the art of Socrates, of interrogating, and under the pretence of doubts, insinuating objections, so that he

infused his own opinions into those from whom he appeared to learn them.

HAMPSHIRE, or HANTS, or SOUTHAMPTON, a county of England, bounded on the N. by Berkshire. It extends 55 miles in length from N. to S. 40 in breadth from E. to W. and is about 220 miles in circumference. The air is very pure, especially upon the downs, on which vast flocks of sheep are kept and bred. In the champaign-part of the county, the soil is very fertile, producing all kinds of grain. The rivers are the Avon, Anton, Arle, Test, Stour, and Itchen; besides several smaller streams, all abounding in fish.

HAMPSHIRE, New, one of the United States of North America, bounded on the N. by Lower Canada. It lies between 2° 41' and 4° 29' Lon. E. of Philadelphia; and between 42° 41' and 45° 30' Lat. N.

HAMPTON, a town of Middlesex, on the Thames, 15 miles W. S. W. of London, and two from Richmond and Kingstown. It is chiefly famous for its royal palace, called Hampton Court, which is the finest in Britain.

HAMPTON, a sea-port of Virginia, 18 miles S. E. of York-Town, and 371 S. S. W. of Philadelphia.

HANAPER, or HAMPER, an office in chancery, under the direction of a master, his deputy, and clerks, comptroller, &c. answering, in some measure, to the fiscus among the Romans.

HANAPER, THE CLERK or WARDEN OF THE, receives also all money due for commissions, and writs; and attends the keeper of the seal daily in term time, and at term-time of sealing; and takes into his custody all sealed charters, patents, &c. which he receives into bags, but anciently, it is supposed, into hampers, which gave name to the office.

HANAU, or HANAU MUNZENBERG, a late county of Germany, bounded by the electorate of Mentz, the bishopric of Fulda, the lordships of Reineck, and Solms; the territories of Hesse-Homburgh, Friedburgh, and Frankfort. Its length was 45 miles; its greatest breadth not above 15. It is very fertile in corn, wine, and fruits; and has salt-springs, with mines of copper, silver, and cobalt. The chief rivers are the Mayne, the Kinzig, and the Nidda. The prevailing religion is Calvinism, but Lutherans and Catholics are tolerated. The chief towns are Hanau, Bergen, Stenau, and Glenhausen.

HANAU, the capital of the above county, eight miles east of Frankfort.

HANAZO, a river of Abyssinia.

HANBOROUGH, two villages in Oxfordshire.

HANCES, in architecture, the ends of elliptical arches; and these are the arches of smaller circles than the scheme, or middle-part of the arch.

HANCES, in a ship, falls of the five-rails placed on bannisters on the poop and quarter-deck down to the gangway.

HANCOCK, a county of the United States in the district of Maine, bounded on the E. by Washington county.

HAND, a member of the human body, at the extremity of the arm. See ANATOMY. The mechanism of the hand is excellently fitted for the various uses and occasions we have for it, and the great number of arts and manufactures it is to be employed in. It consists of a compages of nerves, and little bones joined into each other, which give it a great degree of strength, and at the same time an unusual flexibility, to enable it to handle adjacent bodies, lay hold of them, and grasp them, in order either to draw them toward us, or thrust them off. Anaxagoras is said to have maintained that man owes all his wisdom, knowledge, and superiority over other animals, to the use of his hands. But Galen more justly remarks, that man is not the wisest creature, because he has hands; but he had hands given him because he was the wisest creature; for it was not our hands that taught us arts, but our reason. The hands are the organs of reason, &c. In scripture the word hand is variously applied. To pour water on any one's hand, signifies to serve him. To wash the hands was a ceremony used to denote innocence from murder or manslaughter. To kiss the hand was an act of adoration. To fill the hand signified taking possession of the priesthood, and performing fractions. To lean upon any one's hand was a mark of familiarity and superiority. To give the hand signifies to grant peace, swear friendship, promise security, or make alliance. The right-hand was the place of honour and respect. Amongst the Greeks and Romans it was customary

customary for inferiors to walk on the left-hand of superiors, that the right-hand might be ready to afford protection and defence to their left side, which was, on account of the awkwardness of the left hand, more exposed to danger.

HAND, in falconry, is used for the foot of the hawk. To have a clean, strong, slender, glutinous hand, well clawed, are good qualities of a hawk or falcon.

HAND, in the manage, is also used for the fore-foot of a horse: also for a division of the horse into two parts, with respect to the rider's hand. The fore-hand includes the head, neck, and fore-quarters; the hind-hand is all the rest of the horse.

HAND, in painting, sculpture, &c. is figuratively used for the style of a master.

HAND is much used in composition for that which is manageable by the hand, as a handsaw; or borne in the hand, as a hand-barrow.

HANDS are borne in coat-armour, dexter and sinister; that is, right and left, expanded or open; and after other manners. A bloody hand in the centre of the escutcheon is the badge of a baronet of Great Britain.

HAND-BOROW, in law-books, a surety, or manual pledge, of an inferior rank; as head-borow signifies a chief or superior.

HAND-BREADTH, a measure of three inches. By this standard the height of horses is estimated.

HAND-CUFFS, an instrument formed of two circular pieces of iron, each fixed on a hinge on the ends of a very short iron-bar, which being locked over the wrists of a malefactor, prevents his using his hands.

HAND-SPIKES, wooden levers used at sea to traverse the ordnance, or to turn the windlass in weighing up the anchor, &c. They are more commodious than iron-crows, because their length allows a better poize.

HANDEL, GEORGE FREDERIC, a most eminent master and composer of music, born at Halle, in Upper Saxony, 24th Feb. 1684. His father was a physician in that city, and was upwards of sixty years of age when he was born. During his infancy young Handel amused himself with musical instruments, and made considerable progress before he was seven years of age, without instruction. His propensity for music at last became so strong, that his father, who designed him for the law, forbade him to touch a musical instrument. Handel however concealed a little clavi-chord in the garret, to which he constantly stole when the family were asleep: and thus made such advances in his art, as enabled him to play on the harpsichord. He was first taken notice of by the duke of Saxe Weissenfels on the following occasion. His father went to see another son by a former wife, who was valet de chambre to the duke, and took young Handel, being then in his seventh year, along with him. While he was in the duke's court, it was impossible to keep him from harpsichords; and he sometimes got into the organ-loft at church, and played after service was over. On one of these occasions, the duke happening to go out later than usual, found something so uncommon in Handel's manner of playing, that he inquired of his valet who it was; and receiving for answer that it was his brother, he desired to see him. The duke was so much taken with the musical genius shewn by young Handel, that he persuaded his father to let him follow his inclination. He made the boy a present; and told him, that if he minded his studies, no encouragement should be wanting. On his return to Halle, Handel was placed under one Zackaw, the organist of the cathedral, and was even then able to supply his master's place in his absence. At nine years of age he began to compose church-services for voices and instruments, and continued to compose one every week for three years. At fourteen, he far excelled his master, as he himself owned; and he was sent to Berlin, where he had a relation about the court, on whose care his parents could rely. The opera was then flourishing, being encouraged by Frederic I. king of Prussia, and under the direction of Buononcini, Attilio, and other eminent Italian masters. Buononcini, being of a haughty disposition, treated Handel with contempt; but Attilio behaved to him with great kindness, and he profited much by his instructions. His abilities soon recommended him to the king, who frequently made him presents. After this he went to Hamburg, where the opera was little inferior to that of Berlin. Soon after his arrival his father died; and his mother being left in narrow circumstances, he thought it necessary

to procure some scholars, and to accept a place in the orchestra; by which means, instead of being a burden, he became a great relief to her. At this time the first harpsichord in Hamburg was played by one Kefer, who also excelled in composition; but he, having involved himself in debt, was obliged to abscond. Upon this vacancy, the person who had been used to play the second harpsichord claimed the first by right of succession; but was opposed by Handel, who founded his claim upon his superior abilities. After much dispute, it was decided in favour of Handel; but his antagonist, as they were coming out of the orchestra, made a push at Handel's breast with a sword, which must undoubtedly have killed him, had there not fortunately been a music-book in the bosom of his coat. Handel, though yet but in his 15th year, became composer to the house; and the success of *Almeria*, his first opera, was so great, that it ran thirty nights without interruption. Within less than a year after this, he set two others, called *Florinda* and *Norene*, which were received with equal applause. In his 19th year, Handel took a journey to Italy, where he was received with the greatest kindness by the prince of Tuscany, as well as by the grand duke, who was impatient to have something composed by so great a master; and notwithstanding the difference between the style of the Italian music and the German, to which Handel had hitherto been accustomed, he set an opera called *Roderigo*, which pleased so well, that he was rewarded with 100 sequins and a service of plate. After staying about a year in Florence, he went to Venice, and after some time proceeded to Rome, where he became acquainted with cardinal Ottoboni and many other dignitaries, by whom he was frequently attacked on account of his religion; but Handel declared he would live and die in the religion in which he was educated. Ottoboni also contrived to have a trial of skill between him and Dominici Scarlatti. When they came to the organ, Scarlatti himself yielded the superiority to Handel. From Rome Handel went to Naples; after which he paid a second visit to Florence; and at last, having spent six years in Italy, set out for his native country. In his way thither, he was introduced at the court of Hanover by baron Kilmanseck; when the Elector, (afterwards King George I.) offered him a pension of 1500 crowns a-year as an inducement for him to continue there. This generous offer he declined on account of his having promised to visit the court of the Elector Palatine. The elector being made acquainted with this objection, generously ordered him to be told, that his acceptance of the pension should not restrain him from his promise, but that he should be at full liberty to be absent a year or more if he chose it, and to go wherever he thought fit. Soon after, the place of master of the chapel was bestowed upon Handel; and having visited his mother, who was now aged and blind, and his old master Zackaw, and staid some time at the court of the Elector Palatine, he set out for England, where he arrived in 1710. Operas were then a new entertainment in England, and were conducted in a very absurd manner; but Handel soon put them on a better footing; and set a drama called *Rinaldo*, which was performed with uncommon success. Having staid a year in England, he returned to Hanover; but in 1712 he again came over to England; and the peace of Utrecht being concluded a few months afterwards, he composed a grand *Te Deum* and *Jubilate* on the occasion. He now found the nobility very desirous that he should resume the direction of the opera-house in the Hay-Market; and queen Anne having added her authority to their solicitations, and conferred on him a pension of 200l. a-year, he remained in Britain till the death of the queen in 1714, and the accession of King George I. who added a pension of 200l. a-year to that bestowed by queen Anne; which was soon after increased to 400l. on his being appointed to teach the young princesses music. In 1715, Handel composed his opera of *Amadige*; but from that time to 1720 he composed only *Teseo* and *Pastor Fido*, *Buononcini* and *Attilio* being then composers for the operas. About this time a project was formed by the nobility for erecting a kind of Academy at the Hay-Market, to secure to themselves a constant supply of operas to be composed by Handel, and performed under his direction. No less than 50,000l. were subscribed for this scheme, of which the king subscribed 1000l. and it was proposed to continue the undertaking for fourteen years. Handel went over to Dresden, to engage singers, and returned with *Senesino* and *Duristanti*. *Buononcini* and *Attilio* had still a strong party, but not equal to that

of Handel; and therefore in 1720 he obtained leave to perform his opera of *Radamisto*. The house was so crowded, that many fainted; and 40s. were offered by some for a seat in the gallery. The contention, however, still ran very high between Handel's party and that of the two Italian masters; upon which Dean Swift with his usual acrimony wrote the following epigram:

Some say that signior Buononcini
Compar'd to Handel's a mere ninny:
Others do swear that to him Handel
Is hardly fit to hold the candle.
Strange that such high contests should be
'Twixt Tweedle-dum and Tweedle-dee!

The academy being firmly established, Handel conducted it for nine years with great success; but about that time an irreconcilable enmity took place between Handel and Senesino. From the conduct of Handel in this affair, he lost the good opinion of his friends. But in 1742 his popularity returned, and he retained his glory to the last. He died in 1759, and was buried in Westminster Abbey, where there is an elegant monument to his memory. A complete edition of his works was published by Dr. Arnold. His musical powers are best expressed by Arbutnot's reply to Pope, who seriously asked his opinion of him as a musician; "Conceive (said he) the highest you can of his abilities, and they are much beyond any thing you can conceive."

HANGING, the method of inflicting death on criminals by suspending them by the neck.

HANG-TCHEOU-FOU, the metropolis of the province of Tche-kiang in China. It is, according to the Chinese, the paradise of the earth. It is 12 miles in circumference, exclusive of its suburbs; and the number of its inhabitants amounts to more than a million. It is computed that there are 10,000 workmen within its walls employed in manufacturing silk. This city has a garrison of 3000 Chinese, under the command of the viceroy, and 3000 Tartars, commanded by a general of the same nation. It has under its jurisdiction seven cities of the second and third class.

HANIFAH, or **HANFA**, **ABA**, surnamed **Al Nooma**, the most celebrated Doctor of the orthodox Mussulmans. He was the son of Thabet, and was born at Coufah in the 80th year of the Hegira. He founded the sect of the Hanifites, which continues to be the most popular of the four principal sects among the Mussulmans. Like other teachers of new opinions, he suffered persecution during his life, being imprisoned at Bagdad till he died, by the Khalif Almansor, for refusing to subscribe to the doctrine of absolute predestination. But his opinions were afterwards brought into such credit, by Abou Joseph, a sovereign judge under the Khalif Hadi, that to be a Hanifite was reckoned synonymous with being a good Mussulman; and about 335 years after his death, which happened in the 150th year of the Hegira, Schaw Melick, in the 485th year of that era, and of the Christian, 1092, built a magnificent monument to his memory, and a college, which he appropriated solely to the professors of ABA Hanifah's doctrines. The most eminent of his successors were Achmed Ben Ali, Al Giaffas, and Al Razzi.

HANIFITES. See the last article.

HANKS, in naval affairs, are wooden rings fixed upon the stays to confine stay-sails at different distances. They are in place of gromets, being more convenient as well as of a later invention.

HANNIBAL, a famous Carthaginian general, and the son of Hamilcar, who made him swear eternal enmity to the Romans, at the age of eight years. On the death of Asdrubal, he obtained the command of the Carthaginian armies, and in three years subdued Spain. Having taken Saguntum, which was in alliance with the Romans, it occasioned the second Punic war, in which he shewed the most consummate generalship. He is said to have crossed the Alps by softening the rocks with fire and vinegar. On his arrival in Italy he defeated Cornelius Scipio, and obtained several victories over the most experienced Roman generals, particularly at Cannæ, where the Romans lost about 40,000 men, and had Hannibal pushed on for Rome it must have fallen. But by stopping at Capua, where his soldiers gave themselves up to luxury, the Romans recovered from their surprise; and when he appeared before the city, it excited so little concern, that the ground on which he was encamped was put up for sale, and sold at a high price. He soon retired and experienced a defeat near Zama. A

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peace was then concluded; but Hannibal fearing the Romans, fled to Prusias king of Bithynia, and on hearing that the senate had sent to demand him, he poisoned himself, 182 B. C. (*Watkins.*)

HANNUYE, or **HANUYE**, a town of France in the department of the Dyle, and late province of Austrian Brabant; 20 miles S. E. of Louvain.

HANOVER, lately an electoral state of Germany, of which the king of Great Britain was elector. It was very considerable for the extent of its territories, which were, The duchy of Calenberg, in which are the cities of Hanover, Calenberg, Hamelen, Neustadt, Gottingen; &c. the duchy of Grubenhagen, the county of Diepholt, the county of Illoja, in the bishopric of Hildesheim; the bailiages of Coldingen, Luther, Badenburg, and Westershoven, with the right of protection of the city of Hildesheim; and the county of Danneberg, ceded by the Dukes of Wolfenbuttle to the dukes of Lunenburg, as an equivalent for their pretensions on the city of Brunswick. The whole of this country has lately been incorporated in the kingdom of Westphalia.

HANOVER, the capital of the above state is agreeably situated in a sandy plain on the Lyne, 25 miles W. of Brunswick, and 58 S. E. of Bremen. Lon. 9. 44. E. Lat. 52. 22. N.

HANOVER, a large island in the Pacific Ocean, opposite the N. W. extremity of New Ireland, 30 miles in length. The S. W. part of it is situated in Lon. 178. 27. E. Lat. 2. 49. S.

HANOVER, a county in Jamaica.

HANOVER, a town of the United States, in Grafton county, 115 miles N. W. by W. of Portsmouth.

HANOVER, **NEW**, a county of N. Carolina, in Wilmington district.

HANSE, an ancient name for a society or company of merchants; particularly that of certain cities in Germany, &c. hence called **Hanse-Towns**. The word is obsolete High Dutch or Teutonic; and signifies alliance, confederacy, or association. Some derive it from the German words, *am see*, that is, on the sea; as the first hanse-towns were all situated on the sea-coast: whence they are said to have been first called *am zee stenen*, *i. e.* cities on the sea; and afterwards, by abbreviation, *hansee*, and *hanse*.

The **HANSE-TOWNS**, or The **HANSEATIC SOCIETY** were several maritime cities of Germany, who entered into a league for the mutual protection of their commerce. Bremen and Amsterdam were the two first that formed it; whose trade received such advantage by their fitting out two men of war in each to convoy their ships, that more cities continually entered into the league: even kings and princes made treaties with them, and were often glad of their assistance and protection; by which means they grew so powerful both by sea and land, that they raised armies as well as navies, enjoyed countries in sovereignty, and made peace or war, though always in defence of their trade, as if they had been an united state or commonwealth.—At this time also many cities, though they had no great interest in trade, or intercourse with the ocean, came into their alliance for the preservation of their liberties; so that in 1200, we find no less than 72 cities in the list of the Hanse-Towns; particularly Bremen, Amsterdam, Antwerp, Rotterdam, Dort, Bruges, Ostend, Dunkirk, Middleburgh, Calais, Rouen, Rochelle, Bourdeaux, St. Malo, Bayonne, Bilbao, Lisbon, Seville, Cadiz, Carthage, Barcelona, Marseilles, Leghorn, Naples, Messina, London, Lubec, Rostock, Stralsund, Stetin, Wismar, Königsberg, Dantzic, Elbing, and Marienburg.

HAN-TCHONG, a city of China, in the province of Chen-si, on the Han, 625 miles S. W. of Peking.

HANWAY, **JONAS**, a gentleman eminent for his benevolent designs and useful writings, was born at Portsmouth in Hampshire, on the 12th of August 1712. Being bred a merchant he connected himself as a partner in Mr. Dingley's house, in St. Petersburg; where he arrived on the 10th of June 1743. The trade of the English over the Caspian Sea into Persia at this period had been entrusted to the care of Mr. Elton, who, had injudiciously engaged in the service of Nadir Shah, to build ships on the Caspian after the European manner. This had alarmed the merchants in the Russian trade, who resolved to send one of their body into Persia. On this occasion Mr. Hanway offered his service, which was accepted. He set out on the 10th Sept.; and, after experiencing various dangers in that kingdom during 12 months, returned to St. Petersburg, Jan. 1, 1745, without being able to establish the intended trade by the Caspian; partly through the

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jealousy

jealousy of the Russian court on account of Elton's connections with the Persians, and partly by the Persian revolutions. Though Mr. Hanway's conduct during this expedition seems to have been directed by the strictest integrity, yet some difficulties arose in settling his demands on his employers. These were referred to the determination of impartial arbitrators, who at length decided in his favour. He now settled at St. Petersburg; where he remained five years, and interested himself greatly in the concerns of the merchants who had engaged in the Caspian trade. But having a desire to see his native country, he left St. Petersburg on the 9th of July 1750. On his arrival in London he employed himself some time as a merchant; but afterwards, more beneficially to the world, as an author. In 1753, he published "An Historical Account of the British Trade over the Caspian Sea; with a Journal of Travels from London through Russia into Persia; and back again through Russia, Germany, and Holland: To which are added, the Revolutions of Persia during the present Century, with the particular History of the great Usurper Nadir Kouli;" 4 vols. 4to. On settling in London, he devoted a considerable portion of his time to benevolent purposes, and was the principal institutor of the marine society, and the Magdalen Hospital. For these exertions he was made a commissioner of the navy; and when he resigned his seat at the board, his salary was continued. He died in 1786. He wrote several religious books of considerable merit; the best of which is entitled "Domestic Happiness promoted," 12mo. His publications amounted altogether to between 60 and 70. A list of them is given by his biographer Mr. Pugh.

HAN-YANG, a city of China, in the province of Hon-Quang, at the conflux of the Han and Yang-Tse, 587 miles W. of Pekin.

HAP, or HAPP, in law, signifies to catch or snatch a thing. Thus we meet with, to hap the possession of a deed-poll. Littleton, fol. 8; also, to hap the rent.

HAPPINESS, or FELICITY, absolutely taken, denotes the durable possession of good without any mixture of evil, or the enjoyment of pure pleasure unalloyed with pain; or a state in which all the wishes are satisfied. Relatively taken, happiness denotes the quantity of enjoyment of that which is esteemed good, whether pertaining to the body or the mind. In this sense a man's happiness will be in proportion to the good he enjoys, and it will be real or fancied according as that which he accounts good is so; for a man may esteem that a real good, which is in fact a real evil. Hence it is that many are happy only in the opinion of themselves or others, which indeed is the case with all those who are devoid of the fear and love of God. There can be no solid happiness but in an agreeable relation to, and enjoyment of God, who is perfectly happy in himself and the author of all happiness to his creatures, Gen. xxx. 13, Jer. xii. 1, Mal. iii. 15, Psalm lxxv. 4. Every thing that a man does, and every thing that he possesses, is calculated to make him happy in proportion to his performing or possessing it with the approbation of God: if God disapprove of it, it is his negative happiness or misery. And that every man may attain to happiness is manifest from divine revelation, for there God has declared Himself and his Will, and has shewn us the way to attain and retain his favour, and has promised to give the assurances of his love to those who attend to his revealed Will, and act accordingly; see Psalm lxxxix. 15, 16, James i. 25, Luke i. 77, 79.

HAPSAL, a sea-port of Russia, in Esthonia, 5 miles S. W. of Revel.

HAQUE, in old statutes, a little hand-gun, prohibited to be used for destruction of game, &c. by 33 Hen. VIII. cap. 6, and 2 and 3 Edw. VI. cap. 14.

HARAN, CHARRAN, or CHARRE, a city of Mesopotamia, celebrated for having been the place where Abraham retreated, after he left Ur (Gen. xi. 31, 32); where Terah, his father, died and was buried; whither Jacob retired, when he fled from Esau (id. xxvii. 45, xxviii. 10, &c.) and where Crassus the Roman general was defeated and killed by the Parthians. It was situated between the Euphrates and the Chebar, at a good distance from their junction.

HARBINGER, in the king's household, an officer who has four yeomen under him, who ride a day's journey before the court when it travels, to provide lodgings, &c.

HARBOROUGH, or MARKET HARBOROUGH, a town of Leicestershire, 83 miles N. N. W. of London.

HARBOUR, a place convenient for mooring shipping. The qualities requisite in a good harbour are, that the bottom be entirely free from rocks or shallows; that the opening be of sufficient extent to admit the entrance or departure of large ships without difficulty; that it should have good anchoring-ground, and be easy of access; that it should be well defended from the violence of the wind and sea; that it should have room and convenience to receive the shipping of different nations, and those which are laden with different merchandizes; that it should be furnished with a good light-house, and have variety of proper rings, posts, moorings, &c. in order to remove or secure vessels contained therein; and, finally, that it have plenty of wood, and other materials for firing, besides hemp, iron, mariners, &c.

HARDANGER, GULF OF, a bay in the North Sea, on the coast of Norway. Lon. 6. O. E. Lat. 59. 50. N.

HARDENING, the giving a greater degree of hardness to bodies than they had before. There are several ways of hardening iron and steel, as by hammering them, quenching them in cold water, &c. See CASE-HARDENING, and STEEL.

HARDERWICK, or HARDERWYCK, a town of Batavia, in the department of the Rhine, and late province of Dutch Guelderland, nineteen miles W. of Deventer.

HARDNESS, in physiology, that quality in bodies whereby their parts cohere firmly together, so as not to give way to any external impulse, nor yield inwards, without breaking. In this sense hardness coincides with what on other occasions we call firmness, in opposition to softness and fluidity. From that species of attraction called cohesion, it is easy to account for the different degrees of hardness in bodies: for the hardness will be in proportion to the cohesive force, and nearness of the constituent particles, together with the quantity of surface brought into contact. See ATTRACTION, COHESION, and PHYSICS. But nothing can conduce more to explain the nature of this doctrine, than the following passage of Sir Isaac Newton: "The parts of all homogeneous bodies, (says he,) which fully touch one another, stick together very strongly. And for explaining how this may be, some have invented hooked atoms, which is begging the question; and others tell us, that bodies are glued together by rest, that is, by an occult quality, or rather by nothing; and others, that they stick together by conspiring motions, that is, by relative rest among themselves. I had rather infer from their cohesion, that their particles attract one another by some force, which, in immediate contact, is exceeding strong; at small distances, performs many chemical operations, and reaches not far from the particles with any sensible effect. All bodies seem to be composed of hard particles: even the rays of light seem to be hard bodies; and therefore hardness may be reckoned the property of all uncompounded matter: for all bodies, so far as experience reaches, are either hard, or may be hardened. Now if compound bodies are so hard as we find some of them to be, and yet are very porous, and consist of parts which are only laid together, the simple particles which are void of pores, and were never yet divided, must be much harder. For such hard particles being heaped up together, can scarce ever touch one another in more than a few points, and therefore must be separable by a much less force than is requisite to break a solid particle where parts touch in all the space between them, without any pores or interstices to weaken their cohesion. And how such very hard particles, which are only laid together, and touch only in a few points, can stick together, and that so firmly as they do, without the assistance of something which causes them to be attracted, or pressed towards one another, is very difficult to conceive." Since heat diminishes the cohesion of bodies, it renders them softer, and when so much heat is applied as to destroy the cohesion, the body in consequence of the heat becomes fluid. Mr. Quist and others have constructed tables of the hardness of different substances. The method pursued in constructing these tables was, by observing the order in which they were able to cut or make any impression upon one another. The following table, extracted from M. Magellan's edition of Cronstedt's Mineralogy, was taken from Dr. Quist, Sir T. Bergman, and Mr. Kirwan. The first column shews the hardness, and the second the specific gravity.

Diamond from Ormus.....	20	—	3,7
Pink diamond.....	19	—	3,4
Bluish diamond.....	19	—	3,3
Yellowish diamond.....	19	—	3,3
Cubie			

Cubic diamond.....	18	—	3,2
Ruby.....	17	—	4,2
Pale ruby from Brazil.....	16	—	3,5
Ruby spinell.....	13	—	3,4
Deep blue sapphire.....	16	—	3,8
Ditto paler.....	17	—	3,8
Topaz.....	15	—	4,2
Whitish ditto.....	14	—	3,5
Bohemian ditto.....	11	—	2,8
Emerald.....	12	—	2,8
Garnet.....	12	—	4,4
Agate.....	12	—	2,6
Onyx.....	12	—	2,6
Sardonyx.....	12	—	2,6
Occidental amethyst.....	11	—	2,7
Crystal.....	11	—	2,6
Cornelian.....	11	—	2,7
Green jasper.....	11	—	2,7
Reddish yellow ditto.....	9	—	2,6
Schoerl.....	10	—	3,6
Tourmaline.....	10	—	3,0
Quartz.....	10	—	2,7
Opal.....	10	—	2,6
Chrysolite.....	10	—	3,7
Zeolyte.....	8	—	2,1
Fluor.....	7	—	3,5
Calcareous spar.....	6	—	2,7
Gypsum.....	5	—	2,3
Chalk.....	3	—	2,7

HARE, in zoology. See **LEPUS**.

HARESBURY, an ancient borough of Wiltshire, on the Willy, near Warminster, ninety-four miles from London, in old records called Heightsbury, or Heytsbury; and now written Hatchbury.

HARFLEUR, an ancient town of France, in the department of Lower Seine, and late province of Normandy, thirty-six miles N. W. of Rouen.

HARIDI, a serpent, worshipped at Achmin in Upper Egypt.

HARJEDALEN, a province of Sweden, in Nordland, about 100 miles long, and from 40 to 50 broad; abounding in pastures, cattle, woods, mines, lakes, rivers, and fish.

HARIOT, or **HERIOT**, in law, a due belonging to a lord at the death of his tenant, consisting of the best beast, either horse, or cow, or ox, which he had at the time of his death; and in some manors the best goods, piece of plate, &c. are called harlots.

HARISCHON, **AARON**, a learned rabbi, and Karaite, in the fifteenth century; who wrote a Hebrew grammar, printed at Constantinople, in 1581: probably the same with Aaron, the Karaite, a Jewish physician at Constantinople, who, about 1294, wrote a Commentary on the Pentateuch, printed at Jena, in folio, in 1710, and of which there is an original MS. copy in the National Library at Paris.

HARLEBACK, a town of France, in the department of Lys, and late province of Austrian Flanders, four miles N. E. of Courtray.

HARLECH, or **HARLEICH**, a town of North Wales, in Merionethshire, twenty-four miles S. of Caernarvon.

HARLEM, or **HAERLEM**, a large and populous city of Batavia, in the department of Amstel, and late province of Holland, ten miles W. of Amsterdam.

HARLEQUIN, in the Italian comedy, a buffoon, dressed in party-coloured cloaths; answering much the same purpose as a merry andrew in our drolls, on mountebanks, stages, &c.

HARLESTON, a town of Norfolk, seated on the Waveney, sixteen miles S. of Norwich.

HARLING, or **HERLING**, a town in Norfolk, eighty-eight miles N. E. of London.

HARLINGEN, a sea-port town of Batavia, in the department of the Eems, and late province of West Friesland, fourteen miles W. of Lewarden. Lon. 5. 25. E. Lat. 53. 11. N.

HARLOW, a town in Essex, twenty-three miles N. E. of London.

HARMA, [Gr. *Ἀρμα*, a chariot,] an ancient town of Bœotia, said to have been built on the spot, where Amphiarus was swallowed up with his chariot: whence the name.

HARMATTAN, a remarkable periodical wind which blows from the interior parts of Africa towards the Atlantic ocean. Of this wind we have an account in the Philosophical Transactions, vol. 71, furnished by Mr. Norris. On that part of the coast of Africa which lies between Cape Verd in Lat. 15° N. and Cape Lopez in Lat. 1° S. this wind prevails during December, January, and February. The coast between these two capes runs in an oblique direction nearly from W. S. W. to E. S. E. forming a range of upwards of 2100 miles. At the Isles de Los, which are a little to the N. of Sierra Leone, and to the S. of Cape Verd, it blows from the E. S. E. on the Gold Coast from the N. E. and at Cape Lopez, and the river Gabon, from the N. N. E. This wind is by the French and Portuguese, who frequent the Gold Coast, called simply the N. E. wind, the quarter from which it blows. The English adopt the word *Harmattan*, used by the Fantees, a nation on the Gold Coast. It comes on indiscriminately at any hour of the day, at any time of the tide, or at any period of the moon, and continues sometimes only a day or two, sometimes five or six days, and it has been known to last fifteen or sixteen. There are generally three or four returns of it every season. It blows with a moderate force, not quite so strong as the sea-breeze (which every day during the fair season from the W. W. S. W. and S. W.): but somewhat stronger than the land-wind at night from the N. and N. N. W. A fog is one of the peculiarities which always accompanies the harmattan. The gloom occasioned by this fog is so great, as sometimes to make even near objects obscure. Extreme dryness makes another extraordinary property of this wind; no dew falls during its continuance; vegetables are withered, and the grass becomes dry like hay. The natives take this opportunity to clear the land, by setting fire to the trees and plants while in that dry and exhausted state. The dryness is so extreme, that the covers of books, even closely shut up in a trunk, are bent as if exposed to the fire. Household furniture is much damaged; the pannels of wainscots split, and fineered work flies to pieces. Though this wind is fatal to vegetable life, and occasions troublesome effects to the human species, it is nevertheless highly conducive to health; it stops the progress of epidemics, and relieves the patients labouring under fluxes and intermittent fevers. Infection is not easy at that time to be communicated, even by inoculation. It is also remarkable for the cure of ulcers and cutaneous diseases.

HARMONICA. This word, when originally appropriated by Dr. Franklin to that peculiar form or mode of musical glasses, which he himself, after a number of happy experiments, had constituted, was written *Armonica*. It is derived from the Greek word *ἁρμονία*. The radical word is *ἁρμω*, to suit or fit one thing to another. By the word *ἁρμονία* the Greeks expressed aptitudes of various kinds; and from the use which they made of that expression, we have reason to conclude, that it was intended to import the highest degree of refinement and delicacy in those relations which it was meant to signify. Relations or aptitudes of sound, in particular, were understood by it; and in this view, Dr. Franklin could not have selected a name more expressive of its nature and genius, for the instrument we are now to describe; as, perhaps, no musical tone can possibly be finer, nor consequently susceptible of juster concords, than those which it produces. The doctor, in his letter to F. Beccaria, has given a minute and elegant account of the Harmonica. "Perhaps (says he) it may be agreeable to you, as you live in a musical country, to have an account of the new instrument lately added here to the great number that charming science was possessed of before. As it is an instrument that seems peculiarly adapted to Italian music, especially that of the soft and plaintive kind, I will endeavour to give you such a description of it, and of the manner of constructing it, that you or any of your friends may be enabled to imitate it, if you incline so to do, without being at the expence and trouble of the many experiments I have made in endeavouring to bring it to its present perfection. You have doubtless heard the sweet tone that is drawn from a drinking-glass, by pressing a wet finger round its brim. One Mr. Puckeridge, a gentleman from Ireland, was the first who thought of playing tunes formed of these tones. He collected a number of glasses of different sizes; fixed them near each other on a table; and tuned them, by putting into them water, more or less, as each note required. The tones were brought out by pressing his fingers round their brims. He was unfortunately burnt here,

here, with his instrument, in a fire which consumed the house he lived in. Mr. E. Delaval, a most ingenious member of our Royal Society, made one in imitation of it, with a better choice and form of glasses, which was the first I saw or heard. Being charmed with the sweetness of its tones, and the music he produced from it, I wished to see the glasses disposed in a more convenient form, and brought together in a narrower compass, so as to admit of a greater number of tones, and all within reach of hand to a person sitting before the instrument; which I accomplished after various intermediate trials, and less commodious forms, both of glasses and construction in the following manner. The glasses are blown as near as possible in the form of hemispheres, having each an open neck or socket in the middle. The thickness of the glass near the brim is about the tenth of an inch, or hardly quite so much, but thicker as it comes nearer the neck; which in the largest glasses is about an inch deep, and an inch and a half wide within; these dimensions, lessening as the glasses themselves diminish in size, except that the neck of the smallest ought not to be shorter than half an inch. The largest glass is nine inches diameter, and the smallest three inches. Between these are twenty-three different sizes, differing from each other a quarter of an inch in diameter. To make a single instrument there should be at least six glasses blown of each size; and out of this number one may probably pick thirty-seven glasses (which are different for three octaves with all the semitones) that will be each either the note one wants, or a little sharper than that note, and all sitting so well into each other as to taper pretty regularly from the largest to the smallest. It is true there are not thirty-seven sizes; but it often happens that two of the same size differ a note or half a note in tone, by reason of a difference in thickness, and these may be placed in the other without sensibly hurting the regularity of the taper form. The glasses being chosen, and every one marked with a diamond the note you intend it for, they are to be tuned by diminishing the thickness of those that are too sharp. This is done by grinding them round from the neck towards the brim, the breadth of one or two inches as may be required; often trying the glass by a well-tuned harpsichord, comparing the note drawn from your glass by the finger with the note you want, as sounded by that string of the harpsichord. When you come near the matter, be careful to wipe the glass clean and dry before each trial, because the tone is something flatter when the glass is wet than it will be when dry; and grinding a very little between each trial, you will thereby tune to great exactness. The more care is necessary in this, because if you go below your required tone there is no sharpening it again but by grinding somewhat off the brim, which will afterwards require polishing; and thus increase the trouble. The glasses being thus tuned, you are to be provided with a case for them, and a spindle on which they are to be fixed. My case is about three feet long, eleven inches every way wide within at the biggest end, and five inches at the smallest end; for it tapers all the way, to adapt it better to the conical figure of the set of glasses. This case opens in the middle of its height, and the upper part turns up by hinges fixed behind. The spindle is of hard iron, lies horizontally from end to end of the box within, exactly in the middle, and is made to turn on brass-gudgeons at each end. It is round, an inch in diameter at the thickest end, and tapering to a quarter of an inch at the smallest. A square shank comes from its thickest end through the box, on which shank a wheel is fixed by a screw. This wheel serves as a fly to make the motion equable, when the spindle, with the glasses, is turned by the foot like a spinning-wheel. My wheel is of mahogany, eighteen inches diameter, and pretty thick, so as to conceal near its circumference about 25lb. of lead. An ivory pin is fixed in the face of this wheel, about four inches from the axis. Over the neck of this pin is put the loop of the string, that comes up from the moveable step to give it motion. The case stands on a neat frame with four legs. To fix the glasses on the spindle, a cork is first to be fitted in each neck pretty tight, and projecting a little without the neck, that the neck of one may not touch the inside of another when put together, for that would make a jarring. These corks are to be perforated with holes of different diameters, so as to suit that part of the spindle on which they are to be fixed. When a glass is put on, by holding it stiffly between both hands, while another turns the spindle, it may be gradually brought to its place. But care must be taken that the hole be not too small, lest in forcing it up the neck should split; nor too large, lest the glass, not being firmly fixed, should turn or

move on the spindle, so as to touch or jar against its neighbouring glass. The glasses thus are placed one in another; the largest on the biggest end of the spindle, which is to the left hand: the neck of this glass is towards the wheel; and the next goes into it in the same position, only about an inch of its brim appearing beyond the brim of the first; thus proceeding, every glass when fixed shews about an inch of its brim (or three quarters of an inch, or half an inch, as they grow smaller) beyond the brim of the glass that contains it; and it is from these exposed parts of each glass that the tone is drawn, by laying a finger on one of them as the spindle and glasses turn round. My largest glass is G a little below the reach of a common voice, and my highest G, including three complete octaves. To distinguish the glasses more readily to the eye, I have painted the apparent parts of the glasses within-side, every semitone white, and the other notes of the octave with the seven prismatic colours; viz. C, red; D, orange; E, yellow; F, green; G, blue; A, indigo; B, purple; and C, red again; so that the glasses of the same colour (the white excepted) are always octaves to each other. This instrument is played upon by sitting before the middle of the set of glasses, as before the keys of a harpsichord, turning them with the foot, and wetting them now and then with a sponge and clean water. The fingers should be first a little soaked in water, and quite free from all greasiness; a little fine chalk is sometimes useful, to make them catch the glass and bring out the tone more readily. Both hands are used, by which means different parts are played together. Observe, that the tones are best drawn out when the glasses turn from the ends of the fingers, and not when they turn to them. The advantages of this instrument are, that its tones are incomparably sweet beyond those of any other; that they may be swelled and softened at pleasure by stronger or weaker pressures of the finger, and continued to any length; and that the instrument, being once well tuned, never again wants tuning." A farther account of this instrument is inserted in the Annual Register, vol. iv. p. 149. The author proposes to use cork instead of the finger, but this substitute does not seem capable of producing the same mellowness and equality of tone with the finger. Alum-water is also thought preferable to chalk. From what has already been said, it will easily be perceived, that this instrument requires to be tuned with the nicest degree of delicacy which the laws of temperament will possibly admit. See MUSIC, and TEMPERAMENT. The same rules, however, which are observed in tuning a harpsichord, will be equally effectual in tuning the Harmonica; with this only difference, that greater delicacy in adjusting the chords should, if practicable, be attempted. On Plate LXXXV. fig. 3, is represented an instrument of this kind, made by Mr. Dobb of St. Paul's church-yard, London.

HARMONICAL ARITHMETIC, that part of arithmetic which considers musical intervals, expressed by numbers, in order to our finding their mutual relations, compositions, and resolutions.

HARMONICAL COMPOSITION, in a general sense, includes both harmony and melody, *i. e.* of music or songs, both in a single part and in several parts.

HARMONICAL INTERVAL, in music, denotes the difference of two sounds, which is agreeable to the ear, whether in consonance or succession; and are, therefore, the same with concord. See CONCORD and INTERVAL.

HARMONICAL PROPORTION. See PROPORTION.

HARMONICAL SERIES, a series of many numbers in continual harmonical proportion. Thus if there are four or more numbers, of which every three immediate terms are harmonical, the whole will make a harmonical series: such as 30 : 20 : 15 : 12 : 10. Or, if every four terms immediately next each other are harmonical, it is also a continued harmonical series, but of another species, as 3, 4, 6, 9, 18, 36, &c.

HARMONICAL SOUNDS, an appellation given, by Mr. Sauveur, to such sounds as always make a determinate number of vibrations, in the time that one of the fundamentals, to which they are referred, makes one vibration.

HARMONICS, the concomitant or accessory sounds, which, upon the principles resulting from the experiments made on sonorous bodies, attend any given sound, whatever, and render it appreciable. Thus all the aliquot parts of a musical string produce harmonics, or harmonical sounds.

HARMONY, [*ἁρμονία*.] In the ancient treatises on music that

are extant, harmony appears to be that department whose object is the agreeable succession of sounds, merely considered as high or low; in opposition to the two others called *rhythmica* and *metrica*, which have their principle in time and measure. This leaves our ideas concerning that aptitude of sound vague and undetermined; nor can we fix them without studying for that purpose all the rules of the art: and even after we have done so, it will be very difficult to distinguish harmony from melody, unless we add to the last the ideas of rhythmus and measure: without which, in reality, no melody can have a distinguishing character: whereas harmony is characterised by its own nature, independent of all other quantities except the chords or intervals which compose it. It appears by a passage of Nicomachus, and by others, that they likewise gave the name of harmony to the chord of an octave, and to concerts of voices and instruments, which performed in the distance of an octave one from the other, and which is more commonly called antiphone.

HARMONY, according to the moderns, is a succession of chords agreeable to the laws of modulation. For a long time this harmony had no other principle but such rules as were almost arbitrary, or solely founded on the approbation of a practised ear, which decided concerning the agreeable or disagreeable succession of chords, and whose determinations were at last reduced to calculation. But F. Mersenne and M. Saveur having found that every sound, however simple in appearance, was always accompanied with other sounds less sensible, which constitute with itself a perfect chord-major; with this experiment M. Rameau set out, and upon it formed the basis of his harmonic system, which he has extended to many volumes, and which at last M. D'Alembert has taken the trouble of explaining to the public. Signior Tartini, taking his route from an experiment which is newer and more delicate, though not less certain, has reached conclusions like those of Rameau, by pursuing a path whose direction seems quite opposite. According to Rameau the treble is generated by the bass; Signior Tartini makes the bass result from the treble. One deduces harmony from melody, and the other supposes quite the contrary. To determine from which of the two schools the best performances are likely to proceed, no more is necessary than to investigate the end of the composer, and discover whether the air is made for the accompaniments, or the accompaniments for the air. See **CHORD**, **DISCORD**, **ENHARMONIC**, **FUNDAMENTAL BASS**, **MODULATION**, **MUSIC**, &c.

HARMONY, DIRECT, is that in which the bass is fundamental, and in which the upper parts preserve among themselves, and with that fundamental bass, the natural and original order which ought to subsist in each of the chords that compose this harmony.

HARMONY, INVERTED, is that in which the fundamental or generating sound is placed in some of the upper parts, and when some other sound of the chord is transferred to the bass beneath the others.

HARMONY is also sometimes used to denote an agreement, suitableness, union, conformity, &c. thus, in music, we sometimes apply it to a single voice, when sonorous, clear, and soft; to a single instrument, when it yields a very agreeable sound: in matters of literature we use it for a certain agreement between the several parts of the discourse: in architecture harmony denotes an agreeable relation between the parts of a building: in painting they speak of an harmony both in the ordonnance and composition, and in the colours of a picture: in the ordonnance it signifies the union or connection between the figures, with respect to the subject of the piece; in the colours it denotes the union or agreeable mixture of different colours. See **SYMMETRY**, **COLOURING**, &c.

HARMONY OF THE SPHERES, or **CELESTIAL HARMONY**, a sort of music much talked of by many of the ancient philosophers and fathers, supposed to be produced by the sweetly tuned motions of the stars and planets. This harmony they attributed to the various proportionate impressions of the heavenly globes upon one another, acting at proper intervals. It is impossible, according to them, that such prodigious large bodies, moving with so much rapidity, should be silent; on the contrary, the atmosphere continually impelled by them, must yield a set of sounds proportionate to the impression it receives; consequently as they do not all run the same circuit, nor with one and the same velocity, the different tones arising from the diversity of motions, directed by the hand of the Almighty, must form an admirable sympathy, or concert. They therefore supposed that the moon, as being the

lowest of the planets, corresponded to *mi*; Mercury, to *fa*; Venus, to *sol*; the Sun, to *la*; Mars, to *si*; Jupiter, to *ut*; Saturn, to *re*; and the orb of the fixed stars, as being the highest of all, to *mi*, or the octave.

HARMOSTA, or **HARMOSTES**, [*Ἀρμόστης*, from *ἀρμόω*, to adapt,] in antiquity, a magistrate among the Spartans, whereof there were several, whose business was to look to the buildings of citadels, and repairing the forts and fortifications.

HARMOSYNIANS, [*ἁρμόσυνοι*,] in antiquity, magistrates among the Spartans, who, after the death of Lycurgus, were appointed to enforce the observance of that law, which required married women to wear veils in the streets; whereby they were distinguished from single females, who were allowed to go abroad with their faces uncovered.

HARNESS, comprehends the whole equipage and accoutrements of a cavalier heavily armed: as casque, cuirass, &c. Some derive the word from the Greek *ἀρνίον*, a lamb's skin, because they anciently covered themselves therewith.

HARO, a town of Spain, in Old Castile, on the Ebro, 32 miles N.E. of Burgos.

HARO, **HAROL**, or **HAROU**, of **CLAMOUR DE HARO**, in the Norman customs, was a cry or formula of invoking the assistance of justice against the violence of some offender, who, upon hearing the word *haro*, was obliged to desist, on pain of being severely punished for his outrage, and to go with the party before the judge. The word is commonly derived from *ha* and *roul*, as being supposed an invocation of the sovereign power, to assist the weak against the strong; from *Raoul*, first duke of Normandy.

HARP, a musical instrument of the string-kind, of a triangular figure, held upright between the legs of the person who plays upon it. Papias and Du Cange suppose its name derived from the *Arpi*, a people of Italy, who invented it, and from whom, they say, it was borrowed by other nations. Menage, &c. derive the word from the Latin *harpa*, and that from the German *herp* or *harp*. Others trace it from the Latin, *carpo*, because thrummed with the fingers. Dr. Hickes derives it from *harpa* or *hearpa*, which signify the same thing in the Cimbric and Anglo-Saxon. The harp was the favourite musical instrument of the Britons and other northern nations in the middle ages; as is evident from their laws, and various passages in their history. By the laws of Wales a harp was one of the three things that were necessary to constitute a gentleman or a freeman; and none could pretend to that character who had not one of these favourite instruments, or could not play upon it. That the harp is among the most ancient of musical instruments, the frequent mention of it in scripture, and the splendid account transmitted to us of the Theban harp, both as to the beauty of its decorations and extent of scale, are sufficient evidences. The Irish and Welsh practised the harp long before the gammut of Guido was invented, and it is indeed their national instrument. The harp was in no less estimation and universal use among the Saxons and Danes. There is some diversity in the structure of harps. That called the triple harp has three rows of strings and chords, which in all make seventy eight, or four octaves; the second row makes the half-turn, and the third is unison with the first.

HARP, EOLIAN. See **ACOUSTICS**.

HARP, THE BELL, a musical instrument of the string-kind, thus called from the players on it swinging it about as a bell on its basis. It is about three feet long; its strings which are of no determinate number, are of brass or steel wire, fixed at one end, and stretched across the sound board by screws fixed at the other. It takes in four octaves, according to the number of the strings, which are struck only with the thumbs, the right hand playing the treble, and the left hand the base: and in order to draw the sound the clearer, the thumbs are armed with a little wire-pin. This may perhaps be the *lyra*, or *cythara*, of the ancients; but we find no mention made of it under the name it now bears, which must be allowed to be modern.

HARPAGINES, [*ἁρπάγες*,] in antiquity, were hooks of iron, hainging on the top of a pole, which, being secured with chains to the masts of ships, and then let down with great velocity into the enemy's vessels, caught them up into the air.

HARPASA, a town of Caria, on the Harpasus, famous for an immense rocking-stone, which was moveable by the finger, but could not be displaced by any force.

HARPE

HARPE, in mythology, a crooked sword wherewith Mercury cut off Argus's head, and Perseus that of Medusa.

HARPIES. See **HARPY**, and **HARPYIÆ**.

HARPING-IRON, [from *harpago*, Lat.] a bearded dart with a line fastened to the handle, with which whales are struck and caught.

HARPING-IRON. See **HARPOON**.

HARPINGS, the fore-parts of the wales which encompass the bow of a ship, and are fastened to the stem, being thicker than the after-part of the wales, in order to reinforce the ship in this place, where she sustains the greatest shock of resistance in plunging into the sea, or dividing it, under a great pressure of sail.

HARPOCRATES, in mythology, the son of Isis and Osiris; an Egyptian deity, represented with his fingers applied to his mouth, denoting that he is the god of silence.

HARPONELLY, a district of Hindostan, in the Mysore country.

HARPONELLY, the capital of the above district, 65 miles N.N.E. of Bedamore.

HARPOON, [*harpon*, Fr.] a harping-iron. This instrument is a spear or javelin used to strike the whales in the Greenland fishery. It is furnished with a long staff, having at one end a broad and flat triangular head, sharpened at both edges, so as to penetrate the whale with facility: to the head of this weapon is fastened a long cord, called the whale-line, which lies carefully coiled in the boat, in such a manner as to run out without being interrupted or entangled. See **WHALE-FISHERY**.

HARPOON, GUN, a kind of fire-arm for discharging harpoons at whales, and thereby killing them more expeditiously than formerly, when the harpoons were thrown by the hand. Though this method was projected many years ago, it has but lately come into use; and premiums have been annually offered by the society for encouraging arts, &c. to the persons who first struck a fish in this manner. In the Transactions of that society for 1786, we have an account of the first fish struck in this manner in 1784. The gun was of the blunderbuss-construction, loaded with four common tobacco-pipes full of glazed powder; the fish was shot at the distance of ten fathoms, the harpoon going into her back up to the ring; and she was killed in about an hour. In 1785, three whales were killed in this manner; four in 1786, and three in 1787. Since that time the gun-harpoon has come more into use, and will probably soon supersede the other method entirely. In the Philosophical Transactions for 1789, we have accounts of a number of whales killed in this manner. The instrument appears to be extremely useful in calm weather, as the whale, though a timorous creature, will frequently allow a boat to approach it within twenty, fifteen, or even ten, fathoms, all of which distances are within reach of the gun-harpoon, though not within the reach of that thrown by the hand. The greatest inconvenience was in case of rain or snow, by which the lock was apt to get wet. To remedy this, a case of leather was made to fit round the gun, and over the lock, lined with tin, and big enough to fire the gun when it was on. The fish struck with an harpoon discharged in this manner are soon killed, by reason of its penetrating their bodies to the depth of five or six feet, which no man's strength would be able to accomplish. In the volume just quoted, we have an account of one which was shot through the tail. The harpoon broke in the slit, but five fathoms of line went through the tail. The fish was killed in eight hours, which is perhaps the only instance of a fish struck in that part being caught. In another the harpoon carried six feet of line into its body, and the creature died in ten minutes. Others were killed in fifteen minutes or half an hour, and one had a rib broken by the violence of the stroke. See Plate LXXXV. fig. 1.

HARPSICORD, a musical instrument, strung with wires, and played by striking keys. This is the most harmonious of all the musical instruments of the string-kind. It is played on after the manner of the organ, and is furnished with a set, and sometimes with two sets, of keys; the touching or striking of these keys moves a kind of little jacks, which also move a double row of strings of brass or iron, stretched over four bridges on the table of the instrument.

HARPYIÆ, [*ἁρπυιᾶ*] the **HARPIES**, in mythology, were a rapacious impure sort of monsters, with wings and bears like bears, bodies like vultures, faces like women, and feet and hands

hooked like the talons of birds of prey. The ancients believed the harpies to be genii or demons.

HARQUEBUSS, a kind of a gun, of the length of a musket, usually cocked with a wheel. It carries a ball weighing one ounce and seven-eighths. There was also a larger sort, called the great harquebuss, used for the defence of strong places, which carried a ball of about three ounces and a half. They are now little used, except in some old castles and garrisons.

HARRIOT, THOMAS, an eminent algebraist, born at Oxford in 1560, where he took the degree of B. A. in 1579. Being distinguished for his mathematical learning, he was recommended to Sir Walter Raleigh, who, in 1585, sent him with the colony, under Sir Richard Greenville to Virginia. After having remained there about a year, he published a topographical description of it. About 1588, he was introduced by his patron Sir Walter Raleigh to Henry, Earl of Northumberland, who allowed him a pension of 120*l.* per annum. He spent many years in Sion College; where he died in July 1621, of a cancer in his lip, and was buried in the church of St. Christopher, where a handsome monument was erected to his memory. He was one of the first mathematicians of the age in which he lived, and will always be remembered as the inventor of the present improved method of algebraical calculation; which was adopted by Des Cartes, and for a considerable time imposed upon the French nation as his own invention; but the theft was at last detected by Dr. Wallis, in his History of Algebra, where our author's invention is accurately specified. His works are, 1. A Brief and true Report of the New-found land of Virginia; of the Commodities there found, and to be raised, &c. 2. *Artis Analyticæ Praxis ad Equationes Algebraicas nova expedita, et generali Methodo resolvendas, e Posthumis Thomæ Harrioti, &c.* 3. *Ephemeris Chyrometrica*; MS. in the library of Sion College. He left several other MSS. which were inspected by Dr. Zach, astronomer to the duke of Saxe-Gotha, in 1784, at Petworth in Sussex, the seat of the Earl of Eversmont, a descendant of Henry, Earl of Northumberland. Dr. Zach published an account of them in the Astronomical Ephemeris for 1788: from which it appears, that Harriot had made great discoveries in astronomy, particularly that he had observed the spots in the sun so early as Dec. 8, 1610; which was eighteen months earlier than Galileo's first published observations respecting them; and that he had also discovered the satellites of Jupiter, and made drawings of their positions, and calculations of their revolutions, in Jan. 1610, the same month when Galileo discovered them. Dr. Zach adds, that Harriot's observations of the comet of 1607 are still of use.

HARRIS, JAMES, Esq. an English gentleman of very uncommon parts and learning, the son of James Harris, Esq. by a sister of Lord Shaftesbury, author of *The Characteristics*. He was born at Salisbury, in 1709; and educated there. In 1726, he was removed to Wadham College in Oxford. He was member for Christ-church, Hants, in several successive parliaments. In 1763, he was appointed a lord-commissioner of the admiralty, and soon after removed to the board of treasury. In 1774 he was made secretary and comptroller to the queen, which post he held until his death. He died Dec. 21, 1780, in his seventy-second year, after a long illness. He was author of some valuable works: 1. *Three Treatises*: concerning Art; Music, Painting, and Poetry; and *Happiness*, 1745, 8vo. 2. *Hermes*; or, *A Philosophical Enquiry concerning Universal Grammar*. 3. *Philosophical Arrangements*. 4. *Philological Enquiries*; 1782, 2 vols. 8vo. published since his death.

HARRIS, a peninsula of the Hebrides, forming with Lewis one of the Western Islands of Scotland. Harris is twenty miles long, and ten broad.

HARRISBURGH, or **LOUISBURG**, a post-town of Pennsylvania, and the capital of Dauphine county, seated on the Susquehanna, eighty miles W. of Pennsylvania.

HARRISON, JOHN, the celebrated inventor of the famous time-keeper for ascertaining the longitude at sea, and also of the compound, or, as it is commonly called, the gridiron-pendulum; was born at Foulby, near Pontefract in Yorkshire, in 1693. The vigour of his natural abilities, if not strengthened by want of education, which confined his attention to few objects, at least amply compensated for it; as appeared from the astonishing progress he made in that branch of mechanics to which he devoted himself. His father was a carpenter, in which he assisted, and occasionally surveyed

surveyed land, and repaired clocks and watches. He was, from his childhood, attached to any machinery moving by wheels, as appeared while he lay sick of the small-pox about the sixth year of his age, when he had a watch placed open upon his pillow, to amuse himself by contemplating the movement. In 1700, he removed with his father to Barrow in Lincolnshire; where he eagerly improved every incident from which he might collect information; frequently employing great part of his nights in writing or drawing; and he always acknowledged his obligations to a clergyman who lent him a MS. copy of professor Saunderson's Lectures; which he carefully transcribed, with all the diagrams. In 1726, he had constructed two clocks, mostly of wood, in which he applied the escapement and compound pendulum of his own invention: these surpassed every thing then made, scarcely erring a second in a month. In 1728, he came up to London with the drawings of a machine for determining the longitude at sea, in expectation of being enabled to execute one by the Board of Longitude. Upon application to Dr. Halley, he referred him to Mr. George Graham; who advised him to make his machine before he applied to the Board. He returned home to perform this task; and in 1735 came to London with his first machine; with which he was sent to Lisbon the next year for a trial of its properties. In this short voyage he corrected the dead reckoning about a degree and a half; which success procured him both public and private encouragement. About 1739, he completed his second machine, of a construction much more simple than the former, and which answered much better: this, though not sent to sea, recommended him still more to patronage. His third machine in 1749, was still less complicated than the second, and superior in accuracy, erring only three or four seconds in a week. This he conceived to be the ne plus ultra of his attempts: but in an endeavour to improve pocket-watches, the principles he applied surpassed his expectations so much, as to encourage him to make his fourth time-keeper, which is in the form of a pocket-watch, about six inches diameter. With this time-keeper his son made two voyages, the one to Jamaica, and the other to Barbadoes; in both which experiments it corrected the longitude within the nearest limits required by the act of the 12th of Queen Anne; and the inventor, therefore, at different times, though not without great trouble, received the proposed reward of 20,000*l*. These four machines were given up to the Board of Longitude. The three former were now of no use, as all their advantages were comprehended in the last; they were worthy, however, of being carefully preserved as mechanical curiosities, in which might be traced the gradations of ingenuity executed with the most delicate workmanship. They are kept in the Royal Observatory at Greenwich. The fourth machine, emphatically called the time-keeper, has been copied by the ingenious Mr. Kendal; and that duplicate, during a three years circumnavigation of the globe in the southern hemisphere by Captain Cook, answered as well as the original. The latter part of Mr. Harrison's life was employed in making a fifth improved time-keeper on the same principles with the preceding one; which, at the end of a ten weeks trial, in 1772, at the king's Private Observatory at Richmond, erred only four seconds and a half. Within a few years of his death, he had frequent fits of the gout, a disorder that never attacked him before his seventy-seventh year: he died at his house in Red-Lion Square, in 1776, aged eighty-three. His reclusive manner of life, in the unremitting pursuit of his favourite object, was not calculated to qualify him as a man of the world; and the many discouragements he encountered, in soliciting the legal reward of his labours, still less disposed him to accommodate himself to the humours of mankind. In conversing on his profession, he was clear, distinct, and modest; but found a difficulty in explaining his meaning by writing; in which he adhered to a peculiar and uncouth phraseology. This was evident in his "Description concerning such Mechanism as will afford a nice or true Mensuration of Time," &c. 8vo. 1775; in which he obstinately refused to accept of any assistance whatever. This work contains also an account of his new musical scale; or mechanical division of the octave, according to the proportion which the radius and diameter of a circle have respectively to the circumference. He had in his youth been the leader of a distinguished band of church-singers; had a very delicate ear for music; and his experiments on sound, with a most curious monochord of his own improvement, are reported to have been no less accurate than those he was engaged in for the mensuration of time.

HARRISON, in geography, a county of Virginia, bounded on the N. E. by Monongalia, S. by Greenbrier, S. W. by Kanhawa, and N. by Ohio county. It is 120 miles long, and eighty broad; Clarksburg is the capital.

HARRISTOWN, a town of Ireland, in Kildare, Leinster, eighteen miles S. W. of Dublin.

HARRODSBURG, or **HARRODSTOWN**, a town of Kentucky, in Mercer county, twenty-five miles S. W. of Lexington.

HARROGATE, or **HARROWGATE**, a village in the W. Riding of Yorkshire, in the parish of Knaresborough, remarkable for its chalybeate and sulphureous springs. Formerly, the chalybeate-water only was used internally, and the sulphureous spring was exclusively employed as an external remedy. At present, however, considerable quantities of the latter are drunk for various complaints. The sulphureous water is obtained from four springs, that rise apparently from a large bog situated at a small distance from the wells; and which is composed of decayed vegetable matter, forming a black, half-fluid, foetid mass, four or five feet thick, and supported by a bed of clay and gravel. When first drawn, the Harrogate water is transparent, and emits a few air-bubbles. It possesses a strongly foetid sulphureous smell, similar to that of bilge-water; and is of a bitter, nauseous, and strongly saline, taste. After being exposed for several hours to the open air, it becomes turbid, assumes a greenish colour, loses its sulphureous smell, and deposits sulphur at the bottom and sides of the vessel.

HARROW, [*charroue*, Fr. *harcke*, Germ. a rake,] in agriculture, a frame of timbers crossing each other, and set with teeth, drawn over sowed ground to break the clods, and throw the earth over the seed. See **HUSBANDRY**.

HARROWGATE. See **HARROGATE**.

HART, a stag, or male deer, in the sixth year. See **CERVUS**.

HARTS, **HORNS OF**, the horns of the male deer. The scrapings or raspings of these, are medicinal, and used in decoctions, ptisans, &c. The horns of harts yield by distillation a very penetrating volatile spirit called Volatile Alkali, or Ammonia; which is also procured in equal perfection from the horns, bones, &c. of other animals. See **ALKALI**, and **AMMONIA**.

HARTFORD, a populous and hilly country of Connecticut, bounded on the E. by Tolland.

HARTFORD, a flourishing city in the above county. It lies 50 miles W. of Boston.

HARTLEPOOL, a sea-port town in Durham, 10 miles N. of Stockton.

HARTLEY, **DAVID**, M. A. an eminent physician, born in 1704, at Iltingworth, where his father was curate. He received his academical education at Jesus college, Cambridge, of which he was a fellow. He first practised physic at Newmark upon Trent; afterwards at London; and lastly went to Bath, where he died in 1757, aged 53, leaving two sons and a daughter. He published "A View of the Evidence for and against Mrs. Stephens's Medicines as a Solvent for the Stone, containing 155 Cases with some Experiments and Observations;" London, 1739. He is also said to have written against Dr. Warren, of St. Edmundsbury, in defence of inoculation; and some letters of his are to be met with in the Philosophical Transactions. His chief literary production is "Observations on Man, his Frame, his Duty, and his Expectations, in two parts;" London, 1749, 8vo.

HARTLEY, a town of Northumberland, 12 miles N. E. of Newcastle.

HARTOGIA, in botany, a genus of the pentandria order, and monœcia class of plants; natural order, Aggregatæ. Calyx five-cleft; petals four, spreading; drupe ovate, inclosing two seeds. There is but one species, viz. *H. capensis*, native of the Cape of Good Hope.

HART-ROYAL, a species of buckthorn-plantain. See **PLANTAGO**.

HARTSHORN, a drug that comes into use many ways, and under many forms. What is used here are the whole horns of the common male deer, which fall off every year. This species is the fallow-deer; but some tell us, that the medicinal hartshorn should be that of the true hart or stag. The salt of hartshorn is a great sudorific, and the spirit has all the virtues of volatile alkalies: it is used to bring people out of faintings by its pungency, holding it under the nose, and pouring down some drops of it in water.

HARTSHORN,

HARTSHORN, CALCINED, or COAL OF HARTSHORN, a very white earth, procured by calcining the horns of harts, in a long continued and strong fire. — This earth is employed in medicine, as an absorbent, and when levigated, is the basis of Sydenham's white decoction, which is commonly prescribed in dysenteries.

HARTSHORN JELLY is nutritive and strengthening, and is sometimes given in diarrhoeas; but a decoction of burnt hartshorn in water is more frequently used for this purpose, and is called *hartshorn-drink*.

HARTSHORN, SPIRIT OF. See **AMMONIA**.

HARTZGEROD, a town of Upper Saxony, in Anhalt Bernburg, 24 miles S. W. of Bernburg.

HARVEST FLY, in zoology, a large four-winged fly of the cicada-kind, very common in Italy, and erroneously supposed to be a grasshopper. See **CICADA**.

HARVEY, Dr. WILLIAM, an eminent English physician of the 17th century, took his degree of M. D. at Cambridge; was afterwards admitted into the college of physicians in London, and was appointed lecturer of anatomy and chirurgery in that college. In these lectures he opened his discovery relating to the circulation of the blood; which, after a variety of experiments, he communicated to the world in his "*Exercitatio anatomica de Motu Cordis et Sanguinis*." He was physician to king James I. and to king Charles I. and adhered to the royal cause. His discovery has eternized his memory. In 1651, he published his "*Exercitationes de Generatione Animalium*," a very curious work. His papers were destroyed during the civil wars. In 1654, he was chosen president of the college of physicians in his absence; but as he could not discharge the duty of that office, he desired them to choose Dr. Pringle. As he had no children, he settled his paternal estate upon the college. In 1653 he built a library, and a museum; and in 1656 he brought the deeds of his estate, and presented them to the college. He was then present at the first feast, instituted by himself, together with a commemoration-speech in Latin, to be spoken on the 18th of October annually in honour of the benefactors to the college; and he appointed a handsome stipend for the orator, and also for the keeper of the library and museum, which are still called by his name. He died in 1657. This great physician had the happiness, in his lifetime, to find the clamours of ignorance, envy, and prejudice, against his doctrine, totally silenced, and to see it universally established. It is of the utmost importance in medicine; as it is perhaps impossible to define health and sickness in fewer words, than that the one is a free, and the other an obstructed, circulation. Dr. Harvey was not only an excellent physician, but an excellent man; his modesty, candour, and piety, were equal to his knowledge; the farther he penetrated into the wonders of nature, the more he venerated the Author of it.

HARVIE, ALEXANDER, a native of Scotland, who at the imminent risk of his life, first introduced the incle-manufacture into Britain. He went over to Holland about 1732, and in spite of the care which the Dutch took to conceal their methods of manufacturing, brought over from Haerlem two of their incle-ooms, and one of their workmen; by whose assistance he established the first incle-manufactory at Glasgow, which has since been copied at Manchester, &c.

HARUSPICES, or ARUSPICES, pretenders to divination by certain signs or omens among the Romans. The Roman haruspices were at first all taken from Hetruria; afterwards young Romans were sent there to be brought up in the science.

HARUSPICY, the art of divination. It consisted in foretelling future events by attending to various circumstances of the victims. 1. It was an ill omen if the victim needed to be dragged to the altar, if it broke its rope, fled away, avoided the stroke, struggled much after it, made a great bellowing, was long a-dying, or bled but little. 2. Presages were drawn from inspecting the noble parts, as the heart, lungs, spleen, and especially the liver. If all these were found, if the top of the liver was large and well made, and if its fibres were strong, it presaged well. 3. They were also drawn from the manner in which the fire consumed the victim. If the flame brightened immediately, was pure and clear, rose out till the victim was consumed, these were happy signs. 4. The smoke also was considered, whether it whirled about in curls, or spread itself to the right or the left, or gave a smell different from the common one of broiled meat. 5. It was a lucky omen if the incense they burned melted all at once, and gave a most agreeable smell.

HARWICH, a populous and well built town of Essex, 72 miles N. E. of London.

HAS, a district of Arabia in Yemen.

Has, the capital of the above district, 40 miles N. of Mocha.

HASBAIN, or HASBEIN, a country in the kingdom of Westphalia.

HASELOE, an island of Denmark, in the Categate, 12 miles from Zealand. Lon. 11. 45. E. Lat. 56. 11. N.

HASLEMERE, a town of Surry, on the edge of the county, next Hampshire, 43 miles from London.

HASLI, a district of the Helvetic Republic, in the canton of Bern, in a fine valley S. E. of lake Brienz, and watered by the Aar; famous for cheese, which the citizens export to Italy.

HASLINDEN, or HASLIGDON, a town of Lancashire, 14 miles N. of Manchester.

HASP AND STAPLES, in Scots law, the symbol commonly used in burgage-tenements for entering and infetting an heir, by delivering into his hands the hasp and staple of the door.

HASSELQUIST, FREDERIC, M. D. an eminent Swedish naturalist, born at Tournalla, in E. Gothland, in 1722, and educated at Upsal, under the great Linnæus. By the advice of that eminent botanist, with the assistance of the University of Upsal, who granted him a salary for the purpose, he set out upon a voyage to Palestine, in summer 1749, with the view of investigating the natural history of that country, and thereby illustrating eastern philology, and elucidating many passages in the Old Testament. In this enterprise he also received much pecuniary aid, by private subscriptions. By the interest of Counsellor Lagerstroem, he obtained a free passage in a Swedish E. Indiaman, to Smyrna; where he arrived in Dec. 1749, and was most hospitably received by M. A. Rydel, the Swedish consul. In Jan. 1750, he set out for Egypt, and spent nine months at Cairo, whence he transmitted to Linnæus some specimens of his discoveries, which were published with great approbation. A collection of 10,000 dollars was then made to enable him to continue his travels and researches. In spring 1751, he passed through Jaffa to Jerusalem; Jericho, &c. returning through Rhodes and Scio to Smyrna. Thus he completed the object of his mission, but unfortunately fell a sacrifice to the heat of the climate, which in his travels through Arabia, had affected his lungs so severely, that he died at Smyrna, Feb. 9th 1752, aged 30. The Turks, with their usual rapacity having seized his collections, were prevented from selling them by the Swedish consul, who wrote home an account of his death and circumstances; whereupon Q. Louisa Ulrica generously sent 14,000 dollars to redeem them; and the whole collection, consisting of numerous antiques, shells, birds, insects, serpents, Arabian MSS. &c. arrived in good preservation at Stockholm, and was lodged in the cabinets of Ulrichsdale, and Drottningholm; duplicates of many of them being also sent to Linnæus at Upsal, who published an account of his deceased friend's voyage and observations, and named a plant after him. See next article.

HASSELQUISTIA, in botany, a genus of the digynia order, and pentandria class of plants; natural order, Umbellata. Fruits quite smooth; seeds of the radius oval, plane, margined, and convex in the middle; those in the disk hemispherical, bladder-shaped. It has two species.

HASSELT, a town of Batavia, in the department of Yssel, and late province of Overijssel; 10 miles E. of Campen.

HASSELT, a town of France, in the department of Ourte, and late territory of Liege; 16 miles N. N. W. of Liege.

HASTA, or HASTA PURA, among medalists, signifies a kind of spear or javelin, not shod or headed with iron; or rather an ancient sceptre, somewhat longer than ordinary, occasionally given to all the gods.

HASTA, in some countries, is a measure or quantity of ground amounting to thirty paces: thus called according to M. Du Cange, from the hasta or rod wherewith it was measured.

HASTATA FOLIA, HASTATED LEAVES. See **BOTANY**.

HASTINGS, a town of Sussex, 64 miles S. E. of London. It is the chief of the cinque-ports: and was formerly obliged to find 21 ships, within 40 days after the king's summons, well furnished and armed for service, and to maintain the crews a fortnight at its own charge. Hastings is remarkable for a battle fought in its neighbourhood, between Harold II. K. of England and William Duke of Normandy, on the 15th Oct. 1066, in which the former was defeated and killed; and by his death William became King.

of England. Hastings lies 24 miles E. of Lewis, and 40 of Bright-helmstone.

HAT, [*hat*, Saxon; *hatt*, German,] a covering for the head, which is generally made of a mixture of Spanish wool with that of hares, kids, rabbits, beaver, &c. Lately, feathers have been usefully employed in the manufacture of this article. Hats are said to have been first used by men, about A. D. 1400, for country wear, riding, &c. But the hatters have a tradition among them, that the origin of their art, at least of that branch of it called felting, is much more ancient. The tradition is, that while St. Clement, the 4th bishop of Rome, was flying from his persecutors, his feet became blistered; in consequence of which he was induced to put wool between the soles of his feet and the sandals which he wore. The consequence was, that in continuing his journey, the wool, by the sweat and motion of his feet, became as completely felted as if wrought on purpose. When he afterwards settled at Rome, he improved the discovery, and hence the origin of felting and hat-making. The hatters in Ireland, as well as in several catholic countries, still hold a festival on St. Clement's day.

HAT-MAKING. The materials being sorted out and mixed in various proportions, and of different qualities, according to the value of the article intended to be made; they proceed to the first process, called bowing. The material, without any previous preparation, is laid upon a platform of wood, or of wire, somewhat more than four feet square, called a hurdle. In the hurdle, if of wood, are longitudinal chinks for the purpose of suffering the dust and other impurities of the stuff, to pass through; a purpose still more effectually answered by the hurdle of wire. The workman is provided with a bow, a bow-pin, a basket, and several cloths. The bow is a pole of yellow deal-wood, between seven and eight feet long, to which are fixed two bridges, somewhat like that which receives the hair in the bow of the violin. Over these is stretched a catgut, about one-12th of an inch in thickness. The bow-pin is a stick with a knob, and is used for plucking the bow-string. The basket is a square piece of osier-work, consisting of open strait bars with no crossing or interweaving. The cloths are linen. Besides these implements, the workman is also provided with brown paper. The bowing commences by shovelling the material towards the right hand partition with the basket, upon which, the workman holding the bow horizontally in his left hand, and the bow-pin in his right, lightly places the bow-string, and gives it a pluck with the pin. The string, in its return, strikes part of the fur, and causes it to rise, and fly partly across the hurdle in a light open form. By repeated strokes, the whole is thus subjected to the bow; and this beating is repeated, till all the original clots or masses of the filaments are perfectly opened and obliterated. The quantity thus treated at once is called a batt, and never exceeds half the quantity required to make one hat. When the batt is sufficiently bowed, it is ready for hardening; which term denotes the first commencement of felting. The prepared material being evenly disposed on the hurdle, is first pressed down by the convex side of the basket, then covered with a cloth, and pressed successively in its various parts by the hands of the workman. This pressure brings the hairs against each other, and multiplies their points of contact; the agitation of them gives to each hair a progressive motion towards the root; by means of this motion the hairs are twisted together, and the lamellæ of each hair, by fixing themselves to those of other hairs which happen to be directed the contrary way, keep the whole in that compact state which the pressure makes it acquire. In proportion as the mass becomes compact, the pressure of the hands should be increased; not only to make it more close, but also to keep up the progressive motion and twisting of the hairs, which then takes place with greater difficulty: but throughout the whole of this operation, the hairs fix themselves only to each other, and not to the cloth with which they are covered, the fibres of which are smooth, and have no disposition to felting. See **HAIR**. "In a short time the stuff acquires sufficient firmness to bear careful handling. The cloth is then taken off, and a sheet of paper, with its corners doubled in, so as to give it a triangular outline, is laid upon the batt, which last is folded over the paper as it lies, and its edges, meeting one over the other, form a conical cap. The joining is soon made good by pressure with the hands on the cloth. Another batt, ready hardened, next laid on the hurdle, and the cap here mentioned placed upon it, with the joining downwards. This last batt being also folded up, will consequently have its place of junction diametri-

cally opposite to that of the inner felt, which it must therefore greatly tend to strengthen. The principal part of the hat is thus put together, and now requires to be worked with the hands a considerable time upon the hurdle, the cloth being also occasionally sprinkled with clear water. During the whole of this operation, which is called basoning, the article becomes firmer and firmer, and contracts in its dimensions. It may easily be understood, that the chief use of the paper is to prevent the sides from felting together. The hat thus basoned, they remove it to a large kind of receiver or trough, resembling a mill-hopper, going sloping or narrowing down from the edge or rim to the bottom, which is a copper-kettle filled with water and grounds, kept hot for that purpose. On the descent or sloping side, called the plank, the basoned hat, being first dipped in the kettle, is laid; and here they proceed to work it, by rolling and unrolling it again and again, one part after another, first with the hand, and then with a little wooden roller, taking care to dip it from time to time, till at length, by thus fulling and thickening it four or five hours, it is reduced to the extent or dimensions of the hat intended. The hat thus wrought, they proceed to give it the proper form, which is done by laying the conical cap on a wooden block, of the intended size of the crown of the hat, and then tying it round with a packthread: after which, with a piece of iron or copper bent for that purpose, and called a stamper, they gradually beat or drive it down all round, till it has reached the bottom of the block, and thus is the crown formed; what remains at bottom below the string being the brim. The hat being now set to dry, they proceed to singe it, by holding it over a flare of straw or the like; then it is pounced, or rubbed over with pumice, to take off the coarser knap; then rubbed over afresh with seal-skin to lay the knap a little finer; and lastly, carded with a fine card to raise the fine cotton, with which the hat is afterwards to appear. Things thus far advanced, the hat is thus sent, upon its block, and tied about with a packthread as before, to be dyed. The dye being completed, the hat is returned to the hatter, who proceeds to dry it, by hanging it in the top or roof of a stove or oven, at the bottom of which is a charcoal-fire: when dry, it is to be stiffened, which is done with melted glue, or gum, senegal applied thereon by first smearing it, and beating it over with a brush, and then rubbing it with the hand. The next thing is to steam it on the steaming-bason, which is a little hearth or fire-place. When steamed sufficiently, and dried, they put it again on the block, and brush and iron it on a table or bench for the purpose, called the stall-board; this they perform with a sort of irons like those commonly used in ironing linen, and heated like them, which being rubbed over and over each part of the hat with the assistance of the brush, smooths and gives it a gloss, which is the last operation; nothing now remains but to clip the edges even with scissors, and sew a lining to the crown.

HATS, METHOD OF DYEING. According to Dr. Lewis, the best proportion of ingredients for dyeing hats is as follows: 100 lb. of logwood, 12 lb. of gum, and 6 lb. of galls, are boiled in a proper quantity of water for some hours; after which, about 6 lb. of verdigris and 10 of green vitriol are added, and the liquor kept just simmering, or of a heat a little below boiling: 10 or 12 doz. of hats are immediately put in, each on its block, and kept down by cross-bars for about an hour and an half: they are then taken out and aired, and the same number of others put in their room. The two sets of hats are thus dipped and aired alternately, eight times each; the liquor being refreshed each time with more of the ingredients, but in less quantity than at first. This process (says Dr. Lewis) affords a very good black on woollen and silk stuffs as well as on hats, as we may see in the small pieces of both kinds which are sometimes dyed by the hatters.

HATS are also made for women's wear, not only of the above stuffs, but of chips, straw, or cane, by plaiting, and sewing the plaits together; beginning with the centre of the crown, and working round till the whole is finished. They are also wove and made of horse-hair, silk, &c.

HATA, a large river of S. America, in Chili.

HACHEL, or **HITCHEL**, a tool with which flax and hemp are combed into fine hairs: It consists of long iron-pins, or teeth, regularly set in a piece of board. There are several sorts of hatchels, each finer than the other, with which flax and hemp are prepared for spinning.

HATCHES, in a ship, a kind of trap-doors between the main-
mast

mast and fore-mast, through which all goods of bulk are let down into the hold.

HATCHES, COAMINGS OF THE, are the pieces of timber, or planks, which raise up the hatches, when they are made higher than the rest of the deck.

HATCHES also denote flood-gates set in a river, &c. to stop the current of the water, particularly certain dams or mounds made of rubbish, clay, or earth, to prevent the water that issues from the stream-works and tin-washes in Cornwall, from running into the fresh rivers.

HATCHES, in mining, a term used in Cornwall, to express any of the openings of the earth either into mines or in search of them.

HATCH-WAY, the place where the hatches are. Thus, to lay a thing in the hatch-way, is to put it so, that the hatches cannot be come at, or opened.

HATCHET, [*hache, hachette*, Fr. *ascia*, Latin,] a small axe.

HATCHETS have a basil-edge on the left side, and a short handle, being used with one hand. They are used by various artificers, particularly in hewing wood.

HATCHING, the maturing fecundated eggs, whether by the incubation and warmth of the parent bird, or by artificial heat, so as to produce young chickens alive. The art of hatching chickens by means of ovens has long been practised in Egypt, chiefly in a village named Berme, and its environs. About the beginning of autumn the natives scatter themselves all over the country: where each undertakes the management of an oven. These ovens are of different sizes, but, in general, they contain from 40 to 80,000 eggs. The number of ovens is about 386, and they usually keep them working for about six months: as, therefore, each brood takes up in an oven, as under a hen, only 21 days, it is easy in every one of them to hatch eight different broods of chickens. Every Bermean is under the obligation of delivering to the persons who trusts him with an oven, only two-thirds of as many chickens as there have been eggs put under his care; and he is a gainer by this bargain, as more than two-thirds of the eggs usually produce chickens. In calculating the number of chickens thus annually hatched in Egypt, it has been supposed that only two-thirds of the eggs are hatched, and that each brood consists of at least 30,000 chickens. Hence it appears, that the ovens of Egypt give life yearly to at least 92,640,000 of these animals. This useful and advantageous method of hatching eggs was discovered in France by the ingenious Mr. Reaumur; who, by a number of experiments, reduced the art to fixed principles. He found that the heat necessary for this purpose is nearly the same with that marked 32 on his thermometer, or 96 on Fahrenheit's. This degree of heat is nearly that of the skin of the hen, and of all other domestic fowls, and probably of all other kinds of birds. The degree of heat, which brings about the development of the cygnet, the gosling, and the turkey-pout, is the same as that which fits for hatching the canary songster, and in all probability, the smallest humming-bird: the difference is only in the time during which this heat ought to be communicated to the eggs of different birds. It will bring the canary-bird to perfection in 11 or 12 days, while the turkey-pout will require 27 or 28. After many experiments, Mr. Reaumur found, that stoves heated by means of a baker's oven, succeeded better than those made hot by layers of dung: and the furnaces of glass-houses and those of the melters of metals, by means of pipes to convey heat into a room, might, no doubt, be made to answer the same purpose. As to the form of the stoves, no great nicety is required. A chamber over an oven will do very well. Nothing more is necessary but to ascertain the degree of heat, by melting a lump of butter of the size of a walnut, with half as much tallow, and putting it into a phial. This serves to indicate the heat with sufficient exactness: for when it is too great, this mixture will become as liquid as oil; and when the heat is too small, it will remain fixed in a lump: but it will flow like a thick syrup, upon inclining the bottle, if the stove be of a right temper. Great attention therefore should be given to keep the heat always at this degree, by letting in fresh air if it be too great, or shutting the stove more close if it be too small; and that all the eggs in the stove may equally share the irregularities of the heat, it will be necessary to shift them from the sides to the centre; and thus to imitate the hens, who are frequently seen to make use of their bills, to push to the outer parts those eggs that were

nearest to the middle of their nests, and to bring into the middle such as lay nearest the sides. Mr. Reaumur has invented a sort of low boxes, without bottoms, and lined with furs. These, which he calls artificial parents, not only shelter the chickens from the injuries of the air, but afford a kindly warmth, so that they take the benefit of their shelter as readily as they would have done under the wings of a hen. After hatching, it will be necessary to keep the chickens, for some time, in a room artfully heated and furnished with these boxes; but afterwards they may be safely exposed to the air in the court-yard, in which it may not be amiss to place one of these artificial parents to shelter them, if there should be occasion for it. They are generally a whole day after being hatched, before they take any food at all. A few crumbs of bread may then be given them for a day or two, after which they will pick up insects and grass for themselves. But to save the trouble of attending them, capons may be taught to watch them in the same manner as hens do. Mr. Reaumur says he has seen above 200 chickens at once, all led about and defended only by three or four capons. Nay, cocks may be taught to perform the same office; which they, as well as the capons, will continue to do all their lives after.

HATCHING, or HACHING, in designing, &c. the making of lines with a pen, pencil, graver, or the like; and intersecting or going across those lines with others drawn a contrary way, is called counter-hatching. The depths and shadows of draughts are usually formed by hatching. Hatching is of singular use in heraldry, to distinguish the several colours of a shield, without being illuminated: thus, gules or red is hatched by lines drawn from the top to the bottom; azure by lines drawn across the shield; and so of other colours.

HATCHMENT, in heraldry, is the coat of arms of a person dead; usually placed on the front of a house, whereby may be known what rank the deceased person was of when living; the whole distinguished so as to enable the beholder to know whether he was a bachelor, married man, or widower; with the like distinctions for women.

HATFIELD, or BISHOP's HATFIELD, a town of Hertfordshire, 1½ miles N. of London.

HATFIELD, a town in the W. riding of Yorkshire, four miles from Doncaster, with its chase, famous for deer-hunting.

HATFIELD BROAD-OAK, HATFIELD REGIS, or KING's HATFIELD, a town of Essex, seated on a branch of the Lea, 29 miles N. N. E. of London.

HATHERLEY, a town of Devonshire, 28 miles W. N. W. of Exeter.

HATTEMISTS, in ecclesiastical history, a modern Dutch sect, so called from Pontian Van Hattem, a minister in Zealand, towards the close of the 17th century, who being addicted to the sentiments of Spinoza, was degraded from his pastoral office. The Verschorists and Hattemists resemble each other in their religious systems, though they never formed one communion. The founders of these sects deduced from the doctrine of absolute decrees a system of uncontrollable necessity; they denied the difference between moral good and evil, and the corruption of human nature: whence they concluded, that mankind were under no obligation to correct their manners, improve their minds, or obey the divine laws; that the whole of religion consisted not in acting, but in suffering; and that all the precepts of Jesus Christ are reducible to this one, that we bear with cheerfulness and patience the events that happen to us through the divine will, and make it our constant and only study to maintain a permanent tranquillity of mind.

HATTERAS, CAPE, a cape on the coast of N. Carolina. Lon. 75. 54. W. Lat. 35. 8. N.

HATTINGEN, a town of Germany, in the circle of Westphalia, and county of Mark, 16 miles N. E. of Dusseldorp.

HAVANNAH, a city and sea-port town of the island of Cuba, on the N. coast, opposite to Florida. It is famous for its harbour, which is in every respect one of the best in the West Indies, and perhaps in the world. Lat. 23° 11' 52" N. Lon. 82° 8' 36" W. from Greenwich.

HAVANT, a town of Hampshire, 9 miles W. of Chichester.

HAVEL, a river which rises from a lake in Mecklenburg, and runs N. into the Elbe, near Werben, in Brandenburg.

HAVELBERG, a town of Upper Saxony, in Brandenburg, seated on the Havel, 37 miles N. W. of Brandenburg.

HAVEN,

HAVEN, [*haven*, Dutch; *havre*, French,] a port; a harbour; a station for ships. See **HARBOUR**, and **PORT**.

HAVER is a common word in the northern counties for oats; as, *haver* bread for oatmeal bread; perhaps properly *aven*, from *avena*, Lat.

HAVERFORD WEST, a neat, well-built and populous town of S. Wales, in Pembrokeshire; 256 miles from London.

HAVERHILL, a town of New Hampshire, capital of Grafton county, 32 miles above Dartmouth college, and 496 N. E. of Philadelphia.

HAVERILL, a town of England, partly in Essex, and partly in Suffolk, 20 miles S. E. of Cambridge.

HAUL, among seamen, implies to pull a single rope, without the assistance of blocks or other mechanical powers. When a rope is otherwise pulled, as by the application of tackles, or the connection with blocks, &c. the term is changed into *bowing*.

HAUL THE WIND, is to direct the ship's course nearer to that point of the compass from which the wind arises. Thus, supposing a ship to sail S. W. with the wind northerly, and some particular occasion requires to haul the wind more westward; to perform this operation, it is necessary to arrange the sails more obliquely with her keel; to brace the yards more forward, by slackening the starboard and pulling in the larboard braces, and to haul the lower sheets further aft; and, finally, to put the helm a-port, *i. e.* over to the larboard side of the vessel. As soon as her head is turned directly to the westward, and her sails are trimmed accordingly, she is said to have hauled the wind four points; that is to say, from S. W. to W. She may still go two points nearer to the direction of the wind, by disposing her sails according to their greatest obliquity, or, in the sea-phrases, by trimming all sharp; and in this situation she is said to be close-hauled, as sailing W. N. W.

HAULM, **HALM**, or **HAWN**, among farmers, signifies the stem or stalk of corn, pease, beans, &c. from the root to the ear.

HAUNCH, or **HANCH**, that part of the body between the last ribs and the thigh.

HAUNCHES OF A HORSE are too long, if when standing in the stable he limps, with his hind-legs farther back than he ought; and when the top of his tail is not in a perpendicular line to the tip of his hocks, as it always is in horses whose haunches are of a just length.

HAVRE DE GRACE, a sea-port town of France, in the department of Lower Seine and late province of Normandy, on the English Channel, 45 miles W. of Rouen, and 12 N. W. of Paris.

HAURIANT, in heraldry, a term peculiar to fishes; signifying their standing upright, as if refreshing themselves by sucking in the air.

HAUTBOY, a wind-instrument, shaped much like the lute; only it spreads and widens towards the bottom, and is sounded through a reed. The treble is two feet long; the tenor goes a fifth lower when blown open; it has only eight holes; but the bass, which is five feet long, has 11. The name is French, *haut bois*, *q. d.* high wood; and is given to this instrument because the tone of it is higher than that of the violin.

HAUTBOY STRAWBERRY. See **FRAGRARIA**.

HAUTE FEUILLE, JOHN, an ingenious mechanic, born at Orleans in 1647. Though he was an ecclesiastic, and enjoyed several benefices, he applied almost his whole life to mechanics, in which he made a great progress. He had a particular taste for clock-work, and made several discoveries in it that were of singular use. He found out the secret of moderating the vibration of the balance by means of a small steel-spring, which has since been made use of. This discovery he laid before the members of the Academy of Sciences in 1674; and these watches are called pendulum-watches, not that they have real pendulums, but because they nearly approach to the justness of pendulums. M. Huygens perfected this happy invention; but having declared himself the inventor, and obtained from Lewis XIV. a patent for making watches with spiral springs, the abbé Feuille opposed the registering of this privilege, and published a piece on the subject against M. Huygens. He wrote a great number of other pieces, most of which are small pamphlets consisting of a few pages, but very curious; as, 1. The perpetual Pendulum; 4to. 2. New Inventions; 4to. 3. The Art of Breathing under Water, and the Means of preserving a Flame shut up in a small Place. 4. Reflec-

tions on Machines for raising Water. 5. On the different Sentiments of Malebranche and Regis, relating to the Appearance of the Moon when seen in the Horizon. 6. The magnetic Balance. 7. A Placet to the King on the Longitude. 9. A new System on the Flux and Reflux of the Sea. 10. The Means of making sensible Experiments that prove the Motion of the Earth; and many other pieces. He died in 1724.

HAUTE-RIVE, a town of France, in the department of Upper Garonne, and late province of Languedoc, 10 miles S. of Toulouse.

HAW, or **HAUGH**, in farriery, is a spongy excrescence in the inner corner of the eyes of horses, or other cattle, and which, if not timely removed, will occasion total blindness. It arises from gross humours, and is known by the watering of the eye, and the opening of the lower side.

HAWKER, [from *hock*, Germ.] one who sells his wares by proclaiming them in the street.

HAWKERS anciently were fraudulent persons, who went from place to place buying and selling brass, pewter, and other merchandize, which ought to be uttered in open market. In this sense the word is mentioned, 25 Hen. VIII. cap. 6, and 33, cap. 4. The appellation seems to have arisen from their uncertain wandering, like those who, with hawks, seek their game where they can find it. The term is now used as synonymous with pedlar; a person who travels about the country selling wares. Every hawker must take out an annual licence, for which he must pay 4*l.* and if he travel with a horse, ass, or mule, for every one of them 8*l.* If he travel without a licence, or contrary to it, he forfeits for every offence to the informer, and the poor of the parish where discovered, 10*l.* The acts relating to hawkers do not extend to makers of goods or their agents; or to those who sell goods in fairs or markets; to the sellers of fish, fruit, or other victuals; nor to the venders of books and newspapers: 9 and 10 W. cap. 27. 3 and 4 Anne, cap. 4. But hawkers shall not, by virtue of such licence, sell or offer to sale, any tea or spirituous liquors, though with a permit, under the penalty of having the same seized, and imprisonment and prosecution of the offender, 9 Geo. II. cap. 35. Hawkers who were licensed on June 23, 1785, may set up any business in the place where they are resident inhabitants, brought up thereto. Additional duties, are, however, imposed upon hawkers, by acts, 29 Geo. III. c. 26, and 35 Geo. III. c. 91.

HAWKING, the art, or exercise, of taking wild fowl by means of hawks. The method of reclaiming, manning, and bringing up, a hawk to this exercise, is called **FALCONRY**, which see.

HAWKSHEAD, a town of Lancashire, 38 miles N. of Lancaster, and 273 N. N. W. of London.

HAWKWEED. See **CREPIS**, and **HIERACIUM**.

HAWS, a river of N. Wales, in Montgomeryshire.

HAWS, a river of S. Wales, in Radnorshire.

HAWS, or **HAWS-WATER**, a lake of Westmoreland, W. of Penrith, three miles long, and half a mile broad.

HAWSE, or **HAUSE**, implies the situation of the cables before the ship's stem, when she is moored with two anchors out from forward, *viz.* one on the starboard and the other on the larboard bow. Hence it is usual to say, she has a clear hawse, or a foul hawse. It also denotes any small distance a-head of a ship, or between her head and the anchors employed to ride her, as He has anchored in our hawse, The brig fell athwart our hawse, &c. A ship is said to ride with a clear hawse, when the cables are directed to their anchors, without lying athwart the stem; or crossing, or being twisted round each other, by the ship's winding about, according to the change of the wind, tide, or current. A foul hawse, on the contrary, implies that the cables lie across the stem, or bear upon each other, so as to be rubbed and chafed by the motion of the vessel. The hawse accordingly is foul, by having either a cross, an elbow, or a round turn. If the larboard-cable lying across the stem, points out on the starboard-side, while the starboard-cable at the same time grows out on the larboard-side, there is a cross on the hawse. If, after this, the ship, without returning to her former position, continues to wind about the same way, so as to perform an entire revolution, each of the cables will be twisted round the other, and then directed out from the opposite bow, forming what is called a round turn. An elbow is produced when the ship stops in the middle of that revolution, after having had a cross: or, in other words, if she rides with her head north-

ward with a clear hawse, and afterwards turns quite round so as to direct her head northward again, she will have an elbow.

HAWSE-PIECES, the foremost timbers of a ship, whose lower ends rest on the knuckle-timber, or the foremost of the cant-timbers. They are generally parallel to the stem, having their upper ends sometimes terminated by the lower part of the beak-head; and otherwise by the top of the bow, particularly in small ships and merchantmen.

HAWTHORN. See **CRATÆGUS**.

HAWTHORN, AMERICAN. See **VIBURNUM**.

HAY, grass cut and dried for fodder. The time of mowing grass for hay must be regulated according to its growth and ripeness; nothing being more prejudicial to the crop than mowing it too soon, because the sap is not then fully come out of the root, and when made into hay, the grass shrinks away to nothing. It must not, however, be let stand too long till it have shed its seeds. When the tops of the grass look brown, and begin to bend down, and the red honeysuckle flowers begin to wither, it is ripe for mowing. See **HUSBANDRY**.

HAY, in geography, a town of S. Wales in Brecknockshire. Lon. 3. 4. W. Lat. 51. 59. N.

HAYE, a town of France, in the department of Indre and Loire, on the Creuse; 25 miles S. of Tours.

HAYES, CHARLES, Esq. a person of great erudition and modesty. He was born in 1678, and became distinguished in 1704, by "A Treatise on Fluxions," in folio; the only work to which he ever set his name. In 1710, came out a quarto pamphlet of nineteen pages, entitled "A New and Easy Method to find out the Longitude, from observing the Altitudes of the Celestial Bodies;" and in 1723, "The Moon," a Philosophical Dialogue; tending to shew, that the moon is not an opaque body, but has original light of her own. He principally had the management of the late Royal African company. To a skill in the Greek and Latin, as well as the modern languages, he added the knowledge of the Hebrew: and published several pieces relating to the translation and chronology of the scriptures. He died at London, December 28, 1760, in his 82d year. The title of his posthumous works runs thus: *Chronographiæ Asiaticæ et Egyptiacæ Specimen*; in quo, 1. *Origo Chronologiæ lxx. Interpretum Investigatur*. 2. *Conspectus Totius Operis Exhibitur*, 8vo.

HAZAEEL, [חזקאל, Heb. *z. e.* seeing God,] an officer belonging to Benhadad king of Syria, who caused that prince to be put to death, and reigned in his stead. He defeated Joram, Jehu, and Jehoabaz, kings of Israel; and after his death, was succeeded by Benhadad his son, B. C. 889.

HAZARD, a game on dice, without tables, is very properly so called, since it speedily enriches a man or ruins him. It is played only with two dice without tables. See **GAMING**.

HAZEBROUC, a town of France, in the department of the North, 19½ miles W. of Lille.

HAZEL, or **HAZLE**, in botany. See **CORYLUS**. The kernels of the fruit have a mild, farinaceous, oily taste, agreeable to most palates. A kind of chocolate has been prepared from them, and there are instances of their having been formed into bread. The oil expressed from them is little inferior to the oil of almonds; and is used by painters and by chemists for receiving and retaining odours.

HEAD. See **ANATOMY**.

HEADACH, a most troublesome sensation in the head produced by various causes, and attended with different symptoms, according to its different degrees, and the place where it is seated. See **MEDICINE**.

HEAD-BOROUGH, or **HEAD-BOROW**, is the chief of the frank pledge, and had anciently the principal direction of those within his own pledge. This officer is now called a high constable. The head-borow was the chief of ten pledges: the other nine were called hand-borows, or *plegii manuales*. See **CONSTABLE**.

HEAD-FAST, a rope employed to fasten a ship to a wharf, chain, or buoy, or to some other vessel along-side.

HEADFORD, a town of Ireland, 12 miles N. of Galway.

HEADMOULD-SHOT, a disease wherein the sutures are so close locked together, as to compress the internal parts, the meninges, or even the brain. It is supposed to admit of no cure from medicine, unless room could be given by manual operation or a division of the sutures. It is the opposite of the horse-shoe-head.

HEADON, or **HEYDON**, a borough of Yorkshire, in the East Riding, 8 miles E. of Hull.

HEAD-PENCE, an exaction of a certain sum formerly collected by the sheriff of Northumberland from the inhabitants of that county, without any account to be made to the king. It was abolished by stat. 23 Hen. VI. cap. 7.

HEAD-ROPE, that part of the bolt-rope which terminates any of the principal sails on the upper edge, which is accordingly sewed thereto.

HEAD-SAILS, a general name for all those sails which are extended on the fore-mast and bowsprit, and employed to command the fore-part of the ship: such are the fore-sail, fore-top-sail, fore-top-gallant sail, jib, fore-stay-sail, and the sprit-sail with its top-sail. This term is used in opposition to after-sails, viz. all those which are extended on the mizen-mast, and on the stays between the mizen and main-masts.

HEAD-TIN, in metallurgy, is a preparation of tin-ore toward the fitting it for working into metal. When the ore has been pounded and twice washed, that part of it which lies uppermost, or makes the surface of the mass in the tub, is called the head-tin.

HEAD TO WIND; the situation of a ship or boat, when her head is turned to windward.

HEAD-WAY, the motion of advancing at sea. It is generally used when a ship first begins to advance; or when it is doubtful whether she is in a state of rest or motion. It is in both senses opposed to retreating, or moving with the stern foremost.

HEALFANG, **HEALSFANG**, or **HALSFANG**, [from *halp*, neck, and *pangen*, to contain, Sax.] in the ancient English customs, signifies collistrigium, or the punishment of the pillory: *Pana scilicet qua alicui collum stringatur*.

HEALFANG is also taken for a pecuniary punishment or mulct, to commute for standing in the pillory; and is to be paid either to the king or the chief lord. *Qui falsum testimonium dedit, reddat regi vel terræ domino healfang*.

HEALING, in its general sense, includes the whole process of curing a disorder, and restoring health. In this sense medicine is defined the art of healing. In its more restrained sense, as used in surgery, &c. healing denotes the uniting or consolidating the lips of a wound or ulcer. The medicines proper for this intention are called incarnatives, agglutinatives, vulneraries, &c.

HEALING, in architecture, denotes the covering the roof of a building; whether with lead, tiles, slates, Horsham stones, shingles, reeds, or straw.

HEALTH, [from *heel*, Sax.] a right disposition of the body, and of all its parts; consisting in a due temperature, a right conformation, just connection, and ready and free exercise of all the vital functions. Health admits of latitude, as not being the same in all subjects, who may yet be said to enjoy health. That part of medicine which shews the means of preserving health, is termed hygiene. See **MEDICINE**. The Greeks and Romans deified health. See **HYGIEA** and **SALUS**.

HEALTH, [*heel*, Sax.] is a proper disposition of the several constituent parts of the body, by which they are enabled to perform their respective functions without any impediment. The continuance of health depends chiefly on what has been professionally called, the six non-naturals; namely, air, food, exercise, the passions, evacuation, and retention; sleep and waking. Moderation, however, in the strictest sense of the word, is equally essential to the preservation of health, as a pure air, and wholesome food. Cleanliness, too, ought by no means to be neglected; for an unclean person very seldom enjoys good health. Hence, frequent washing of the skin is of the first importance; and we are fully persuaded, that most of the diseases, with which the lower classes of people are affected, especially in crowded neighbourhoods, originate from the filthy state which is but too evident in many of their wretched habitations. With respect to those persons who propose to reside in hot climates, we shall state only a few simple rules, by an attention to which their health may be effectually preserved. 1. Abstain from all excess in spirituous liquors. 2. Avoid with the utmost care the evening dews, or wetting of the feet on the approach of night; as fatal sore throats not unfrequently arise from this source. Should the feet, however, have been wetted by any accident, let the whole body be speedily immersed into cold water. 3. Bathe every morning in the sea, or, if possible,

possible, in sea-water; but, where that cannot be procured, dissolve an ounce of salt in a basin of water, and wash the skin with the solution, after which put on the clothes without drying the skin. This operation strengthens the muscular fibres, and covers the skin with a kind of saline crust, which, in the opinion of Dr. Hales, effectually prevents all febrile infections. With these precautions, he asserts, a person of a sound constitution may enjoy as good a state of health in the hottest as in the most temperate climates.

HEARING, a sensation, whereby, from a due motion impressed on the fibrillæ of the auditory nerve, and communicated thence to the sensory, the mind perceives and gets the idea of sounds. See **ANATOMY** and **ACOUSTICS**.

HEART, [*heort*, Sax. *hertz*, German,] the muscle which by its contraction and dilatation propels the blood through the course of circulation, and is therefore considered as the source of vital motion. See **ANATOMY**.

HEART, EXPERIMENTS TO ASCERTAIN THE FORCE OF THE BLOOD IN THE. Physiologists and Anatomists have from time to time attempted to make estimates of the force of the blood in the heart and arteries; but have differed as widely from each other, as they have from the truth, for want of sufficient data. This set the ingenious Dr. Hales upon making proper experiments, to ascertain the force of the blood in the veins and arteries of several animals. If, according to Dr. Keil's estimate, the left ventricle of a man's heart throws out in each systole an ounce or 1.638 cubic inches of blood, and the area of the orifice of the aorta be = 0.4187, then dividing the former by this, the quotient 3.9 is the length of the cylinder of blood which is formed in passing through the aorta in each systole of the ventricle; and in the 75

pulses of a minute, a cylinder of 292.5 inches in length will pass: this is at the rate of 1462 feet in an hour. But the systole of the heart being performed in one-third of this time, the velocity of the blood in that instant will be thrice as much, viz. at the rate of 4386 feet in an hour, or 73 feet in a minute. And if the ventricle throws out one ounce in a pulse, then in the 75 pulses of a minute, the quantity of blood will be equal to 4.4 pounds 11 ounces, and, in 34 minutes, a quantity equal to a middle-sized man, viz. 158 pounds will pass through the heart. But if, with Dr. Harvey and Dr. Lower, we suppose 2 ounces of blood, that is, 3.276 cubic inches, to be thrown out at each systole of the ventricle, then the velocity of the blood in entering the orifice of the aorta will be double the former, viz. at the rate of 146 feet in a minute, and a quantity of blood equal to the weight of a man's body will pass in half the time, viz. 17 minutes. If we suppose, what is probable, that the blood will rise $7 + \frac{1}{2}$ feet high in a tube fixed to the carotid artery of a man, and that the inward area of the left ventricle of his heart is equal to 15 square inches, these, multiplied into $7 + \frac{1}{2}$ feet, give 1350 cubic inches of blood, which presses on that ventricle, when it first begins to contract a weight equal to 15.5 pounds. What Dr. Hales thus calculated from supposition, with regard to mankind; he actually experimented upon horses, dogs, fallow-does, &c. by fixing tubes in orifices opened in their veins and arteries; by observing the several heights to which the blood rose in these tubes as they lay on the ground; and by measuring the capacities of the ventricles of the heart and orifices of the arteries. And, that the reader may the more readily compare the said estimates together, he has given a table of them, ranged in the following order:

HEART, TABLE OF THE VELOCITY, &c. OF THE BLOOD IN THE, OF DIFFERENT ANIMALS.

The several animals.	Weight of each.	Height of the blood in the tube from the jugular vein.	Height of the blood in tubes fixed to arteries.	Capacity of the left ventricle of the heart.	Area of the orifice of the aorta.	Velocity of the blood in the aorta.	Quantities of blood equal to the weight of the animal, in what time.	How much in a minute.	Weight of the blood sustained in the left ventricle contracting.	N° of pulses in a minute.	Area of transverse section of descending aorta.	Area of the transverse section of ascending aorta.
	Pounds.	Inches.	Feet. Inches.	Cubic inches.	Square inches.	Feet and inches in a minute.	Minutes.	Pounds.	Pounds.		Square inches.	Square inches.
Man	160	On straining.	7 6	1.659	0.4187	56.65	34.18	8.32	51.5	75		
Horse 1st			8 3	4.318		113.3	17.5	9.36				
2d			9 8									
3d	825	12 52	9 6	10	1.036	86.85	60	13.75	113.22	86	0.677	0.369
Ox	1600			12.5	1.539	76.95	88	18.14		38	0.912	0.84
Sheep	91	5½ 9	6 5½	1.85	0.172	174.5	20	4.593	36.56	65	0.094	0.07
Doe			4 2	9	0.476						0.383	0.246
Dog 1st	52	0 6	6 8	1.172	0.196	144.7	11.9	4.34	33.61	97	0.106	0.041
2d	24	5 7	2 8	1	0.185	130.9	6.48	3.7			0.102	0.031
3d	18	5	4 8	0.633	0.118	130	7.8	2.3	19.8		0.07	0.022
4th	12½	4	3 3	0.5	0.101	120	6.7	1.85	11.1		0.061	0.015

HEARTH-MONEY, or CHIMNEY-MONEY, a duty to the crown on houses. By stat. 14. Char. II. cap. 2, every fire-hearth, and stove of every dwelling or other house, within England and Wales (except such as pay not to church and poor), was chargeable with 2s. per annum, payable at Michaelmas and Lady-day to the king and his heirs and successors, &c. This tax, being much complained of as burdensome to the people, has been since taken off, and others imposed in its stead; among which that on windows has by some been esteemed almost equally grievous.

HEART'S-EASE. See VIOLA.

HEART-SEED. See CARDIOSPERMUM.

HEAT, [*heat, hat*, Saxon; *heete*, Danish,] in physiology, has a double meaning; being put either for that peculiar sensation which is felt on the approach of burning bodies, or for the cause of that sensation; in which last sense it is synonymous with fire, or that substance now called caloric. See CALORIC, CHEMISTRY, COMBUSTION, and ELECTRICITY.

HEAT, INTERNAL, OF THE EARTH. That there is a very considerable degree of heat always felt in digging to great depths in the earth, is agreed upon by all naturalists: but the quantity of this heat hath seldom been measured in any part; nor is it known whether in digging to an equal depth in different parts of the earth, the heat is found always the same. In digging mines, wells, &c. they find that at a little depth below the surface it is cold. A little lower it is colder still, as being beyond any immediate influence of the sun's rays; inasmuch that water will freeze almost at any season of the year: but when we go to the depth of 40 or 50 feet, it begins to grow warm, so that no ice can bear it; and then the deeper we go, still the greater the heat, until at last respiration grows difficult, and the candles go out. This heat of the earth has been variously explained. Some suppose an immense body of fire lodged in the centre of the earth, which they consider as a central sun, and the great principle of the generation, vegetation, nutrition, &c. of fossil and vegetable bodies. But Mr. Boyle, who had been at the bottom of some mines himself, suspects that this degree of heat, at least in some of them, may arise from the peculiar nature of the minerals generated therein. In proof of this, he instances a mineral of a vitriolic kind, dug up in large quantities in many parts of England, which by the bare effusion of common water will grow so hot, that it will almost take fire.

HEAT, NOXIOUS EFFECTS OF IMMODERATE. Great heats are rather the remote, than the immediate cause of epidemical diseases, by relaxing the fibres, and disposing the juices to putrefaction; especially among soldiers and persons exposed the whole day to the sun; for the greatest heats are seldom found to produce epidemical diseases, till the perspiration is stopped by wet clothes, fogs, dews, damps, &c. and then some bilious or putrid distemper is the certain consequence, as fluxes and ardent intermitting fevers. Sometimes, however, heats have been so great as to prove the more immediate cause of particular disorders; as when centinels have been placed without cover or frequent reliefs in scorching heats; or when people imprudently lie down and sleep in the sun. All these circumstances are apt to bring on distempers, varying according to the season of the year. In the beginning of summer, they produce inflammatory fevers; and in autumn, remitting fevers or dysenteries. To prevent, therefore, the effects of immoderate heats, commanders have found it expedient so to order the marches, that the men come to their ground before the heat of the day; and to give strict orders, that none of them sleep out of their tents, which, in fixed encampments, may be covered with boughs to shade them from the sun. It is likewise a rule of great importance to have the soldiers exercised before the cool of the morning is over; as thus not only the sultry heats are avoided, but the blood being cooled, and the fibres braced, the body will be better prepared to bear the heat of the day. Lastly, in very hot weather, it has often been found proper to shorten the centinel's duty, when obliged to stand in the sun.

HEAT OF ANIMALS. Of the natural heat of animals, there are various degrees; some preserving a heat of 100° or more in all the different temperatures of the atmosphere; others keeping only a few degrees warmer than the medium which surrounds them; and in some of the more imperfect animals, the heat is scarcely one degree above that of the air or water in which they live. The phenomenon of animal heat has, from the earliest ages, been the subject of philosophical discussion; and many hypotheses have

been framed to account for it. According to Dr. Crawford, who has made accurate experiments on this subject, the blood which circulates through the lungs absorbs oxygen in the act of respiration, by means of which a portion of the carbon which it contains is acidified and carried off in the elastic state. After this, and perhaps other changes, the fluid passes through the arteries to the extreme vessels, depositing in some manner the elementary parts or principles of animal matter during the act of nutrition, in which state of still further change the blood returns by the veins, and again passes through the course of circulation. From his experiments on the capacities of arterial and venous blood, Dr. Crawford found the capacity of the former for heat to be 1.030, and that of the latter only 0.892, whence he concludes, that though heat must be given out in consequence of the diminished capacity of the combined oxygen absorbed by respiration, yet the increased capacity of the arterial blood will prevent its becoming sensible immediately in the lungs; instead of which, it will be given out at the smaller ramifications where the blood becomes changed in its nature, and in its capacity for heat by its conversion to the venous state. It has also been established by the experiments of the same philosopher, that the process of absorption of oxygen is less in a higher than in a low temperature; the difference between the arterial and venous blood being at the same time less, and consequently the augmentation of temperature in the animal less considerable. This law of the animal economy, assisted by the increased evaporation, and by the slow conducting power of an animal body, and perhaps by the permanency of the enlarged capacity, seems sufficient to account for the power which animals possess of maintaining their natural temperature without any remarkable change in an atmosphere greatly heated, as was shewn in the experiments of Fordyce and Blagden. (See Philos. Trans. 1775.) However this subject will admit of farther consideration and investigation.

HEAT OF THE ATMOSPHERE. The mercury seldom falls under 16° in Fahrenheit's thermometer; but we are apt to reckon it very cold at 24°, and it continues cold to 40° and a little above. However, such colds have been often known as bring it down to 0° the beginning of the scale, or nearly the cold produced by a mixture of snow and salt, often near it, and in some places below it. Thus, the degree of the thermometer has been observed at various times and places as follows:

Places.	Lat.	Year.	Therm.
Pennsylvania	40° 0'	1732	5°
Paris	48 50	1709 & 1710	8
Leyden	52 8½	1729	5
Utrecht	52 5	—	4
London	51 31	1709 & 1710	0
Copenhagen	55 41½	1709	0
Upsal	59 51½	1732	-1
Petersburg	59 56	—	-28
Torneo	65 50½	1736-7	-33
Hudson's Bay	52 24	1775	-37

The middle temperature of our atmosphere is about 48° being nearly a medium of all the seasons. The French make it somewhat higher; reckoning it equal to the cave of their national observatory, or 53°. In cold countries, the air is found agreeable enough to the inhabitants while it is between 40 and 50°. In our climate we are best pleased with the heat of the air from 50 to 60°; while in the hot countries the air is generally at a medium about 70°. With us, the air is not reckoned warm till it arrives at about 64°, and it is very warm and sultry at 80°. It is to be noted, that the foregoing observations are to be understood of the state of the air in the shade; for as to the heat of bodies acted upon by the direct rays of the sun it is much greater: thus, Dr. Martine found dry earth heated to above 120°; but Dr. Hales found a very hot sun-shine heat in 1727 to be about 140°; and Musschenbroeck once observed it so high as 150; but at Montpellier the sun was so very hot, on one day in 1705, as to raise M. Amontons's thermometer to the mark of boiling water itself, which is 212°. The diversity in the heat of different climes and seasons arises from the different angles under which the sun's rays strike upon the surface of the earth. In the Phil. Trans. Abr. vol. 2. p. 165, Dr. Halley has given a computation of this heat, on the principle, that the simple action of the sun's rays, like other impulses or strokes, is more or less

less forcible, according to the sines of the angles of incidence, or to the sines of the sun's altitudes, at different times or places. Hence it follows, that, the time of continuance, or the sun's shining on any place, being taken for a basis, and the sines of the sun's altitudes perpendicularly erected upon it, and a curve-line drawn through the extremities of those perpendiculars, the area thus comprehended will be proportional to the collection of all the heat of the sun's beams in that space of time. Hence it likewise follows, that, at the pole, the collection of all the heat of a tropical day, is proportional to the rectangle or product of the sine of $23\frac{1}{2}$ degrees in 24 hours, or the circumference of a circle, or as $\frac{1}{2}$ into 12 hours, the sine of $23\frac{1}{2}$ degrees being nearly $\frac{1}{2}$ of radius. Or the polar heat will be equal to that of the sun continuing 12 hours above the horizon at 53 degrees height: and the sun is not five hours more elevated than this under the equinoctial. But as it is the nature of heat to remain in the subject, after the luminary is removed, and particularly in the air, under the equinoctial the 12 hours absence of the sun abates but little from the effect of his heat in the day; but under the pole the long absence of the sun for six months has so chilled the air, that it is in a manner frozen; and after the sun has risen upon the pole again, it is long before his beams can make any impression, being obstructed by thick clouds and fogs. From the foregoing principle Dr. Halley computes the following table, exhibiting the heat to every 10th degree of latitude, for the equinoctial and tropical sun, and from which an estimate may easily be made for the intermediate degrees.

Lat.	Sign that the sun is in.		
	γ or Δ	Θ	Ψ
0	20000	18341	18341
10	19696	20290	15834
20	18794	21737	13166
30	17321	22651	10124
40	15321	23048	6944
50	12855	22991	3798
60	10000	22773	1075
70	6840	23543	0
80	3473	24673	0
90	0	25055	0

From the same principles, and table, also he deduced the following corollaries, viz. 1. That the equatoreal heat, when the sun becomes vertical, is as twice the square of the radius. 2. That, at the equator, the heat is as the sine of the sun's declination. 3. That, in the frigid zones, when the sun sets not, the heat is as the circumference of a circle into the sine of the altitude at 6: and consequently that, in the same latitude, these aggregates of heat are as the sines of the sun's declination; and at the same declination of the sun, they are as the sines of the latitudes; and generally they are as the sines of the latitudes into the sines of declination. 4. That the equatoreal day's heat is everywhere the same as the cosine of the latitude. 5. In all places where the sun sets, the difference between the summer and winter heats, when the declinations are contrary, is equal to a circle into the sine of the altitude at 6, in the summer-parallel; and consequently those differences are as the rectangles of the sines of the latitude and declination. 6. The tropical sun has the least force of any at the equator; and at the pole it is greatest of all. Against this theory some object, that the effect of the sun's heat is not in the simple, but in the duplicate ratio of the sines of the angles of incidence; like the law of the impulse of fluids. And indeed, the quantity of the sun's direct rays received at any place, being evidently as the sine of the angle of incidence, or of the sun's altitude, if the heat be also proportional to the force with which a ray strikes, like a mechanical action or impulse of any body, then it will follow that the heat must be in the compound ratio of both, that is, as the square of the sine of the sun's altitude. But this last principle is here only assumed gratis, as we do not know a priori that the heat is proportional to the force of a striking body; and it is only experiment that can determine this point. It is certain, that heat communicated by the sun to bodies on the earth depends also much upon other circumstances beside the direct force of his rays. These must be modified by our atmosphere, and variously reflected and combined by the action of the earth's surface itself, to produce any remarkable effects

of heat. So that if it were not for these additional circumstances, it is probable, the naked heat of the sun would not be very sensible. Dr. Halley himself allowed, that many other circumstances, besides the direct force of the sun's rays, contributed to augment or diminish the effect of this, and the heat resulting from it, in different climates. No calculation, therefore, formed on the preceding theory, can be supposed to correspond exactly with observation and experiment. It has also been objected, that, according to the foregoing theory, the greatest heat in the same place should be at the summer-solstice, and the most extreme cold at the winter-solstice; which is contrary to experience. To this objection it may be replied, that heat is not produced in bodies by the sun instantaneously, nor do the effects of his heat cease immediately when his rays are withdrawn; and therefore those parts which are once heated, retain the heat for some time; which, with the additional heat daily imparted, makes it continue to increase, though the sun declines from us: and this is the reason why July is hotter than June, although the sun has withdrawn from the summer-tropic; as we also find it is generally hotter at 1, 2, or 3, P. M. when the sun has declined towards the west, than at noon, when he is on the meridian. As long as the heating particles, which are constantly received, are more numerous than those which fly away or lose their force, the heat of bodies must continually increase. So, after the sun has left the tropic, the number of particles, which heat our atmosphere and earth, constantly increases, because we receive more in the day than we lose at night, and therefore our heat must also increase. But as the days decrease, and the action of the sun becomes weaker, more particles will fly off in the night than are received in the day, by which means the earth and air will gradually cool. Farther, those places which are well cooled, require time to be heated again; and therefore January is mostly colder than December, although the sun has withdrawn from the winter-tropic, and begun to emit his rays more perpendicularly upon us. But the chief cause of the difference between the heat of summer and winter is, that in summer the rays fall more perpendicularly, and pass through a less dense part of the atmosphere; and therefore with greater force, or at least in greater number in the same place; and besides, by their long continuance, a much greater degree of heat is imparted by day than can fly off by night. For the calculations and opinions of several other philosophers on this head, see Keill's Astron. lect. 8; Ferguson's Astron. ch. 10; Long's Astron. 777; Acad. Scienc. 1719.

HEATH, in botany. See ERICA.

HEATH, BERRY-BEARING. See EMPETRUM.

HEATH, MOUNTAIN. See SAXIFRAGA.

HEATHENS. See PAGANS.

HEAVING, in the sea-language, signifies throwing any thing over-board. Also turning about the capstan, is called heaving at the capstan. Likewise, when a ship being at anchor rises and falls by the force of the waves, she is said to heave and set.

HEAVE THE LOG, See LOG, and NAVIGATION.

HEAVEN, [*heofon*, which seems to be derived from *heofd*, the places over the head, Saxon.] Among Christian divines and philosophers, is considered as a place in some remote part of infinite space, in which the omnipresent Deity affords a nearer and more immediate view of himself, and a more sensible manifestation of his glory, than in the other parts of the universe. This is often called the empyrean heaven, from that splendor with which it is supposed to be invested; and of this place the inspired writers give us the most noble and magnificent descriptions.

HEAVEN, among Pagans, was considered as the residence only of the celestial gods, into which mortals were not admitted after death, unless they were deified. As for the souls of good men, they were consigned to the Elysian fields. See ELYSIUM.

HEAVEN, in astronomy called also aethereal and starry heaven, is that immense region wherein the stars, planets, and comets, are disposed. See ASTRONOMY. This is what Moses calls the firmament, speaking of it as the work of the second day's creation; at least it is thus the word *רקיע* is usually rendered by his interpreters; though somewhat abusively, to countenance their own notion of the heavens being firm or solid. But the word properly signifies no more than expanse or extension; a term very well adapted by the prophet to the impression which the heavens make on our senses; whence, in other parts of scripture, the heaven is compared to a curtain, or a tent stretched out to dwell in. The LXX.

first added to this idea of expansion that of firm or solid; rendering it by *ερεβωλας*, according to the philosophy of those times; in which they have been very injudiciously followed by the modern translators. Des Cartes, Kircher, &c. demonstrated this heaven not to be solid, but fluid; but they still supposed it full, or perfectly dense, without any vacuity, and cantoned out into many vortices. But others have overturned not only the solidity, but the supposed plenitude, of the heavens. Sir Isaac Newton has abundantly shewn the heavens void of almost all resistance, and, consequently, of almost all matter: this he proves from the phenomena of the celestial bodies; from the planets persisting in their motions without any sensible diminution of their velocity; and the comets freely passing in all directions towards all parts of the heavens. Heaven, taken in a general sense, for the whole expanse between our earth and the remotest regions of the fixed stars, may be divided into two very unequal parts, according to the matter found therein; viz. the atmosphere, or aerial heaven, possessed by air; and the æthereal heaven, possessed by a thin, unresisting medium, called æther.

HEAVEN is also used, in astronomy, for an orb, or circular region, of the æthereal heaven. The ancient astronomers supposed as many different heavens as they observed motions therein. These they supposed all to be solid, as thinking they could not otherwise sustain the bodies fixed in them; and spherical, that being the most proper form for motion. Thus they had seven heavens for the seven planets; viz. the heavens of the moon, Mercury, Venus, the Sun, Mars, Jupiter, and Saturn. The 8th was for the fixed stars, which they called the firmament. Ptolemy adds a 9th heaven, which he called the primum mobile. Two crystalline heavens were added by king Alphonsus X. &c. to account for some irregularities in the motions of the other heavens: and lastly, an empyrean heaven was drawn over the whole, for the residence of the Deity; which made the number twelve. But others admitted many more heavens according as their different views and hypotheses required. Eudoxus supposed 23, Calippus 30, Regiomontanus 33, Aristotle 47, and Fracastor no less than 70. The astronomers, however, did not much concern themselves whether the heavens they thus allowed of were real or not; provided they served a purpose in accounting for any of the celestial motions, and agreed with the phenomena.

HEBDOMAD, [*hebdomas*, Latin,] a work; a space of seven days.

HEBDOMADARY, HEBDOMADARIUS, or HEBDOMADIUS, [from *εβδομας*, Gr. seven,] a member of a chapter or convent, whose week it is to officiate in the choir, to rehearse the anthems and prayers, and to perform the usual functions which the superiors perform at solemn feasts, and other extraordinary occasions.

HEBDOMAGENES, [from *επτα*, seven, and *γεννησις*, birth,] a title of Apollo, so named from his being born on the 7th day of the month; whence the 7th days were held sacred to him. See **HEBDEME**.

HEBDOMARIUS, or HEBDOMARY. See the article **HEBDOMADARY**.

HEBDOME, [*εβδομας*, Gr. the seventh day,] a solemnity of the ancient Greeks, in honour of Apollo, in which the Athenians sung hymns to his praise, and carried in their hands branches of laurel. It was observed on the seventh day of every lunar month.

HEBE, in ancient mythology, a goddess, the idea of whom, among the Romans, seems to have been that of eternal youth, or immortality of bliss. She is fabled to have been a daughter of Jupiter and Juno. According to some she was the daughter of Juno only, who conceived her after eating lettuce. She was fair, and always in the bloom of youth, being the goddess of youth, and made by her mother cup-bearer to the gods.

HEBENSTRETIA, in botany, a genus of the angiospermia order and didynamia class of plants; natural order, Aggregata. Calyx emarginated, divided below; corolla unilabiate; the lip rising upwards, and quadrifid; capsule dispermonous; stamina inserted into the margin of the limb of the corolla. It has six species, natives of the Cape.

HEBREW LANGUAGE, ANCIENT, is the language spoken by the ancient Hebrews, and wherein the Old Testament is written. This appears to be the most ancient of all the lan-

guages in the world, at least we know of none older; and some learned men are of opinion, that this is the language in which God spoke to Adam in Paradise. Dr. Sharpe adopts the opinion, that the Hebrew was the original language; not indeed that the Hebrew is the unvaried language of our first parents, but that it was the general language of men at the dispersion; and however it might have been improved and altered from the first speech of our first parents, it was the original of all the languages, or almost all the languages, and dialects, that have since arisen in the world. See **PHILOLOGY**. The books of the Old Testament are the only pieces to be found, in all antiquity, written in pure Hebrew; and the language of many of these is extremely sublime: it appears perfectly regular, and particularly so in its conjugations. Indeed, properly speaking, it has but one conjugation; but this is varied in each seven or eight different ways, which has the effect of so many different conjugations, and affords a great variety of expressions, to represent by a single word, the different modifications of a verb, and many ideas, which in the modern, and in many of the ancient and learned languages, cannot be expressed without a periphrasis. The primitive words, which are called roots, have seldom more than three letters or two syllables. In this language there are 22 letters, five of which are vowels, viz. *Aleph*, *He*, *Jod*, *Ain* or *Oin*, and *Vau*, answering to our *a*, *e*, *i*, *o*, and *u*; but then each vowel is divided into two, a long and a short, the sound of the former being somewhat grave and long, and that of the latter short and acute. And the two last vowels have sounds that differ in other respects, besides quantity and a greater or less elevation. To those 10 or 12 vowels may be added others, called semi-vowels, which connect the consonants, and make the easier transitions from one to another. The number of accents in this language is indeed prodigious: of these there are near 40, the use of some of which, notwithstanding all the inquiries of the learned, are not yet perfectly known. We know, in general, that they serve to distinguish the sentences, like the points called commas, semicolons, &c. in our language; to determine the quantity of the syllables; and to mark the tone with which they are to be spoken or sung. It is no wonder, then, that there are more accents in the Hebrew than in other languages, since they perform the office of three different things, which in other languages are called by different names. As we have no Hebrew but what is contained in the Scripture, that language to us wants many words; not only because, in those primitive times, the languages were not so copious as at present; but also on this account, that the inspired writers had no occasion to mention many of the terms that might be in the language. The Chaldee, Syriac, Ethiopic, &c. languages, are by some held to be only dialects of the Hebrew; as the French, Italian, Spanish, &c. are dialects of the Latin. It has been supposed by many very learned men, that the Hebrew letters were often used hieroglyphically, and that each had its several distinct sense understood as a hieroglyphic. Neuman, who seems to have taken vast pains to find out this secret meaning of these letters, gives the following explication: *aleph*, he says, is a character denoting motion, readiness, and activity; *beth* signifies, 1. Matter, body, substance, thing; 2. Place, space, or capacity; and, 3. In, within, or contained: *gimel* stands for flexion, bending or obliquity of any kind: *daleth* signifies any protrusion made from without, or any protrusion of any kind: *he* stands for presence, or demonstrative essence of any thing: *vau* stands for copulation or growing together of things: *daain* expresses vehement protrusion and violent compression, such as is occasioned by at once violently discharging and constringing a thing together; it also signifies sometimes the straitening of any figure into a narrow point at the end: *cheth* expresses association, society, or any kind of composition or combination of things together: *teth* stands for the withdrawing, drawing back, or recess, of any thing: *jod* signifies extension and length, whether in matter or in time: *caph* expresses a turning, curvedness, or concavity: *lamed* stands for an addition, access, impulse, or adversation, and sometimes for pressure: *mem* expresses amplitude, or the amplifying of any thing in whatever sense; in regard to continue qualities, it signifies the adding of length, breadth, and circumference; and in distinct qualities it signifies multitude: *nun* signifies the propagation of one thing from another, or of the same thing from one person to another: *samech* expresses cincture and coarctation: *guain* stands for observation, objection, or obviation: *pe* stands for a crookedness or an angle of

of any figure: **tsade** expresses contiguity and close succession: **koph** expresses a circuit or ambit: **resh** expresses the egress of any thing, as also the exterior part of a thing, and the extremity or end of any thing: **shin** signifies the number three, or the third degree, or the utmost perfection of any thing: **tau** expresses a sequel, continuation, succession, of any thing. According to this explication, as the several particular letters of the Hebrew alphabet separately signify the ideas of motion, matter, space, and several modifications of matter, space, and motion, it follows, that a language, the words of which are composed of such expressive characters, must necessarily be of all languages the most perfect and expressive, as the words formed of such letters, according to their determinate separate signification, must convey the idea of all the matters contained in the sense of the several characters, and be at once a name and a definition, or succinct description of the subject, and all things material as well as spiritual, all objects in the natural and moral world, must be known as soon as their names are known, and their separate letters considered. Urim and Thummim are thus easily explained, and found, perhaps the most apposite and expressive words that were ever formed. See that article.

HEBREW LANGUAGE, RABBINICAL, or the MODERN HEBREW, is the language used by the rabbins in their writings. The basis or body hereof is the Hebrew and Chaldee, with divers alterations in the words of these two languages, the meanings whereof they have considerably enlarged and extended. Abundance of things they have borrowed from the Arabic: the rest is chiefly composed of words and expressions from the Greek; some from the Latin: and others from the other modern tongues; particularly that spoken in the place where each rabbin lived or wrote. The rabbinical Hebrew must be allowed to be a very copious language. M. Simon, in his Hist. Crit. du Vieux Testam. liv. iii. ch. 27, observes, that there is scarce any art or science but the rabbins have treated thereof in it. They have translated most of the ancient philosophers, mathematicians, astronomers, and physicians; and have written themselves on most subjects: they do not want even orators and poets. This language, notwithstanding it is so crowded with foreign words, has many beauties in the works of those who have written well in it.

HEBREW BIBLE. See BIBLE.

HEBREWS, or EPISTLE TO THE HEBREWS, a canonical book of the New Testament. Though St. Paul did not prefix his name to this epistle, the concurrent testimony of the best authors, ancient and modern, afford such evidence of his being the author of it, that the objections to the contrary are of little or no weight. His mentioning himself in it, as lately a prisoner in Italy, and his promise to visit the Hebrews, together with Timothy, who had been released from imprisonment, both denote the writer, and the time of his writing this epistle, that it was just after the deliverance of St. Paul from his first trial at Rome. The Hebrews, to whom this epistle was written, were the believing Jews of Palestine, and its design was to convince them, and, by their means, all the Jewish converts, wheresoever dispersed, of the insufficiency and abolishment of the ceremonial and ritual law. In order to which he undertakes to shew, first, the superior excellency of Christ's person above that of Moses: secondly, the superiority of Christ's priesthood above the Levitical: thirdly, the mere figurative nature, and utter insufficiency of the legal ceremonies and sacrifices: and, fourthly, that to forsake the Mosaic law, was not, as the Jews boldly asserted, to apostatize from God, but was their indispensable duty and obligation. These particulars are intermixed with proper inferences and exhortations, all tending to shew the Jewish Christians the unreasonableness, folly, and danger, of relapsing into Judaism.

HEBRIDES, ÆBUDÆ, or WESTERN ISLANDS, the general name of some islands, lying to the N. W. of Scotland, of which kingdom they constitute a part. They are situated between 55° and 59° lat. N. are supposed to be about 300 in number, and to contain 48,000 inhabitants. The principal are Skye, Mull, Ilay, Arran, St. Kilda, N. and S. Uist, Cannay, Staffa, Jura, Lewis, and Harris. See these articles.

HEBRIDES, New, a cluster of islands in the Pacific Ocean, so named by Captain Cook, who explored the whole cluster, and, besides ascertaining the extent and situation of these islands, added the knowledge of several others. They extend 375 miles, from N. N. W. to S. S. E. The natives are civil and hospitable; of a

slender make, and dark colour, and have mostly frizzled hair. The productions are cocoa-nuts, bread-fruit, plantains, sugar-canes, yams, &c. The whole cluster consists of the following islands; some of which have received names from the different European navigators, others retain the names which they bear among the natives: viz. Tierra del Espiritu Santo, Mallicollo, St. Bartholomew, Isle of Lepers, Aurora, Whitsuntide, Ambrym, Immer, Apce, Three Hills, Sandwich, Montagu, Hinchinbrook, Shepherd, Erromanga, Erromon, Anaton, and Tanna. They are situated between 160° 40' and 170° 21' Lon. E. and between 14° 25' and 20° 4' Lat. S.

HEBRON, in ancient geography, a city seated in the hilly country of the tribe of Judah to the south. Its more ancient name was Kirjath-Arba, or Cariath-Arba. In antiquity it vied with the more ancient cities of Egypt, being seven years prior to Zoan, translated Tanis by the LXX. Josephus makes it not only older than Tanis, but even than Memphis. Hebron is twenty-one miles S. of Bethlehem, and twenty-four S. W. of Jerusalem.

HEBRUS, in ancient geography, the largest river of Thrace, which rises from mount Scombrus, and falls by two mouths into the Ægean Sea.

HEBUDÆ, HEBUDES, or ÆBUDÆ, in ancient geography, islands on the W. of Scotland, now called the Western Isles, and Hebrides.

HECATEA, [*Ἑκάτα*], in antiquity, statues erected to the goddess Hecate, who, the Athenians believed, was the overseer of their families, and the protectress of their children.

HECATE, in the mythology, a name of Diana. She was called Luna in heaven, Diana on earth, and Hecate or Proserpine in hell; whence her name of Diva Triformis, Tergemina, Triceps. She was supposed to preside over enchantments. She was generally represented like a woman, with the head of a horse, a dog, or a boar; and sometimes she appeared with three different bodies, and three faces, with one neck.

HECATE, in fabulous history, a queen of Taurica Chersonesus, daughter of Peres and Asteria, who poisoned her father.

HECATESIA, [*Ἑκατεσία*], in antiquity, an annual solemnity observed by the Stratonicensians, in honour of Hecate.

HECATOMB, in antiquity, was a sacrifice of 100 beasts of the same kind, at 100 altars, and by 100 priests or sacrificers. The Greek word, *ἑκατόμῃ*, properly signifies a magnificent sacrifice. Others derive it from the Greek *ἑκατόν*, a hundred, and *βῆς*, a bullock; others from *ἑκατόν* and *πῆς*, a foot; on which principle they hold, that the hecatomb might consist of only twenty-five four-footed beasts; and that it did not matter what kind of beasts were chosen for victims, provided there were but 100 feet. Pythagoras is said to have sacrificed a hecatomb to the Muses of 100 oxen, in gratitude for discovering the demonstration of the forty-seventh proposition of Euclid. Strabo relates that there were 100 cities in Laconia, and that each city used to sacrifice a bullock every year for the common safety of the country; whence the institution of hecatombs. Others refer the origin of hecatombs to a plague, wherewith the 100 cities of Peloponnesus were afflicted; for the removal whereof, they jointly contributed to do so splendid a sacrifice.

HECATOMBAEON, [*Ἑκατομβαιών*], in chronology, the first month of the Athenian year. It consisted of thirty days, and began on the first new moon after the summer-solstice; answering to the latter part of June and beginning of July. The Boeotians called it Hippodromus, and the Macedonians Loüs, (*Λοῦς*, or *Λοῦς*). See MONTH. The word is derived from the Greek *ἑκατόμῃ*, a hecatomb, because of the great number of hecatombs sacrificed in it.

HECATOMPOLIS, a surname of Crete, from its 100 cities.

HECKLE See FLAX-DRESSING, and HATCHEL.

HECLA, a volcano of Iceland, and one of the most furious in the world. See ICELAND. It was visited in 1772 by Dr. Van Troil, a Swedish gentleman, along with Mr. (now Sir Joseph) Banks, Dr. Solander, and Dr. James Lind of Edinburgh. On their first landing they found a tract of land sixty or seventy miles in extent entirely ruined by lava, which appeared to have been in the highest state of liquefaction. Having undertaken a journey to the top of the mountain, they travelled from 300 to 360 English miles over an uninterrupted tract of lava; and had at length the pleasure of being the first who had arrived at the summit of the mountain. Hecla, according to their accounts, is situated in the

S. part of the island, about four miles from the sea-coast; and is divided into three parts at the top, the middle-point being the highest. From an exact observation with Ramsden's barometer, it is 5000 feet above the level of the sea. They were obliged to quit their horses at the first opening from which the fire had burst. They describe this as a place with lofty glazed walls and high-glazed cliffs, unlike any thing which they had ever seen before. A little higher up they found a large quantity of grit and stones; and still farther on another opening, which, though not deep, descended lower than that of the highest point. Here they imagined they plainly discerned the effects of boiling water; and not far from thence the mountain was covered with snow, excepting some spots. The reason of this difference they perceived to be the hot vapour ascending from the mountain. As they ascended higher they found the spots become larger: and about 200 yards below the summit, a hole about a yard and an half in diameter was observed, from whence issued so hot a steam, that they could not measure the degree of heat with the thermometer. The mountain seems to be made up, not of lava, but of sand, grit, and ashes; which are thrown up with the stones partly discoloured, and partly melted by the fire. Several sorts of pumice-stones were found on it, among which was one with some sulphur. Sometimes the pumice was so much burnt, that it was as light as tow. Its form and colour were sometimes very fine, but at the same time so soft, that it was difficult to remove it from one place to another. The common lava was found in both large and small pieces; as well as a quantity of black jasper burned at the extremities, and resembling trees and branches.

HECTIC-FEVER. See **MEDICINE.**

HECTOR, the son of Priam and Hecuba, and the father of Astyanax, celebrated for the valour with which he defended the city of Troy against the Greeks. He was killed by Achilles, who dragged his body, fastened to his chariot, thrice round the walls of Troy, and afterwards restored it to Priam for a large ransom.

HECUBA, in fabulous history, the wife of Priam, the last king of Troy, and the mother of nineteen of his fifty-three children. She was the daughter of Dymas, according to Homer, or of Cisseus, according to Virgil. When with child of Paris she dreamed that she brought forth a firebrand.

HE DAMORA, a town of Sweden, in Westmania, on the Dahl, fifty-five miles N.W. of Upsal. Lon. 17. 7. E. Lat. 60. 14. N.

HERERA, *IVY*; in botany, a genus of the monogynia order, and pentandria class of plants; natural order, *Hederaceæ*. Petals five, oblong; berry pentaspermous, girt by the calyx. There are six species.

HERERACEÆ, [from *hedera*, ivy,] the forty-sixth order in Linnæus's fragments of a natural method. See **BOTANY.**

HEDGE, [*hegge*, Sax.] in agriculture, a fence made round grounds with prickly bushes, or woven twigs. Hedges are either planted to make fences round inclosures, or to divide the several parts of a garden. When they are designed as outward fences, they are planted either with hawthorn, crabs, or black-thorn: but those hedges which are planted in gardens, either to surround wilderness-quarters, or to screen the other parts of a garden from sight, are planted according to the fancy of the owner. Some prefer evergreens, in which case the holly is best; next the yew, then the laurel, laurustinus, phyllyrea, &c. Others prefer the beech, the horn-beam, and the elm. Before planting, it is proper to consider the nature of the land, what sort of plants will thrive best in it; and what is the soil from whence they are to be taken. The sets ought to be about the thickness of one's little finger, and cut within about four or five inches of the ground; they ought to be fresh taken up, straight, smooth, and well-rooted. Those plants that are raised in the nursery are to be preferred. In planting outside-hedges, the turf is to be laid, with the grassy side downwards, on that side of the ditch on which the bank is designed to be made; and some of the best mould should be laid upon it to bed the quick, which is set upon it at a foot asunder. When the first row of hawthorn, or quick is set, it must be covered with mould; and when the bank is a foot high, another row of sets may be laid against the spaces of the former, and covered like the others. The bank is then to be topped with the bottom of the ditch, and a dry or dead hedge laid, to shade and defend the under plantation. Stakes should then be driven into the loose earth, so low as to

reach the firm ground: these are to be placed at about two feet and a half distant: to render the edge yet stronger, edder it, that is, bind the top of the stakes with small long poles, and when the eddering is finished, drive the stakes anew. The quick must be kept constantly weeded, and secured from being cropped by cattle; and in February it will be proper to cut it within an inch of the ground, which will cause it to strike root afresh, and help it much in the growth. The crab is frequently planted for edges. Plants raised from the kernels of the small wild-crabs are to be preferred to those raised from the kernels of all sorts of apples without distinction; because the plants of the true small crab never shoot so strong as those of the apples, and may therefore be better kept within the proper compass of a hedge. The black-thorn, or sloe, is often planted for hedges. The best method is, to raise the plants from the stones of the fruit, which should be sown about the middle of January, if the weather permit, in the place where the hedge is intended. When they are kept longer out of the ground, it will be proper to mix them with sand, and keep them in a cool place. The same fence will do for it when sown, as when planted. The holly is sometimes planted for hedges; but where it is exposed, it is very difficult to prevent its being destroyed: otherwise, it is by far the most beautiful plant; and, being an evergreen, affords much better shelter for cattle in winter than any other sort of hedge. See **HUSBANDRY.**

HEDGE-PUMITORY. See **FUMARIA.**

HEDGE-ROG. See **ERINACEUS.**

HEDGE-HYSSOP. See **GRATIOLA.**

HEDGE-MUSTARD. See **ERVISMUM.**

HEDGE-SPARROW. See **MOTACILLA.**

HEDJAS, or **HEDSJAS**, a province of Arabia, bounded on the E. by Nejed; on the S. by Yemen; on the W. by the Arabian Gulph; and on the N. by the desert of Sinai.

HEDWIGIA, a genus of the octandria monogynia class and order. Calyx four-toothed; corolla four-cleft; style none; capsule trilocular; seed a nut. There is one species, a tree of St. Domingo.

HEDYCARYA, a genus of the icosandria order, and diœcia class of plants. Calyx of the male cleft in eight or ten parts; no corolla; antheræ in the bottom of the calyx, four-furrowed, bearded at top. Calyx and corolla of the female as in the male; germs pedicellate; the nuts pedicellate and monospermous. There is one species, a tree of Guiana.

HEDYCREA, a genus of the class and order pentandria monogynia. Calyx one-leaved, hemispherical, five-toothed; corolla none; drupe oval, one-celled; nectary ovate, covered with filices; one-celled; shell hard. There is one species, a tree of Guiana.

HEDYOSMUM, a genus of the class and order monœcia polyandria. The male is an ament with anthers: no corolla, perianth, or filaments; female calyx three-toothed; corolla none; style one, three-cornered; berry three-cornered, one-seeded. There are two species, shrubs of Jamaica.

HEDYOTIS, a genus of the monogynia order, and tetrandria class of plants; natural order, *Stellatæ*. Corolla monopetalous, funnel-shaped; capsule bilocular, polyspermous, inferior. There are eight species, herbs of Ceylon, &c.

HEDYPTIS, a genus of the class and order syngenesia polygamia æqualis. The calyx calyced, with short scales; seeds crowned with the calyces; receptacle naked, hollow-dotted.

HEDYSARUM, **FRENCH HONEY-SUCKLE**; in botany, a genus of the decandria order, and diadelphia class of plants; natural order, *Papilionacæ*. The carina of the corolla is transversely obtuse: the seed-vessel a legumen with monospermous joints. There are ninety species, see **PLATE LXV.**

HEEL. See **ANATOMY.**

HEEL, in the sea-language. If a ship leans on one side, whether she be aground or afloat, then it is said she heels a-starboard or a-port; or that she heels offwards, or to the shore; that is, inclines more to one side than to another.

HEEL OF A HORSE, the lower hinder part of the foot comprehended between the quarters, and opposite to the toe. The heel of a horse should be high and large, and one side of it should not rise higher than the other upon the pastern. See **FARRIERY.**

HEEL OF A HORSEMAN. This being the part that is armed with the spur, the word is used for the spur itself; "This horse understands the heel well." To ride a horse from one heel to another,

other, is to make him go sideways, sometimes to one heel and sometimes to another.

HEGIRA, [formed of *הגירה*, *hagirah*, flight; of *הגר*, to fly,] in chronology, a celebrated epocha among Mohammedans. The event which gave rise to this epocha was the flight of Mohammed from Mecca, with his new proselytes, to avoid the persecution of the Coraischites; who, being then most powerful in the city, could not bear that Mohammed should abolish idolatry, and establish his new religion. This flight happened in the fourteenth year after Mohammed had commenced prophet: he retired to Medina, which he made the place of his residence. To render this epocha more creditable, the Mohammedans affect to use the word *hegira* in a peculiar sense for an act of religion, whereby a man forsakes his country, and gives way to the violence of persecutors and enemies of the faith: they add, that the Coraischites, being then the strongest party in the city, obliged their prophet to fly, as not being able to endure his abolishing of idolatry. This flight was not the first of Mohammed's, but it was the most famous. It happened in the fourteenth year from his assuming the character of prophet and apostle, and promulgating his new religion. The orientals do not agree with us as to the time of the *hegira*. Among the Mohammedans, Amasi fixes it to A. D. 630, and from the death of Moses 2347; and Ben Casseni to A. M. 5804: according to the Greek computation among the Christians, Said Ebn Batrik refers the *hegira* to A. D. 614, and A. M. 6113. Khondemir relates, that it was Omar, the second caliph, that first established the *hegira* as an epocha, and appointed the years to be numbered from it: at the time he made this decree, there were already seven years elapsed. This establishment was made in imitation of the Christians, who, in those times, reckoned their years from the persecution of Dioclesian. But there is another *hegira*, and that earlier too, though of less eminence. Mohammed, in the fourteenth year of his mission, was obliged to relinquish Medina: the Coraischites had all along opposed him very vigorously, as an innovator and disturber of the public peace; and many of his disciples, not enduring to be reputed followers of an impostor, desired leave of him to abandon the city, for fear of being obliged to renounce their religion. This retreat makes the first *hegira*. These two *hegiras* the Mohammedans, in their language, call *hegira-taa*. The years of the *hegira* consist only of 354 days. To reduce these years to the Julian calendar, *i. e.* to find what Julian year a given year of the *hegira* answers to, reduce the year of the *hegira* given into days, by multiplying by 354, divide the product by 365, and from the quotient subtract the intercalations, *i. e.* as many days as there are four years in the quotient; and lastly, to the remainder add 622. For a table of the years of the *hegira* connected with the years of the Christian era, see the article **EPOCH**.

HEIDEGGER, JOHN HENRY, professor of divinity at Zurich, was born in 1633. He published, 1. *Exercitationes Selectæ de Historia sacra Patriarcharum*, 2 vols. 4to. 2. *De Ratione Studiorum Opuscula Aurea*, 12mo. 3. *Tumulus Tridentini Concilii*, 4to. 4. *Historia Papatus*, 4to.

HEIDELBERG, a populous town of Germany, capital of the Lower Palatinate, with a celebrated university. It is noted for its great tun, which holds 800 hogsheads, generally kept full of good Rhenish wine. The town stands on the Neckar, forty-four miles S. S. E. of Mentz.

HEIDENHEIM, a town of Germany, in Suabia. Lon. 10. 19. E. Lat. 48. 37. N.

HEIGHTS, METHODS OF MEASURING. See **BAROMETER**, **MENSURATION**, and **TRIGONOMETRY**.

HEILA, a town of Royal Prussia, in Cassubia, twelve miles N. of Dantzic.

HEILBRONN, an imperial town of Germany, in Suabia, twenty miles N. of Stuttgart, and twenty-six E. of Heidelberg.

HEILEGEN HAVE, a sea-port town of Germany, in Lower Saxony, on the Baltic. Lon. 11. 15. E. Lat. 57. 30. N.

HEILGELAND, an island in the North Sea, belonging to Denmark, nine miles in circumference, with a light-house; thirty-three miles N. W. of the mouth of the Elbe. Lon. 7. 57. E. Lat. 54. 22. N.

HEINECCIUS, JOHN GOTTLIEB, one of the greatest civilians of the eighteenth century, born at Eisenberg, in Altenberg, in 1681. After having studied at Gossar and Leipsic, he became professor of philosophy at Hall in 1710; and in 1721, he was

made professor of civil law, with the title of Counsellor of the Court. His great reputation made the states of Friesland invite him to Franeker in 1724; but in 1727, the king of Prussia prevailed on him to accept of a professorship of law at Frankfort on the Oder, where he distinguished himself till 1733. Becoming again professor at Hall, he remained there till his death, in 1741, though invited to Marburg, Denmark, and Holland. He wrote many works, all of them much esteemed. The principal are, 1. *Antiquitatum Romanarum Jurisprudentiam Illustrantium Syntagma*. This excellent abridgement gave rise to his reputation in foreign countries. 2. *Elementa Juris Civilis*. 3. *Fundamenta Styli Cætoris*; a most useful work for forming a Latin style. 4. *Elementa Philosophiæ Rationalis et Moralis*. 5. *Historia Juris Civilis Romanæ ac Germanicæ*. 6. *Elementa Juris Naturæ et Gentium*, &c.

HEINECKEN, or **HEINETKEN**, CHRISTIAN, an extraordinary child, the prodigy of the North, born at Lubeck in 1721. He spoke his maternal tongue fluently at ten months. At one year old, he knew the principal events of the Pentateuch; in two months more, he was master of the entire history of the Old and New Testaments; at two years and an half, he answered the principal questions in geography, and in ancient and modern history; and he spoke Latin and French with great facility before his fourth year. His constitution was so delicate, that he was not weaned till a few months before his death. M. Martini of Lubeck published a pamphlet in 1730, in which he endeavoured to give natural reasons for the extraordinary capacity of this child, who died in his fifth year.

HEIR, [*heres*, Lat.] in law, signifies the person who succeeds another by descent to lands, tenements, and hereditaments, being an estate of inheritance, or an estate in fee; because nothing passes by right of inheritance but in fee. See **CONSANGUINITY**, **DESCENT**, **INHERITANCE**, **SUCCESSION**, and **LAW**. If land be given to a man for ever, or to him and his assigns for ever, this vests in him but an estate for life. This very great nicety about the insertion of the word *heirs* in all feoffments and grants, in order to vest a fee, is plainly a relic of the feudal strictness, by which it was required, that the form of the donation should be punctually pursued; or that, as Craig expresses it, in the words of Baldus, "*donationes sint stricti juris, ne quis plus, donasse præsumatur quam in donatione expresserit*." And therefore, as the personal abilities of the donee were originally supposed to be the only inducements to the gift, the donee's estate in the land extended only to his own person, and subsisted no longer than his life; unless the donor, by an express provision in the grant, gave it a longer continuance, and extended it also to his heirs. But this rule is now softened by many exceptions. For, 1. It does not tend to devise by will; in which, as they were introduced at the time when the feudal rigour was apace wearing out, a more liberal construction is allowed: and therefore by a devise to a man for ever, or to one and his assigns for ever, or to one in fee-simple, the devisee hath an estate of inheritance; for the intention of the deviser is sufficiently plain from the words of perpetuity annexed, though he hath omitted the legal words of inheritance. But if the devise be to a man and his assigns, without annexing words of perpetuity, there the devisee shall take only an estate for life; for it does not appear that the deviser intended any more. 2. Neither does this rule extend to fines or recoveries, considered as a species of conveyance; for thereby an estate in fee passes by act and operation of law without the word *heirs*; as it does also, for particular reasons, by certain other methods of conveyance, which have relation to a former grant or estate, wherein the word *heirs* was expressed. 3. In creations of nobility by writ, the peer so created hath an inheritance in his title, without expressing the word *heirs*; for they are implied in the creation, unless it be otherwise specially provided; but in creations by patent, which are stricti juris, the word *heirs* must be inserted, otherwise there is no inheritance. 4. In grants of lands to sole corporations and their successors, the word successors supplies the place of heirs; for as heirs take from the ancestor, so doth the successor from the predecessor. Nay, in a grant to a bishop, or other sole spiritual corporation, in frank almoign, the word frank almoign supplies the place of successors (as the word successors supplies the place of heirs), *ex vi termini*; and in all these cases a fee simple vests in such sole corporation. But, in a grant of lands to a corporation aggregate, the word successors is not necessary,

cessary, though usually inserted; for albeit such simple grant be strictly only an estate for life, yet as that corporation never dies, such estate for life is perpetual, or equivalent to a fee simple, and therefore the law allows it to be one. Lastly, in the case of the king, a fee simple will vest in him, without the word heirs or successors in the grant; partly from prerogative royal, and partly from a reason similar to the last, because the king, in judgement of the law, never dies. But the general rule is, that the word heirs is necessary to create an estate of inheritance.

HEIR APPARENT, is a person so called in the lifetime of his ancestors, at whose death he is heir at law.

HEIR PRESUMPTIVE is one who, if the ancestor should die immediately, would, in the present circumstance of things, be his heir; but whose right of inheritance may be defeated by the contingency of some nearer heir being born.

HEIRESS, is a female heir to a person having an estate of inheritance of lands. If there are more than one, they are called co-heiresses, or rather, in legal expression, co-heirs. The offence of stealing an heiress is founded on the statute 3 Hen. VII. c. 2, which enacts, that if a man shall, for lucre, take any woman, being maid, widow, or wife, and having substance either in goods or lands, or being heir-apparent to her ancestor, contrary to her will, and afterwards she be married to such misdoer, or by his consent to another, or defiled; he, his procurers and abettors, and such as knowingly receive such women, shall be deemed principal felons; and by 39 Eliz. c. 9, the benefit of clergy is taken away from principals, procurers, and accessaries before. And it is not material whether a woman so taken contrary to her will, be at last married or defiled with her own consent or not, if she were under the force at the time.

HEIR-LOOMS, are such goods and personal chattels as, contrary to the nature of chattels, shall go by special custom to the heir, along with the inheritance, and not the executor of the last proprietor. Heir-loom comprehends divers implements; as tables, presses, cupboards, and bedsteads.

HEIRSHIP MOVEABLES, in Scotch law, the best of certain kinds of moveables, which the heir of line is intitled to take, besides the heritable estate.

HEISKER, an island of Scotland, 6 miles N. of North Uist.

HEISTERIA, in botany, a genus of the monogynia order, and decandria class of plants; natural order Holoraceæ. Calyx five cleft; petals, five; drupe having a large, coloured calyx. One species, coccinea, a native of Martinico.

HELEN, or **HELENA**, in fabulous history, the daughter of Tyndarus, or according to the poets, of Jupiter and Leda, was married to Menelaus, king of Sparta, but was stolen from him by Theseus, B. C. 1235. She was restored soon after; but carried off again by Paris, which occasioned the famous Trojan war.

HELENA, St. an island in the Atlantic Ocean, belonging to the English East India company. Its greatest length is about eight miles, and its circumference about twenty. It has some high mountains, particularly one called Diana's Peak, which is covered with woods to the very top. Some of the hills bear evident marks of a volcanic origin; and some have huge rocks of lava, and a kind of half-vitrified flags. The island is laid out entirely in gardens and pasturage. Peaches are the only European fruits that thrive here. Cabbages and other greens are devoured by caterpillars; and corn is destroyed by rats. Furze has been of singular advantage to the inhabitants of St. Helena. Before the introduction of that plant, the ground was parched by the intense heat, and all kinds of herbage were shrivelled up. But the furze-bushes, which throve as it were in spite of the sun, preserved a degree of moisture in the ground, which made the grass spring up vigorously, and the country became covered with a rich and beautiful sod. The furze is now used for fuel. The number of inhabitants does not exceed two thousand, including five hundred soldiers, and six hundred slaves. By the India ships, which they supply with refreshments, they are provided with all sorts of necessities; and the company annually order one or two of their ships to touch there in their way to India, to supply them with European goods and provisions. Many of their slaves are employed in catching fish, which are very plentiful; and, by the help of these, together with their poultry, cattle, roots, and salt provisions, they subsist very happily through the year. St. Helena was first discovered by the Portuguese in 1502, on St. Helen's day; whence its name. St. Helena lies

1200 miles W. of Africa, and 1800 E. of South America. Lon. 5. 49. W. Lat. 15. 55. S.

HELENA, St. an island of South Carolina.

HELENium, **BASTARD SUN-FLOWER**; a genus of the polygamia superflua order, and syngenesia class of plants; natural order, Compositæ. Receptacle naked in the middle; under the radius paleaceous; pappus consists of five short awns; calyx simple, multipartite; florets of the radius semitrid. The species are two, natives of America.

HELENUS, in fabulous history, a celebrated soothsayer, son of Priam and Hecuba. He was greatly respected by all the Trojans.

HELEPOLIS, in the ancient art of war, a machine for battering down the walls of a place, the invention of which is ascribed to Demetrius Poliorcetes. Diodorus Siculus says, that each side of the Helepolis was 405 cubits in breadth, and 90 in height; that it had nine stages, and was carried on four strong solid wheels, eight cubits in diameter; that it was armed with large battering rams, and had two roofs capable of supporting them; that in the lower stages there were different sorts of engines for casting stones; and in the middle they had large catapultas for discharging arrows, and smaller ones in those above, with a number of expert men for working all these machines.

HELIACAL, [*heliacque*, Fr, from *ἥλιος*,] in astronomy, is applied to the rising and setting of the stars. A star is said to rise heliacally, when after having been in conjunction with the sun, and on that account invisible, it comes to be at such a distance from him as to be seen in the morning before sun-rising; the sun by his apparent motion, receding from the star towards the east. The heliacal setting is when the sun approaches so near a star as to hide it with his beams, which prevent the fainter light of the star from being perceived; so that the terms apparition and occultation would be more proper than rising and setting.

HELIADES, in mythology, the daughters of Apollo and Clymene, who were so affected with the death of their brother Phæthon, that the gods, in compassion, transformed them into poplars on the banks of the Eridanus. Their names were Phæthusa, Lampetia, and Phœbe.

HELLEA, in Grecian antiquity, the greatest and most frequented court in Athens for the trial of civil affairs. See **HELIASTÆ**.

HELIANTHUS, the **GREAT SUNFLOWER**; a genus of the polygamia frustranea order, and syngenesia class of plants; natural order, Compositæ. Receptacle paleaceous, plane; pappus diphylous; calyx imbricated; scales standing a little out at the tops. There are twelve species, most of which are now common in our gardens, though all of them are natives of America. They are all very hardy, and prosper in almost any soil or situation. They may be propagated either by seeds, or by parting their roots.

HELIASÆ, or **HELIASTES**, in antiquity, the judges of the court Heliæa. They were so called, according to Ulpian, from *ἥλιος*, to assemble in a great number; or, according to others, from *ἥλιος*, the sun, because they held their assemblies in an open place, and from sun-rise to sun-set. They composed the most numerous and important of the Athenian tribunals. Their province was to explain obscure laws, and to give authority to those which had been violated. The Thesmothetæ convoked the assembly of the Heliastæ, which sometimes amounted to a thousand, sometimes to one thousand five hundred, judges. Mr. Blanchard is of opinion, that, to make this number, the Thesmothetæ sometimes summoned those of each tribe who had last quitted the public offices which they had exercised in another court. The assemblies of the Heliastæ were not frequent, as they would have interrupted the jurisdiction of the stated tribunals and the common course of affairs. The Thesmothetæ paid to each member of this assembly, for his attendance, three oboli. Hence Aristophanes terms them the brothers of triobolus. They were fined if they came too late, and if the orators had begun to speak, they were not admitted. They were paid out of the public treasury, and their pay was called *misthos heliasticus*. The judges were bound to the right performance of their duty by a strict and solemn oath.

HELICOID PARABOLA, or the **PARABOLIC SPIRAL**, is a curve arising from the supposition that the common or Apollonian parabola is bent or twisted, till the axis come into the periphery

riphery of a circle, the ordinates still retaining their places and perpendicular positions with respect to the circle, all these lines still remaining in the same plane. Thus the axis of a parabola being bent into the circumference BCDM (Plate XCV. fig. 13), and the ordinates CF, DG, &c. still perpendicular to it, then the parabola itself, passing through the extremities of the ordinates, is twisted into the curve BFG, &c. called the helicoid, or parabolic spiral. Hence all the ordinates CF, DG, &c. tend to the centre of the circle, being perpendicular to the circumference. Also, the equation of the curve remains the same as when it was a parabola, viz. putting x = any circular absciss BC, and y = CF, the corresponding ordinate, then is $px = y^2$, where p is the parameter of the parabola.

HELICON, in ancient geography, a mountain in the neighbourhood of Parnassus and Cytheron, sacred to Apollo and the Muses. It is situated in Livadia, and now called Zagura or Zaguya.

HELICONIA, in botany, a genus of the monogynia order, and pentandria class of plants. Spatha universal and partial; no calyx; corolla, three-petaled; nectarium, two-leaved; capsule, three-grained. It has three species, natives of the West Indies.

HELICONIAN, or **HELICONIDES**, epithets of the Muses, from Mount Helicon.

HELICTERES, the **SCREW-TREE**; a genus of the decandria order, and gynandria class of plants; natural order, Columniferae. Calyx monophyllous, oblique; petals, five; nectarium consists of five petal-like leaflets; capsules intorted or twisted inwards. There are nine species, all natives of warm climates. They are shrubby plants, rising from five to fourteen feet in height, adorned with flowers of a yellow colour.

HELIER, St. the capital of the island of Jersey, in the bay of St. Aubin. See **JERSEY**. Lon. 2. 10. W. Lat. 49. 11. N.

HELIER, St. a little island near the above town, on the side of Jersey; so named from St. Helier, a hermit, who lived in this island many centuries ago, and was slain by the Pagan Normans at their coming here.

HELIOCARPUS, in botany, a genus of the digynia order, and dodecandria class of plants; natural order, Columniferae. Calyx tetraphyllous; petals, four; styles, simple; capsule, bilocular, compressed, and radiated lengthwise on each side. One species, a native of America.

HELIOCENTRIC, [*heliocentrique*, Fr. $\eta\lambda\iota\omicron\varsigma$, and $\chi\epsilon\iota\tau\rho\omicron\nu$.] The heliocentric place of a planet is said to be such as it would appear to us from the sun, if our eye were fixed in its centre. See **ASTRONOMY**.

HELIOCENTRIC LATITUDE OF A PLANET, the inclination of a line drawn between the centre of the sun and the centre of a planet to the plane of the ecliptic. See **ASTRONOMY**.

HELIOCOMETES, a phenomenon sometimes observed about sun-setting; being a large luminous tail or column of light proceeding from the body of the sun, and dragging after it, like the tail of a comet; whence the name.

HELIOID PARABOLA, or the **PARABOLIC SPIRAL**, in mathematics, a curve which arises from the supposition of the axis of the common Apollonian parabola's being bent round into the periphery of a circle, and is a line then passing through the extremities of the ordinates, which do now converge towards the centre of the said circle.

HELIOMETER, [from $\eta\lambda\iota\omicron\varsigma$, the sun, and $\mu\epsilon\lambda\epsilon\tau\omega$, to measure,] an instrument called also astrometer, invented by M. Bouguer in 1747, for measuring with particular exactness the diameters of the stars, and especially those of the sun and moon. This instrument is a kind of telescope, consisting of two object-glasses of equal focus-distance placed the one by the side of the other, so that the same eye-glass serves for both. The tube is of a conic form, larger at the upper end, which receives the two object-glasses, than at the lower, which is furnished with an eye-glass and micrometer. By the construction of this instrument two distinct images of an object are formed in the focus of the eye glass, whose distance, depending upon that of the two object-glasses from one another, may be measured with great accuracy: nor is it necessary that the whole disk of the sun or moon come within the field of view; since, if the images of only a small part of the disk be formed by each object-glass, the whole diameter may be easily computed by their position with respect to one another: for if the object be large, the images will approach, or perhaps lie even

over one another; and the object-glasses being moveable, the two images may always be brought to touch one another, and the diameter may be computed from the known distance of the centres of the two glasses. Besides, as this instrument has a common micrometer in the focus of the eye-glass, when the two images of the sun or moon are made in part to cover one another, that part which is common to both the images may be measured with great exactness, as being viewed upon a ground that is only one-half less luminous than itself; whereas, in general, the heavenly bodies are viewed, upon a dark ground, and on that account are imagined to be larger than they really are. By a small addition to this instrument, provided it be of a moderate length, M. Bouguer thought it very possible to measure angles of three or four degrees, which is of particular consequence in taking the distance of stars from the moon. With this instrument M. Bouguer, by repeated observation, found, that the sun's vertical diameter, though somewhat diminished by the astronomical refraction, is longer than the horizontal diameter; and, in ascertaining this phenomenon, he also found, that the upper and lower edges of the sun's disk are not so equally defined as the other parts; on this account his image appears somewhat extended in the vertical direction. This is owing to the decomposition of light, which is known to consist of rays differently refrangible in its passage through our atmosphere. Thus the blue and violet-coloured rays, which proceed from the upper part of the sun's disk at the same time with those of other colours, are somewhat more refracted than the others, and therefore seem to us to have proceeded from a higher point; whereas, on the contrary, the red rays proceeding from the lower edge of the disk, being less refracted than the others, seem to proceed from a lower point; so that the vertical diameter is extended, or appears longer, than the horizontal diameter. Mr. Servington Savery discovered a similar method of improving the micrometer, which was communicated to the Royal Society in 1743. See **MICROMETER**.

HELIOPHILA, in botany, a genus of the siliquosa order, and tetradynamia class of plants; natural order, Siliquosae. Nectaria two, recurved towards the vesicular base of the calyx. It has ten species, natives of the Cape.

HELIOPHOBI, [from $\eta\lambda\iota\omicron\varsigma$, the sun, and $\phi\omicron\sigma\epsilon\omega$, to terrify,] a name given to the white negroes or albinos, from their aversion to the light of the sun.

HELIOPOLIS, an ancient city of Egypt, so called by Herodotus and Diodorus Siculus; by Moses On, and by Jeremiah Bethshemesh. It lies S. E. of the Delta, and E. of Memphis; and was long famous for its temple of the sun.

HELIOPELIS, a city of Coelosyria, near the springs of the Orontes; so called from the worship of the sun: now named Balbec. See **BALBEC**.

HELIOSCOPE, [$\eta\lambda\iota\omicron\varsigma$ and $\sigma\kappa\omicron\pi\omega$,] a sort of telescope fitted so as to look on the body of the sun, without offence to the eyes. Mr. Huygens only used a plain glass, blacked at the flame of a candle on one side, and placed between the eye-glass and the eye; which answers the design very well.

HELIOTATA, in optics, an instrument invented by the late learned Dr. S. Gravesende; who gave it this name from its fixing, as it were, the rays of the sun in a horizontal direction across the dark chamber all the while it is in use. See **OPTICS**.

HELIOTROPE, among the ancients, an instrument or machine for shewing when the sun arrived at the tropics and the equinoctial line. This name was also used for a sun-dial.

HELIOTROPE, in lithology, a precious stone of the flint genus, of a green colour, streaked with red veins. Pliny says it is thus called, because, when cast into a vessel of water, the sun's rays falling thereon seem to be of a blood-colour; and that, when out of the water, it gives a faint reflection of the figure of the sun; and is proper to observe eclipses of the sun, as a helioscope. It occurs massive in angular and rolled pieces; specific gravity about 2.7. It is found in the East Indies, as also in Ethiopia, Germany, Bohemia, &c. Some have ascribed to it the property of rendering people invisible, like Gyges's ring.

HELIOTROPIUM, [$\eta\lambda\iota\omicron\varsigma$ and $\tau\rho\omicron\pi\omega$,] **TURNSOLE**: a genus of the polygynia order, and pentandria class of plants; natural order, Asperitoliæ. Corolla salver-shaped, quinquefid, with less dents interjected alternately; throat closed up by small arches formed in the corolla itself. There are twenty-four species, all natives of warm countries.

HELIX, [ἑλῆξ,] literally signifies a wreath or winding; of ἑλίσσω, to environ.

HELIX, in anatomy, is the whole circuit or extent of the auricle or border of the ear outwards; whence the inner protuberance surrounded thereby, and answering thereto, is called antihelix. See **ANATOMY**.

HELIX, in architecture. Some authors make a difference between the helix and the spiral. A staircase, according to Daviler, is in a helix, or is helical, when the stairs or steps wind round a cylindrical newel; whereas the spiral winds round a cone, and is continually approaching nearer and nearer its axis. The word is also applied to the caulicules or little volutes under the flowers of the Corinthian capital; called also *urilla*. See **ARCHITECTURE**.

HELIX, the **SNAIL**, in zoology, a genus in the class *vermes*, and order *testacea*. Animal a *limax*; shell consists of one spiral, brittle, and almost diaphanous valve; aperture narrow, roundish. There are upwards of 300 species, principally distinguished by the figure of their shells. They are of various sizes, from that of a small apple to less than half a pea. Some of them live on land, frequenting woods and gardens, or inhabiting clefts of rocks and dry sand-banks. Others are aquatic, inhabiting ponds, deep rivers, and the ocean. They are separated into divisions; A. whorls, with a carinate acute margin; B. umbilicate, the whorls rounded; C. rounded imperforate; D. tapering; E. ovate, imperforate. See Plate LXVII.

H. HORTENSIS, **GARDEN-SNAIL**, has its shells imperforate, globular, pale, with broad interrupted brown bands: this species inhabits gardens and orchards in most parts of Europe, with a viscid slimy juice, which it readily gives out by boiling in milk or water, so as to render them thick and glutinous. The decoctions in milk are apparently very nutritious and demulcent, and have been recommended in a thin acrimonious state of the humours, in consumptive cases and emaciations. The eyes of snails are lodged in their horns, one at the end of each horn, which they can retract at pleasure. The manner of examining these eyes, which are four in number, is this: when the horns are out, cut off nimbly the extremity of one of them; and placing it before the microscope you may discover the black spot at the end to be really a semiglobular eye. The dissection of this animal is very curious; for the microscope not only discovers the heart beating just against the round hole near the neck, which seems the place of respiration, but also the liver, spleen, stomach, and intestines, with the veins, arteries, mouth, and teeth, are plainly observable. Snails are all hermaphrodites, having both sexes united in each individual. They lay their eggs with great care in the earth, and the young ones are hatched with shells completely formed. Cutting off a snail's head, a little stone appears, which is supposed to be a great diuretic, and good in all nephritic disorders. Immediately under this stone the heart is seen beating; and the auricles are evidently distinguishable, are membranous, and of a white colour; as are also the vessels which proceed from them. The snail, though a small animal, is not free from the plague of supporting other smaller animals on its body; and as in other animals we find these secondary ones either living only on their surface, as lice, &c. or only in the intestines, as worms, it is very remarkable that this creature infests the snail in both these manners; being found sometimes on the surface of its body, and sometimes within its intestines. There is a part of the common garden-snail, and of other of the like kinds, commonly called the collar. This surrounds the neck of the snail, and is considerably thick, and is the only part that is visible when the animal is retired quietly into its shell. In this state of the animal these insects which infest it are usually seen in considerable numbers marching about very nimbly on this part: besides, the snail, every time it has occasion to open its anus, gives them a place by which to enter into its intestines, and they often seize the opportunity. Snails are great destroyers of fruit in gardens, especially the better sorts of wall-fruit. Lime and ashes sprinkled on the ground where they most resort will drive them away, and destroy the young brood of them: it is a common practice to pull off the fruit they have bitten; but this should never be done, for they will eat no other till they have wholly eat up this if it be left for them.

H. JANTHINA, with a violet-coloured shell. This is remarkable for the extreme thinness of texture, which breaks with the least pressure, and seems therefore entirely calculated to keep the

open sea, or at least to shun rocky shores. It inhabits the seas of Europe, especially the Mediterranean; those of Asia and Africa; and also the ocean. The living animal, when touched, exudes a juice which stains the hands of a violet-colour.

H. FORMATIA, a snail with five spires remarkably ventricose, slightly umbilicated, fasciated with a lighter and deeper brown: this is found in the woods of the southern counties of England; it is said to have been introduced into this country by Sir Kenelm Digby, for medicinal purposes. These are confined to the southern counties, attempts having been made, but without success, to bring them into Northamptonshire. This snail is used in many parts of Europe as food, particularly at Rome during the weeks of Lent: here they are fattened, and grow to a very large size. It is oviparous, very tenacious of life, and, towards winter, covers its aperture with a calcareous lid.

HELL, [*helle*, Sax. a covered place, or a cavern; perhaps from *ελλος*, a lake, or from the Heb. *הול*, he was tormented,] signified formerly the place of separate spirits, but is now used for the place of divine punishment after death, in contradistinction to heaven. As all religions have supposed a future state of existence after this life, so all have their hell or place of torment, in which the wicked are supposed to be punished. The hell of the ancient heathens was divided into two mansions; the one called Elysium, on the right hand, pleasant and delightful, appointed for the souls of good men; the other called Tartarus, on the left, a region of misery and torment, appointed for the wicked. The latter only was hell, in the present restrained sense of the word. The philosophers were of opinion, that the infernal regions were at an equal distance from all the parts of the earth; nevertheless it was the opinion of some, that there were certain passages which led thither, as the river Lethe near the Syrtis, and the Acherusian cave in Epirus. At Hermione it was thought, that there was a very short way to hell; for which reason the people of that country never put the fare into the mouths of the dead to pay their passage. The Jews placed hell in the centre of the earth, and believed it to be situated under waters and mountains. The Mohammedans believe the eternity of rewards and punishments in another life. In the Koran it is said, that hell has seven gates, the first for the Mussulmans, the second for the Christians, the third for the Jews, the fourth for the Sabians, the fifth for the Magians, the sixth for the Pagans, and the seventh for hypocrites of all religions. Among Christians, there are two controverted questions in regard to hell; the one concerning the locality, the other the duration of its torments. 1. The locality of hell, and the reality of its fire, began first to be controverted by Origen. That father, interpreting the scripture-account metaphorically, makes hell to consist, not in external punishments, but in a consciousness or sense of guilt, and a remembrance of past pleasures. Among the moderns, Mr. Whiston advanced a new hypothesis. The comets, he thinks, are so many hells appointed in their orbits alternately to carry the damned into the confines of the sun, there to be scorched by its violent heat, and then to return with them beyond the orb of Saturn, there to starve them in those cold and dismal regions. Another modern author supposes the sun to be the local hell. 2. As to the duration of the torments, Origen is again at the head of those who deny that they are eternal; it being that father's opinion, that not only men, but devils, after a due course of punishment suitable to their respective crimes, shall be pardoned, and restored to heaven. The chief principle upon which Origen built his opinion, was the nature of punishment, which he took to be emendatory, applied only as physic for the recovery of the patient's health. The chief objection to the eternity of hell-torments, among modern writers, is the disproportion between temporary crimes and eternal punishments. Those who maintain the affirmative, ground their opinions on scripture-accounts, which represent the pains of hell under the figure of a worm which never dies, and a fire which is not quenched; as also upon the words, "These shall go away into everlasting punishment, but the righteous into life eternal." But, say their opponents, the character given by the Almighty of himself should decide the point: "His mercy is over all his works." Eternal punishment excludes every idea of mercy; and even of justice, for finite crimes can never merit infinite punishment. But here is certainly a mistake or two. Eternal punishment does not exclude every idea of mercy; for the very beings who suffer have rejected the infinite mercy of God to the ruin

ruin of their own souls. Neither does it exclude the idea of justice, for though it be true that finite crimes can never merit infinite punishment, yet it does not follow that because punishments are eternal they are therefore infinite. We are told that a finite creature is incapable of committing an infinite crime, the same argument will prove that he is incapable of infinite punishment, but it by no means proves him incapable of suffering eternal punishment. However, a man may seek to extenuate or lessen the idea of his crimes, it must be acknowledged that the very least breach of God's law is a crime inconceivably great, what then must be the magnitude of the total of the crimes of those, who have lived in the continual breach of all his laws, and to this have added the crimes of repeatedly rejecting infinite mercy: now it is granted that justice demands an adequate punishment, which must therefore be inconceivably great beyond all the comprehensions of the mind; what then hinders it to be eternal, as the clear revelation of God concerning it declares?

HELL, VALLEY OF, a valley of Suabia, in the Black Forest, through which, for many leagues, there is scarcely room for fifty men to march in front, the mountains rise so high on each side.

HELLAS, in ancient geography, an appellation comprising, according to the ancient Greeks and Romans, Achaia and Peloponnesus, but afterwards restrained to Achaia.

HELLE, in fabulous history, a daughter of Athamas king of Thebes by Nephele. She fled from her father's house with her brother Phryxus, to avoid the cruelty of her step-mother, Ino. According to some she was carried through the air on a ram with a golden fleece, which her mother had received from Neptune, and in her passage became giddy, and fell into that part of the sea, which from her received the name of Hellespont. Others say that she was carried on a cloud, or rather upon a ship, from which she fell into the sea and was drowned. See **PHRYXUS**.

HELLEBORE, WHITE. See **VERATRUM**.

HELLEBORUS, HELLEBORE: a genus of the polygynia order, and pentandria class of plants; natural order, Multisiliqua. Calyx none; petals five or more; nectaria bilabiate, tubular; capsules polyspermous, and a little erect. It has seven species.

H. NIGER, BLACK HELLEBORE, or CHRISTMAS-ROSE, has roots composed of many thick fleshy spreading fibres, crowned by a large cluster of lobed leaves, consisting each of seven or eight obtuse fleshy lobes, united to one foot-stalk; and between the leaves several thick fleshy flower-stalks three or four inches high, surmounted by large beautiful white flowers of five roundish petals, and numerous filaments, appearing in winter, about or soon after Christmas. It may be propagated either by seeds or parting the roots. It prospers in open borders, or may be planted in pots to move when in bloom, in order to adorn any particular place; but it always flowers fairest and most abundantly in the front of a warm sunny border. The plants may be removed, and the roots divided for propagation, in September, October, or November. On chewing the root for a few minutes, the tongue seems benumbed, and affected with a kind of paralytic stupor, as when burnt by eating any thing too hot. The fibres are more acrimonious than the head of the root from whence they issue. Black hellebore-root, taken from fifteen to thirty grains, proves a strong cathartic; and, as such, has been celebrated for the cure of maniacal and other disorders proceeding from what the ancients called the atra bilis; in which cases, medicines of this kind are doubtless occasionally of use, though they are by no means possessed of any specific power. It does not however appear, that our black hellebore acts with so much violence as that of the ancients; whence many have supposed it to be a different species of plant: and indeed the descriptions which the ancients have left us of their hellebore, do not agree with those of any of the sorts usually taken notice of by modern botanists.

H. NIGER ORIENTALIS is a species discovered in the eastern countries, which Tournefort distinguishes thus; amplissimum folio, caule praalto, flore purpureo, and supposes to be the true ancient hellebore, from its growing in plenty about mount Olympus, and in the island of Anticyra, celebrated of old for the production of this antimaniacal drug: he relates, that a scruple of this sort, given for a dose, occasioned convulsions.

HELLENISM, [*ἑλληνισμός*], a Greek idiom, used only when

speaking of the authors who, writing in a different language, express themselves in a phraseology peculiar to the Greek.

HELLENISTIC LANGUAGE, that used by the Grecian Jews who lived in Egypt and other parts where the Greek tongue prevailed. In this language it is said the Septuagint was written, and also the books of the New Testament, and that it was thus denominated to shew that it was Greek filled with Hebraisms and Syriasms.

HELLENISTS, or HELLENISTÆ, a term occurring in the Greek text of the New Testament, and which in the English version is rendered Grecians. The critics are divided as to the signification of the word. Eusebius, in his Scholia on Acts vi. 1, observes, that it is not to be understood as signifying those of the religion of the Greeks, but those who spoke Greek, *τῶν ἑλλήνων φηγομένων*. The authors of the Vulgate version, indeed, render it like ours, Græci; but Messieurs Du Port-Royal more accurately, Juifs Grecs, Greek or Grecian Jews; the Jews who spoke Greek being here treated of, and hereby distinguished from the Jews called Hebrews, that is, who spoke the Hebrew tongue of that time. These Hellenists, or Grecian Jews, were those who lived in Egypt and other parts where the Greek tongue prevailed. It is to them we owe the Greek version of the Old Testament, commonly called the Septuagint, or that of the LXX. Salmasius and Vossius, however, are of a different opinion, with regard to the Hellenists. The latter will only have them to be those who adhered to the Grecian interests. Scaliger is represented, in the Scaligerana, as asserting the Hellenists to be the Jews who lived in Greece and other places, and who read the Greek Bible in their synagogues, and used the Greek language in sacris; and thus they were opposed to the Hebrew Jews, who performed their public worship in the Hebrew tongue. In this sense St. Paul speaks of himself as a Hebrew of the Hebrews, (Phil. iii. 5,) *i. e.* a Hebrew both by nation and language. The Hellenists are thus properly distinguished from the Hellenes or Greeks, mentioned John xii. 20, who were Greeks by birth and nation, and yet proselytes to the Jewish religion.

HELLENODICE, [*ἑλληνοδικαί*], in antiquity, the directors of the Olympian games. At first there was only one, afterwards the number increased to two and three, and at length to nine. They assembled in a place called *ἑλληνοδικαίον*, in the Elean forum, where they were obliged to reside ten months before the celebration of the games, to take care that such as offered themselves to contend, performed their *προσγυμνασματα*, or preparatory exercises, and to be instructed in all the laws of the games by certain men called *νομοφύλακες*, *i. e.* keepers of the laws.

HELLESPONT, a narrow strait between Asia and Europe, near the Propontis, so named from Helle. It is now called the Dardanelles.

HELM, in ship-building, a long and flat piece of timber, or an assemblage of several pieces, suspended along the hind part of a ship's stern-post, where it turns upon hinges to the right or left, serving to direct the course of the vessel, as the tail of a fish guides the body. The helm is usually composed of three parts, *viz.* the rudder, the tiller, and the wheel, except in small vessels, where the wheel is unnecessary. As to the form of the rudder, it becomes gradually broader in proportion to its distance from the top, or to its depth under the water. The back, or inner part of it, which joins to the stern-post, is diminished into the form of a wedge throughout its whole length, so as that the rudder may be more easily turned from one side to the other, where it makes an obtuse angle with the keel. It is supported upon hinges; of which those that are bolted round the stern-post to the after extremity of the ship, are called googings, and are furnished with a large hole in the after-part of the stern-post. The other parts of the hinges, which are bolted to the back of the rudder, are called pintles, being strong cylindrical pins, which enter into the googings, and rest upon them. The length and thickness of the rudder is nearly equal to that of the stern-post. The rudder is turned upon its hinges by means of a long bar of timber, called the tiller, which is fixed horizontally in its upper end within the vessel. The movements of the tiller to the right and left, accordingly, direct the efforts of the rudder to the government of the ship's course as she advances; which, in the sea-language, is called steering. The operations of the tiller are guided and assisted by a sort of tackle, communicating with the ship's side, called the

the tiller-rope, which is usually composed of untarred rope-yarns for traversing more readily through the blocks or pulleys.

HELM, MANAGEMENT OF THE. To facilitate the management of the helm, the tiller-rope, in all large vessels, is wound about a wheel, which acts upon it with the powers of a crane or wind-flass. The rope employed in this service being conveyed from the fore-end of the tiller, to a single block on each side of the ship, is farther communicated to the wheel, by two blocks suspended near the mizen-mast, and two holes immediately above, leading up to the wheel, which is fixed upon an axis on the quarter-deck, almost perpendicularly over the fore-end of the tiller. Five turns of the tiller-rope are usually wound about the barrel of the wheel; and when the helm is amidship, the middle-turn is nailed to the top of the barrel, with a mark by which the helmsman readily discovers the situation of the helm, as the wheel turns it from the star-board to the larboard side. The spokes of the wheel generally reach about eight inches beyond the rim or circumference, serving as handles to the person who steers the vessel. As the effect of a lever increases in proportion to the length of its arm, it is evident that the power of the helmsman to turn the wheel will be increased according to the length of the spokes beyond the circumference of the barrel. When the helm, instead of lying in a right line with the keel, is turned to one side or the other, as in BD, Plate LXXXV. fig. 2, it receives an immediate shock from the water, which glides along the ship's bottom in running aft from A to B; and this fluid pushes it towards the opposite side, whilst it is retained in this position: so that the stern, to which the rudder is confined, receives the same impression, and accordingly turns from B to *b* about some point *c*, whilst the head of the ship passes from A to *a*. It must be observed, that the current of water falls upon the rudder obliquely, and only strikes it with that part of its motion which acts according to the sine of incidence, pushing it in the direction NP, with a force which not only depends on the velocity of the ship's course, by which this current of water is produced, but also upon the extent of the sine of incidence. This force is by consequence composed of the square of the velocity with which the ship advances, and the square of the sine of incidence, which will necessarily be greater or smaller according to circumstances; so that if the vessel runs three or four times more swiftly, the absolute shock of the water upon the rudder will be 9 or 16 times stronger under the same incidence: and, if the incidence is increased, it will yet be augmented in a greater proportion, because the square of the sine of incidence is more enlarged. This impression, or power of the helm, is always very feeble, when compared with the weight of the vessel; but as it operates with the force of a long lever, its efforts to turn the ship are extremely advantageous. For the helm being applied to a great distance from the centre of gravity G, or from the point about which the vessel turns horizontally, if the direction PN of the impression of the water upon the rudder be prolonged, it is evident that it will pass perpendicularly to R, widely distant from the centre of gravity G: thus the absolute effort of the water is very powerful. It is not therefore surprising, that this machine impresses the ship with a considerable circular movement, by pushing the stern from B to *b*, and the head from A to *a*; and even much farther whilst she sails with rapidity, because the effect of the helm always keeps pace with the velocity with which the vessel advances. Amongst the several angles that the rudder makes with the keel, there is always one position more favourable than any of the others, as it more readily produces the desired effect of turning the ship, in order to change her course. To ascertain this, it must be considered, that if the obliquity of the rudder with the keel be greater than the obtuse angle ABD, so as to diminish that angle, the action of the water upon the rudder will increase, and at the same time oppose the course of the ship in a greater degree; because the angle of incidence will be more open, so as to present a greater surface to the shock of the water, by opposing its passage more perpendicularly. But at that time the direction NP, of the effort of the helm upon the ship, will pass with a smaller distance from the centre of gravity G towards R, and less approach the perpendicular NL, according to which it is absolutely necessary that the power applied should act with a greater effect to turn the vessel. Thus it is evident, that if the obtuse angle ABD is too much inclosed, the greatest impulse of the water will not counterbalance

the loss sustained by the distance of the direction NP from NL, or by the great obliquity which is given to the same direction NP of the absolute effort of the helm with the keel AB. If, on the contrary, the angle ABD is too much opened, the direction NP of the force of the action of the helm will become more advantageous to turn the vessel, because it will approach nearer the perpendicular NL; so that the line prolonged from NP will increase the line GR, by removing R to a greater distance from the centre of gravity G: but then the helm will receive the impression of the water too obliquely, for the angle of incidence will be more acute; so that it will only present a small portion of its breadth to the shock of the water, and by consequence will only receive a feeble effort. By this principle it is easy to conceive, that the greatest distance GR from the centre of gravity G, is not sufficient to repair the diminution of force occasioned by the too great obliquity of the shock of the water. Hence we may conclude, that when the water either strikes the helm too directly, or too obliquely, it loses a great deal of the effect it ought to produce. Between the two extremes there is therefore a mean position, which is the most favourable to its operations. The diagonal NP of the rectangle IL represents the absolute direction of the effort of the water upon the helm. NI expresses the portion of this effort which is opposed to the ship's head-way, or which pushes her astern, in a direction parallel to the keel. It is easily perceived, that this part NI of the whole power of the helm contributes but little to turn the vessel; for, if IN is prolonged, it appears that its direction approaches to a very small distance GV from the centre of gravity G; and that the arm of the lever BN = GV, to which the force is applied, is not in the whole more than equal to half the breadth of the rudder: but the relative force NL, which acts perpendicular to the keel, is extremely different. If the first NI is almost useless, and even pernicious, by retarding the velocity; the second NL is capable of a very great effect, because it operates at a considerable distance from the centre of gravity G of the ship, and acts upon the arm of a lever GE, which is very long. Thus it appears, that between the effects NL and NI, which result from the absolute effort NP, there is one which always opposes the ship's course, and contributes little to her motion of turning; whilst the other produces only this movement of rotation, without operating to retard her velocity. Geometricians have determined the most advantageous angle made by the helm with the line prolonged from the keel, and fixed it at $54^{\circ} 44'$, presuming that the ship is as narrow at her floating line, or at the line described by the surface of the water round her bottom, as at the keel. But as this supposition is absolutely false, inasmuch as all vessels augment their breadth from the keel upward to the extreme breadth, where the floating-line or the highest water-line is terminated; it follows, that this angle is too large by a certain number of degrees. For the rudder is impressed by the water, at the height of the floating-line, more directly than at the keel, because the fluid exactly follows the horizontal outlines of the bottom; so that a particular position of the helm might be supposed necessary for each different incidence which it encounters from the keel upwards. But as a middle position may be between all these points, it will be sufficient to consider the angle formed by the sides of the ship, and her axis, or the middle-line of her length, at the surface of the water, in order to determine afterwards the mean point, and the mean angle of incidence. It is evident that the angle $54^{\circ} 44'$ is too open, and very unfavourable to the ship's head-way, because the water acts upon the rudder there with too great a sine of incidence, as being equal to that of the angle which it makes with the line prolonged from the keel below; but above, the shock of the water is almost perpendicular to the rudder, because of the breadth of the bottom, as we have already remarked. If then the rudder is only opposed to the fluid, by making an angle of 45° with the line prolonged from the keel, the impression, by becoming weaker, will be less opposed to the ship's head-way, and the direction NP of the absolute effort of the water upon the helm drawing nearer to the lateral perpendicular, will be placed more advantageously, for the reasons above mentioned. On the other hand, experience daily testifies, that a ship steers well when the rudder makes the angle DBE equal to 35° only. It has been already remarked, that the effect of moving the wheel to govern the helm increases in proportion to the length of the spokes; and

so great is the power of the wheel, that if the helmsman employs a force upon its spokes equivalent to 30lb. it will produce an effect of 90 or 120lb. upon the tiller. On the contrary, the action of the water is collected into the middle of the breadth of the rudder, which is very narrow in comparison with the length of the tiller; so the effort of the water is very little removed from the fulcrum B upon which it turns; whereas the tiller forms the arm of a lever 10 or 15 times longer, which also increases the power of the helmsman in the same proportion that the tiller bears to the lever upon which the impulse of the water is directed. This force then is by consequence 10 or 15 times stronger; and the effort of 30 pounds, which at first gave the helmsman a power equal to 90 or 120lb. becomes accumulated to one of 900 or 1800lb. upon the rudder. This disadvantage then arises from the shortness of the lever upon which the action of the water is impressed, and the great comparative length of the tiller, or lever, by which the rudder is governed; together with the additional power of the wheel that directs the movements of the tiller, and still farther accumulates the power of the helmsman over it. Such a demonstration ought to remove the surprise with which the prodigious effect of the helm is sometimes considered, from an inattention to its mechanism: for we need only to observe the pressure of the water, which acts at a great distance from the centre of gravity G, about which the ship is supposed to turn, and we shall easily perceive the difference there is between the effort of the water against the helmsman, and the effect of the same impulse against the vessel. With regard to the person who steers, the water acts only with the arm of a very short lever NB, of which B is the fulcrum: on the contrary, with regard to the ship, the force of the water is impressed in the direction NP, which passes to a great distance from G, and acts upon a very long lever EG, which renders the action of the rudder extremely powerful in turning the vessel; so that, in a large ship, the rudder receives a shock from the water of 2700 or 2800lb. which is frequently the case when she sails at the rate of three or four leagues by the hour; and this force being applied in E, perhaps 100 or 110 feet distant from the centre of gravity G, will operate upon the ship to turn her about, with 270,000 or 308,000lb; whilst, in the latter case, the helmsman acts with an effort which exceeds not 30lb. upon the spokes of the wheel. From what has been said, it is plain that the more a ship increases her velocity with regard to the sea, the more powerful will be the effect of the rudder; because its acts against the water with a force, which increases as the square of the swiftness of the fluid, whether the ship advances or retreats; or, in other words, whether she has head-way or stern-way; with this distinction, that in these two circumstances the effects will be contrary. For if the vessel retreats, or moves astern, the helm will be impressed from I to N; and instead of being pushed, according to NP, it will receive the effort of the water from N towards R; so that the stern will be transported to the same movement, and the head turned in a contrary direction. When the helm operates by itself, the centre of rotation of the ship, and her movement, are determined by estimating the force of this machine; that is to say, by multiplying the surface of the rudder by the square of the ship's velocity.

HELM, TERMS USED RESPECTING THE. In the sea-language, bear up the helm, signifies, let the ship go more at large before the wind: helm a mid-ship, or right the helm, is, keep it even with the middle of the ship: port the helm, put it over the left side of the ship; and starboard the helm, put it on the right side of the ship.

HELMET, armour for the head, it was anciently worn by horsemen both in war and in tournaments. It covered both the head and face, only leaving an aperture in the front secured by bars, which was called the visor. In achievements, it is placed above the escutcheon for the principal ornament, and is the true mark of chivalry and nobility. Helmets vary according to the different degrees of those who bear them. They are also used as a bearing in coats of arms. See **HERALDRY**.

HELMINTHOLITHUS, in natural history, a name given by Linnæus to petrified bodies resembling worms. Of these he reckons four genera: 1. Petrified lithophyta, found in the mountains of Sweden. 2. Petrified shells. 3. Petrified zoophytes. 4. Petrified reptiles.

HELMONT, JOHN BAPTIST VAN, a celebrated Flemish gen-

tleman, born at Brussels in 1577. He acquired such skill in natural philosophy, physic, and chemistry, that he was accounted a magician, and thrown into the inquisition: but having with difficulty justified himself, as soon as he was released he retired to Holland; where he died in 1644. He published, 1. *De Magnetica Corporum Curatione*. 2. *Febrium Doctrina Inaudita*. 3. *Ortus Medicinæ*. 4. *Paradoxa de Aquis Spadanis*; and other works, printed together in one vol. folio.

HELMONT, a small town of Batavia, in the department of Dommel and Scheldt, and late province of Dutch Brabant.

HELMSDALE, a river of Scotland, in Sutherland, called in the Celtic, Abhin liigh, or Avonuille, which rises from several lakes in the parish of Kildonan, and falls into the German Ocean.

HEMSLEY, a town of Yorkshire, on the Rye, twenty-two miles N. of York.

HELMSTADT, or **HALMSTADT**, a strong maritime town of Sweden, and capital of the province of Halland, on the Baltic. Lon. 12. 48. E. Lat. 56. 38. N.

HELONIAS, in botany, a genus of the trigynia order, and hexandria class of plants; natural order, Coronariæ. Corolla hexapetalous; no calyx; capsule trilocular. It has two species, American herbs.

HELOS, in ancient geography, a maritime town of Laconia, between Trinasus and Acridæ, in the district of Helotea. In Pausanias's time it was in ruins.

HELSINGFORS, a sea-port of Sweden, in the province of Nyland, on the N. coast of the Gulf of Finland, 140 miles E.S.E. of Abo.

HELSINGIA, or **HELSINGLAND**, a province of Sweden, bounded on the N. by Jemterland and Medelpadia; on the E. by the Bothnic Gulf; on the S. by Gestricia, and S.W. and W. by Dalecarlia. It is full of mountains and forests. The principal towns are Hudwicksvald, Alta, and Dilsbo. The rivers and lakes abound with fish. It is 120 miles long and 90 broad.

HELSINGIC CHARACTER, a peculiar character found on stones in Helsingia, resembling the Runic.

HELSTON, a populous borough of Cornwall, twelve miles E. of Penzance.

HELVETIA, or **CIVITAS HELVETIÆ**, in ancient geography, the country of the Helvetii, was divided into four Pagi or Cantons, situated to the S. and W. of the Rhine, by which they were divided from the Germans; and extending towards Gaul, from which they were separated by mount Jura on the W. and by the Rhodanus and Lacus Lemanus on the S. and therefore called a Gallic nation. It was formerly a part of Celtic Gaul, but by Augustus assigned to Gallia Belgica: lately called Switzerland, and now the Helvetic Republic.

HELVETIC REPUBLIC, one of the modern democratic States of Europe, formed by the French out of the late cantons of Switzerland.

HELVETII, a people of Gallia Belgica, near the country of the Allobroges and the Provincia Romana; famed for bravery and a turn for war; and not destitute of learning.

HELVOETSLUYS, a sea-port town of Batavia, in the department of Delft, island of Voorn, and late province of S. Holland. It is twelve miles W. of Dort, and fifteen S.W. of Rotterdam.

HEMEROBAPTISTS, a sect among the ancient Jews, thus called from their washing and bathing daily in all seasons; and performing this custom with the greatest solemnity, as a religious rite necessary to salvation, from *hama*, day, and *Sanctus*, I baptize.

HEMEROBIUS, in zoology, a genus of insects of the neuroptera order. Mouth furnished with two teeth; palpi are four; wings deflected, not plaited; antennæ bristly, longer than the breast. It has about forty species, principally distinguished by their colours. They are named hemerobii from the shortness of their lives, which, however, continue several days. In the state of larva they are great devourers of plant-lice, for which it has had the name of the lion of the plant-lice. They are also cannibals, and devour each other after their transformation. The eggs are borne on small gummy pedicles, spun by the insects from their abdomen. These eggs are deposited upon leaves, and set in the form of bunches. They have been taken for parasitic plants. In fifteen or sixteen days the larva attains to its full growth. With its spinning-wheel at its tail, it makes itself a small, round, white, silky,

silky cod, of a close texture. In summer, at the end of three weeks, the hemerobius issues forth with its wings; but when the cod has not been spun till autumn, the chrysalis remains in it the whole winter, and does not undergo its final metamorphosis till the next spring. The flight of this insect is heavy: some species have an excrementitious smell. See Plate LXXXVI. This genus is divided into two sections. A those having a membranaceous, annulate, cylindrical, lip. B having a vaulted, horny, lip.

HEMEROCALLIS, DAY-LILY, or LILY-ASPHODEL: a genus of the monogynia order, and hexandria class of plants; natural order, Coronaria. Corolla bell-shaped; the tube cylindric; stamina declining. There are five species.

HEMERODROMI, [from *ἡμερα*, day, and *δρομη*, course, &c.] among the ancients, were guards, appointed for the security of cities and other places.

HEMEROTROPHIS, [from *ἡμερα*, Gr. a day, and *τροφη*, food,] in antiquity, a measure of capacity, the same with the *choenix*; so called from its holding one day's food.

HEMI, [from *ἡμις*, Gr. half,] a word used in the composition of various terms, signifying the same with semi or demi, half.

HEMICYCLE, [of *ἡμις*, half, and *κύκλος*, circle,] a semicircle, is particularly applied, in architecture, to vaults in the cradle-form; and arches or sweeps of vaults, constituting a perfect semicircle.

HEMICYCLE, or **HEMICYCLIUM**, was also a part of the orchestra in the ancient theatre.

HEMICYCLE, or **HEMICYCLIUM**, was also used for a sort of sundial, the cusp whereof looked to the north.

HEMIMERIS, in botany, a genus of the angiospermia order, and didynamia class of plants. Essential character: calyx five-parted; corolla wheel-form; upper lip cloyen, with a nectareous bag at the base. There are three species.

HEMINA, in Roman antiquity, a liquid measure, which, according to Arbuthnot, was equal to half a wine-pint English measure; its contents being 2.818 solid inches.

HEMIOBOLON, a weight often mentioned by the ancient writers in medicines, signifying the half of the obolus, or the twelfth part of a drachm, i. e. five grains.

HEMIONITES, ENGLISH MULE-FERN, [from *hemisnus*, a mule,] in botany, a genus of the cryptogamia filices, or ferns. Capsules digested into lines, meeting together, either intersecting each other, or branched. There are eight species; natives of both the Indies.

HEMIPLEGY, [*ἡμις*, half, and *πλησσω*, to strike, or seize,] a palsy, or any nervous affection relating thereunto, that seizes one side at a time; some partial disorder of the nervous system. See MEDICINE.

HEMIPTERA, [from *ἡμις*, half, and *πτερον*, wing,] in the Linnæan system, the second order of insects, comprehending the following genera, viz. the blatta, mantis, gryllus, fulgora, cicada, notonecta, nepa, cimex, aphid, chermes, coccus, thrips, macrocephalus, and pneumora. See those articles, and ENTOMOLOGY.

HEMISPHERE, [*ἡμισφαίριον*,] in astronomy, is particularly used for one-half of the mundane sphere. The equator divides the sphere into two equal parts, called the northern and southern hemispheres. The horizon also divides the sphere into the upper and the lower hemispheres.

HEMISPHERE, is also used for a map, or projection, of half the terrestrial globe, or half the celestial sphere, on a plane. Hemispheres are frequently called planispheres.

HEMISPHERE, in geometry, the half of a globe or sphere, when it is supposed to be cut through its centre in the plane of one of its great circles. See GEOMETRY.

HEMISTIC, [*ἡμιστίχον*, *hemistiche*, Fr.] half a verse. It denotes also a verse not completed. Of this there are frequent examples in Virgil's *Æneid*; but whether they were left unfinished by design or not, is disputed among the learned: such are,

Ferro accincta vocat. *Æn.* II. v. 614.

And, Italian non sponte sequor. *Æn.* IV. 361.

In reading common English verses, a short pause is required at the end of each hemistich or half-verse.

HEMITONE, in the ancient music, was what we now call a half-note or semitone.

HEMITRITEUS, [from *ἡμις*, half, and *τρίτιος*, tertian,] in medicine, a kind of fever, denoting the same as semi-tertian, returning twice every day.

HEMLOCK. See CICUTA and CONIUM.

HEMODES, in ancient geography, seven islands of Denmark, now called Zealand, Fynen, Langeland, Muen, Falster, Lalandt, and Femeren.

HEMOIPTOTON. See ORATORY.

HEMORRHAGY. See HÆMORRHAGIA.

HEMORRHOIDS, [*ἡμορροΐδες*; *hemorrhoids*, Fr.] the piles; the emerods. See MEDICINE.

HEMP, [*hanep*, Sax. *hampe*, Dutch; *cannabis*.] See CANNABIS. It does not appear that the ancients were acquainted with the use of hemp, in respect of the thread it affords. Pliny, who speaks of the plant in his natural history, lib. xx. cap. 23, says not a word of this; but extols the virtues of its stem, leaves, and root. In effect, what some writers on the Roman antiquities remark, viz. that the hemp necessary for the use of war was all stored up in two cities of the western empire, viz. at Ravenna and Vienne, under the direction of two procurators, called procuratores linisicii, must be understood of linum or flax. The common hemp, or cannabis sativa, is a valuable plant, which grows wild in the East Indies, and is cultivated to a very considerable extent in Britain, particularly in the counties of Sussex and Suffolk. It thrives most favourably on a sandy, moist, loam, or on old meadows, and low bottoms; near rivers, and is propagated from seed, which is sown in the proportion of eleven pecks, or two bushels, per acre, broadcast; though a much smaller quantity will suffice, if it be drilled. The proper time of sowing hemp, is from the middle to the end of April, or even a month later; but the best crops are generally produced from the earlier seeds. This useful plant requires no weeding: the male, or fimbler-hemp, is usually fit for pulling in the middle of July, or about nine weeks after it is sown. The female, termed karle, or seed-hemp, is seldom ripe till September, when it is pulled, tied into bundles, and set to dry: at the end of ten days they are loosened, and the heads or tops are held upon a hurdle by one person, while another, with a small threshing-flail, beats out the seed. The hemp is then prepared for the manufacturer, either by grassing, that is, lying on stubble or pasture-ground, in order to be gradually dew-ripened; or, by water-ratting, for which process clay-pits are preferred to running-water. In these, the hemp is immersed in bundles, laid both directly, and across, for four or five days, according to the fineness of the weather. The next operation is that of reeding, namely, the separation of the bark from the reed, or woody part, which is effected either by pulling out the reed with the hand, or by drying, and breaking it by machinery, like flax. The hemp is then cleared of its mucilaginous matter, by pouring water through it, and squeezing out the liquid after every affusion, till it be completely divested of those particles. The next operation is that of breaking it, which, in the county of Suffolk, is performed with the aid of certain machinery worked by the hand; when the hemp is beaten in mills; combed or dressed by drawing it through heckles, similar to the combs of wool-manufacturers; and spun into thread, whence it is made into twine, cordage, cloth, netting, &c. Beside the strong cloth, and other articles made from it, hemp is of considerable utility for other purposes. The refuse, called hemp-sheaves, affords an excellent fuel; and the seeds yield by expression a pure oil, which is peculiarly adapted for burning in chambers, as it is perfectly limpid, and possesses no smell. Another valuable property of hemp is, that it effectually expels vermin from plantations of cabbages; for, if it be sown on the borders of fields, &c. planted with that vegetable, no caterpillars will infest it. When fresh, hemp has a strong, narcotic, smell: the water in which it has been soaked, is said to be in a high degree poisonous, and to produce fatal effects, immediately after drinking it. The seeds have an unctuous, sweetish, taste; they may be triturated with water, or boiled in milk as an emulsion, which is occasionally taken as a domestic remedy in coughs, heat of urine, and similar complaints. The important uses of hemp, and the superiority of that produced in this country, have justly rendered it an object of attention to government. Accordingly, in the year 1783 a bounty of 3d. per stone was granted on all hemp raised in Britain, in order to encourage its growth; and, with the same patriotic view, heavy duties are imposed on that article, when imported from foreign countries. On the other hand, its exportation both from Britain and Ireland, is duty-free.

HEMP-AGRIMONY. See EUPATORIUM.

HEMP-AGRIMONY, BASTARD. See AGERATUM.

HEMPSTED,

HEMPSTED, a town of Hertfordshire, eighteen miles S. W. of Hertford, and twenty-three N. W. of London.

HEN. See PHASIANUS.

HEN, GUINEA. See NUMIDA.

HENBANE. See HYOSCIAMUS.

HENDECAGON, [*ἑνδεκάγων*, and *γωνία*,] a figure of eleven sides or angles.

HENDECASYLLABON, in grammar, a word consisting of eleven syllables, from the Greek words *ἑνδεκά*, eleven, and *συλλαβή*, a syllable.

HENDIADIS, [*ἑνδιὰς*, Gr.] a figure in rhetoric, when two substantive-nouns are used for a substantive and adjective.

HEN-MOUL SOIL, in agriculture, a term used by the husbandmen in Northamptonshire, and other counties, to express a black, hollow, spongy, and mouldering earth, usually found at the bottoms of hills.

HENNEAMIMERIS, in poetry, a verse of nine half-feet.

HENNEBERG, a mountainous country in Franconia.

HENNEBERG, a town in the above country, thirty-four miles N. W. of Bamberg.

HENNEBON, a town of France, in the department of Morbihan, and late province of Bretagne; 22 miles N. W. of Vannes, and 260 W. by S. of Paris.

HENOTICUM, [*ἑνωτικόν*, *q. d.* reconciliative; of *ἑνω*, I unite,] in church-history, a famous edict of the emperor Zeno, published A. D. 482, and intended to re-unite the Eutychians with the Catholics.

HENRICHEMONT, a town of France, in the department of Cher, and late province of Berry, twelve miles and a half N. N. E. of Bourges.

HENRY, the name of eight emperors of Germany, and one of Constantinople; of eight kings of England, four of France, four of Spain, one of Portugal, and one of Scotland. Our limits will not permit us to give an account of each of these, we therefore refer the reader to the histories of the countries where these monarchs reigned.

HENRY, MATTHEW, an eminent dissenting minister, born in 1662. He continued under his father's care till he was eighteen years of age; in which time he became well skilled in the learned languages, especially in the Hebrew, which his father had rendered familiar to him from his childhood; and from first to last the study of the Scriptures was his most delightful employment. He completed his education in Mr. Doolittle's academy at Islington, and was afterwards entered in Gray's-Inn for the study of the law. But at length, resolving to devote his life to divinity, in 1686 he retired into the country, and was chosen pastor of a congregation at Chester, where he lived about twenty-five years, greatly esteemed and beloved by his people. He had several calls to London, which he constantly declined; but was at last prevailed upon to accept an unanimous invitation from a congregation at Hackney. He wrote, 1. Expositions of the Bible, in 5 vols. folio. 2. The Life of Mr. Philip Henry. 3. Directions, for daily Communion with God. 4. A Method for Prayer. 5. Four Discourses against Vice and Immorality. 6. The Communicant's Companion. 7. Family Hymns. 8. A Scriptural Catechism. And, 9. A Discourse concerning the Nature of Schism. He died of an apoplexy at Nantwich, in 1714; and was interred at Trinity church in Chester.

HENRY, ROBERT, D. D. a Scotch divine, was born at St. Ninian's in 1718, and educated at Edinburgh. In 1748 he was ordained as a Presbyterian minister at Carlisle. He afterwards removed to Berwick, and in 1768 to Edinburgh, where he became minister of the New Gray-friars church. In 1776 he was chosen one of the ministers at the Old church, and died in 1790. Dr. Henry is known as the author of a valuable history of Great Britain, to the reign of Henry VII. which has gone through several editions. This work arranges, under separate heads, the civil and military history of Great Britain; the history of religion; the history of our constitution, government, laws, and courts of justice; the history of learning, of learned men, and of the chief seminaries of learning; the history of arts; the history of commerce, of shipping, of money or coin, and of the price of commodities; and the history of manners, virtues, vices, customs, language, dress, diet, and amusements. Under these seven heads, which extend the province of an historian greatly beyond its usual limits, every

thing curious or interesting in the history of any country may be comprehended.

HENTING, in agriculture, a term used by the farmers for a particular method of sowing before the plough; the corn, being cast into a straight line just where the plough is to come, is by this means presently ploughed in. By this way of sowing they think they save a great deal of seed and other charges, a dexterous boy being as capable of sowing this way out of his hat as the most skilful seedsman. Henting is also a term used by the ploughmen, and others, to signify the two furrows that are turned from one another at the bottom, in the ploughing of a ridge. The word seems to be a corruption of ending, because those furrows made an end of ploughing the ridges. The tops of the ridges they call veerings.

HEPAR, the LIVER. See ANATOMY.

HEPAR SULPHURIS, or LIVER OF SULPHUR, a combination of alkali and sulphur. It is now denominated sulphuret. See SULPHURET.

HEPATICE ARTERIE. See ANATOMY.

HEPATIC GAS, the gas which is now called sulphuretted hydrogen gas. See GAS.

HEPATITIS, in medicine, an inflammation of the liver. See MEDICINE.

HEPATOSCOPIA, [from *ἥπαρ*, liver, and *σκοπεω*, I consider,] in antiquity, a species of divination, wherein predictions were made by inspecting the livers of animals. The word was also used for divination by entrails.

HEPHÆSTIA, in antiquity, an Athenian festival in honour of Vulcan, the chief ceremony of which was a race with torches.

HEPHÆSTUS, [*Ἡφαίστος*, from *ἥφα*, I have kindled, and *ἑστια*, a fire,] the Greek name of Vulcan.

HEPHTHEMIMERIS, [of *ἑπτα*, seven, *ἡμισυς*, and *μέτρον*, part,] in the Greek and Latin poetry, a sort of verses consisting of three feet and a syllable; that is, of seven half-feet: called also trimetri catalectici. Such are most of the verses in Anacreon:

Θεῶν	λιν	ἄτρει	δὲς
Θεῶν	δε Κεῖ	μον α	δὲν, &c.

And that of Aristophanes, in his *Plutus*:

Ἐπεσθε μάλιστα χοῖροι.

HEPHTHEMIMERIS, or HEPHTHEMIMERES, is also a cæsura after the third foot; that is, on the seventh half-foot. It is a rule, that this syllable, though it be short in itself, must be made long on account of the cæsura, or to make it an hephthemimeris. As in that verse of Virgil.

“Et furis agitatus amor, et conscia virtus.”

HEPS, or HIPS, HEP-TREE. See ROSA.

HEPTACAPSULAR [*ἑπτά*, Gr. and *capsula*, Lat.] having seven cavities or cells.

HEPTACHORD, in ancient poetry, signified verses that were sung or played on seven chords, *i. e.* on seven different notes. In this sense it was applied to the lyre when it had but seven strings. One of the intervals is also called an heptachord, as containing the same number of degrees between the extremes.

HEPTAGON, [*heptagone*, Fr. *ἑπτάγων*, and *γωνία*,] a figure with seven sides or angles.

HEPTAGON, in fortification, a place that has seven bastions for its defence. See GEOMETRY and MENSURATION.

HEPTAGONAL NUMBERS, are a kind of polygonal numbers in which the difference of the terms of the corresponding arithmetical progression is 5. Thus,

Arithmeticals, 1, 6, 11, 16, 21, 26, &c.

Heptagonals, 1, 7, 18, 34, 55, 81, &c.

where the heptagonals are formed by adding continually the terms of the arithmeticals, above them, whose common difference is 5. One property, among many others, of these heptagonal numbers is, that if any one of them be multiplied by 40, and to the product 9 be added, the sum will be a square number.

Thus	1 × 40	+ 9	=	49	= 7 ²
and	7 × 40	+ 9	=	289	= 17 ²
and	18 × 40	+ 9	=	729	= 27 ²
and	34 × 40	+ 9	=	1369	= 37 ² , &c.

Where it is remarkable that the series of squares so formed is 7², 17², 27², 37², &c. the common difference of whose root is 10, the

double of the common difference of the arithmetical series from which the heptagonals are formed. See POLYGONALS.

HEPTANDRIA, [from *ἑπτα*, seven, and *ανδρ*, a man,] in botany, the seventh class in Linnæus's sexual method, consisting of plants with hermaphrodite flowers, which have seven stamina or male organs. See BOTANY.

HEPTANGULAR, in geometry, having seven angles.

HEPTARCHY, [*heptarchie*, Fr. *ἑπτα* and *αρχη*,] a government composed of seven persons, or a country governed by seven persons, or divided into seven kingdoms. The Saxon heptarchy included all England, which was cantoned out into seven independent kingdoms, peopled and governed by different clans and colonies, viz. those of Kent, the South Saxons, West Saxons, East Saxons, Northumberland, the East Angles, and Mercia.

HERACLEA, an ancient city of European Turkey in Romania, 45 miles W.S.W. of Constantinople.

HERACLEONITES, a sect of heretics, the followers of Heracleon, who refined upon the Gnostic system, and maintained that the world was not the immediate production of the Son of God, but that he was only the occasional cause of its being created by the Demiurgus. The Heracleonites denied the authority of the Old Testament, maintaining that they were mere random-sounds in the air; and that St. John the Baptist was the only true voice that directed to the Messiah.

HERACLEUM, **COW-PARSNIP**; a genus of the digynia order, and pentandria class of plants; natural order Umbellatæ. Fruit elliptical, emarginated, compressed, striated, with a thin border; corolla difform, inflexed, emarginated; involucre dropping off. It has six species.

HERACLIDÆ, the descendants of Hercules, greatly celebrated in ancient history. Hercules, at his death, left his son Hyllus all the rights and demands which he had upon Peloponnesus, and ordered him to marry Iole, the daughter of Eurystheus, as soon as he came of age. The posterity of Hercules were not more kindly treated by Eurystheus than their father had been, and they were obliged to retire for protection to the court of Ceyx, king of Trachinia. Eurystheus pursued them thither; and Ceyx, afraid of his resentment, begged the Heraclidæ to depart from his dominions. From Trachinia they came to Athens, where king Theseus, who had accompanied their father in some of his expeditions, received them with great humanity, and assisted them against Eurystheus. Eurystheus was killed by Hyllus himself; his children perished with him, and all the cities of Peloponnesus became the indisputed property of the Heraclidæ. Their triumph, however, was short; their numbers were lessened by a pestilence; and the oracle informed them, that they had taken possession of Peloponnesus before the gods permitted their return. Upon this they abandoned Peloponnesus, and came to settle at Attica, where Hyllus married Iole. Soon after he consulted the oracle, anxious to recover the Peloponnesus; and the ambiguity of the answer determined him to make a second attempt. He challenged to single combat Atreus, the successor of Eurystheus on the throne of Mycenæ; and it was mutually agreed that the undisturbed possession of Peloponnesus should be ceded to the victor. Echemus accepted the challenge for Atreus; Hyllus was killed, and the Heraclidæ departed from Peloponnesus a second time, about twenty years before the Trojan war. Cleodæus, the son of Hyllus, made a third attempt, and was equally unsuccessful; and his son Aristomachus, some time after, met with the same unfavourable reception, and perished in the field of battle. Aristodemus, Temenus, and Chresphontes, the three sons of Aristomachus, encouraged by the more express word of an oracle, and desirous to revenge the death of their progenitors, assembled a numerous force, and with a fleet invaded all Peloponnesus. Their expedition was attended with much success; and after some decisive battles they became masters of all the peninsula. The recovery of

Peloponnesus by the Heraclidæ forms an interesting epoch in ancient history, which is universally believed to have happened eighty years after the Trojan war, B. C. 1104. This conquest was totally achieved about a hundred and twenty years after the first attempt of Hyllus, who was killed about twenty years before the Trojan war. As it occasioned many changes and revolutions in the affairs of Greece, the return of the Heraclidæ is the epocha of the beginning of profane history: all the time that preceded it is reputed fabulous. Accordingly, Ephorus, Cumeus, Callisthenes, and Theopompus, begin their histories from this era.

HERACLIDES, a Greek philosopher of Pontus, the disciple of Speusippus, and afterwards of Aristotle, flourished about B. C. 336. His vanity prompted him to desire one of his friends to put a serpent into his bed just as he was dead, in order to raise a belief that he was ascended to the heavens among the gods; but the cheat was discovered. All his works are lost.

HERACLITUS, a famous Ephesian philosopher, who flourished about the sixty-ninth Olympiad, in the time of Darius Hystaspes. He is said to have continually bewailed and wept for the wicked lives of men; contrary to Democritus, who made the follies of mankind a subject of laughter. He retired to the temple of Diana, and played at dice with the boys there; saying to the Ephesians who gathered round him, "Worst of men, what do you wonder at? Is it not better to do thus than to govern you?" Darius invited him to come and live with him, but he refused. At last, out of hatred to mankind, he retired to the mountains, where he contracted a dropsy, by living on herbs, which killed him at sixty years of age. His writings gained him great reputation. Laertius mentions a Treatise upon Nature, divided into three books, concerning the universe: the second on politics: the third on theology. This book he deposited in the temple of Diana; and it is said that he affected to write obscurely, lest it should be read by the vulgar, and become contemptible. The fundamental doctrine of his philosophy was, that fire is the principle of all things.

HERALD, [from the Saxon word *Herehault*, a champion of an army,] a term formerly applied to him who, in the army, had the special charge to denounce war, to challenge to battle and combat, to proclaim peace, and to execute martial messages. But the business of heralds, now, is as follows, viz. to marshal, order, and conduct, all royal cavalcades, ceremonies at coronations, royal marriages, installations, creations of dukes, marquises, earls, viscounts, barons, baronets, and dubbing of knights; embassies, funeral-processions, declarations of war, proclamations of peace, &c.: to record and blazon the arms of the nobility and gentry; and to regulate any abuses therein through the British dominions, under the authority of the Earl Marshal, to whom they are subservient. The office of Windsor, Chester, Richmond, Somerset, York, and Lancaster heralds, is to be assistants to the kings at arms, in the different branches of their office; and they are superior to each other, according to creation, in the above order. Heraldry was anciently held in much greater esteem than they are at present; and were created and christened by the king, who, pouring a goldcup of wine on their head, gave them the herald-name: but this is now done by the Earl Marshal. They could not arrive at the dignity of herald without being seven years pursuivant; nor quit the office of herald, but to be made king at arms. Richard III. was the first who formed them, in this kingdom, into a college; and afterwards great privileges were granted them by Edward VI. and Philip and Mary. The origin of heralds is very ancient. Stentor is represented by Homer as herald of the Greeks, who had a voice louder than fifty men together. The Greeks called them *μηνυτεις*, and *μηνυφουδαιες*; and the Romans, *feciales*. The Romans had a college of heralds, appointed to decide whether a war were unjust; and to prevent its coming to open hostilities, till all means had been attempted for deciding the difference in a pacific way.

HERALDRY.

HERALDRY, [*herauldrie*, Fr. from *herehault*, Sax.] is a science which teaches how to blazon, or explain in proper terms, all that belongs to arms; and how to marshal, or dispose regularly, divers arms on a field. It also teaches whatever relates to the marshalling of solemn cavalcades, processions, and other public cere-

monies at coronations, installations, creations of peers, nuptials, christenings of princes, funerals; &c. Arms, or coats of arms, are hereditary marks of honour, made up of fixed and determined colours and figures, granted by sovereign princes, as a reward for military valour, or some signal public service; and serve to denote the

the descent and alliance of the bearer, or to distinguish states, cities, societies, &c. civil, ecclesiastical, and military. Sir John Ferne is of opinion, that we borrowed arms from the Egyptians; meaning from their hieroglyphics. Sir William Dugdale mentions, that arms, as marks of honours were first used by great commanders in war, necessity requiring that their persons should be notified to their friends and followers. The learned Alexander Nisbet, in his excellent System of Heraldry, says, that arms owe their rise and beginning to the light of nature, and that signs and marks of honour were made use of in the first ages of the world, and by all nations, however simple and illiterate, to distinguish the noble from the ignoble. We find in Homer, Virgil, and Ovid, that their heroes had divers figures on their shields, whereby their persons were distinctly known. Alexander the Great, desirous to honour those of his captains and soldiers who had done any glorious action, and also to excite an emulation among the rest, granted them certain badges to be borne on their armour, pennons, and banners; ordering, at the same time, that no person or potentate, through his empire, should attempt or presume to give or tolerate the bearing of those signs upon the armour of any man, but it should be a power reserved to himself; which prerogative has been claimed ever since by all other kings and sovereign princes within their dominions. On this subject, all that can be said with any certainty is, that in all ages, men have made use of figures of living creatures, or symbolical signs, to denote the bravery and courage either of their chief or nation, to render themselves more terrible to their enemies, and even to distinguish themselves or families, as names do individuals. The famous C. Agrippa, in his treatise of the vanity of sciences, cap. 81, has collected many instances of these marks of distinction, anciently borne by kingdoms and states that were any way civilized, viz. the Egyptians bore an ox; the Athenians an owl; the Goths a bear; the Romans an eagle; the Franks a lion; and the Saxons a horse. As to hereditary arms of families, William Cambden, Sir Henry Spelman, and other judicious heralds, agree, that they did not begin till towards the end of the eleventh century. These marks of honour are called arms, from their being principally and first worn by military men at war and tournaments, who had them engraved, embossed, or depicted, on shields, targets, banners, or other martial instruments. They are also called Coats of Arms, from the custom of the ancients embroidering them on the coats they wore over their arms as heralds do to this day. Arms are distinguished by different names, to denote the causes of their bearing: such as, arms of Dominion, of Pretension, of Concession, of Community, of Patronage, of Family, of Alliance, of Succession.

ARMS OF DOMINION, or SOVEREIGNTY, are those which emperors, kings, and sovereign states, constantly bear; being, as it were, annexed to the territories, kingdoms, and provinces, they possess. Thus the three lions are the arms of England, the fleur-de-lis those of the late monarchy of France, &c.

ARMS OF PRETENSION are those of such kingdoms, provinces, or territories, to which a prince or lord has some claim, and which he adds to his own, although the said kingdoms or territories be possessed by a foreign prince or other lord.

ARMS OF CONCESSION, or augmentation of honour, are either entire arms, or else one or more figures, given by princes as a reward for some great service. We read in history, that Robert Bruce, King of Scotland, allowed the Earl of Winton's ancestor to bear, in his coat-armour, a crown supported by a sword, to shew that he, and the clan Seaton, of which he was the head, supported his tottering crown.

ARMS OF COMMUNITY are those of bishoprics, cities, universities, academies, societies, companies, and other bodies corporate.

ARMS OF PATRONAGE are such as governors of provinces, lords of manors, patrons of benefices, &c. add to their family-arms, as a token of their superiority, rights, and jurisdiction. These arms have introduced into heraldry, castles, gates, wheels, ploughs, rakes, harrows, &c.

ARMS OF FAMILY, or PATERNAL ARMS, are those that belong to one particular family, that distinguish it from others, and which no person is suffered to assume without committing a crime, which sovereigns have a right to restrain and punish.

ARMS OF ALLIANCE are those which families or private persons take up and join to their own, to denote the alliances they have contracted by marriage. This sort of arms is either impaled, or

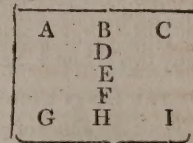
borne in an escutcheon of pretence, by those who have married heiresses.

ARMS OF SUCCESSION are such as are taken up by those who inherit certain estates, manors, &c. either by will, entail, or donation, and which they either impale or quarter with their own arms; which multiplies the titles of some families out of necessity, and not through ostentation, as many imagine. These are the eight classes under which the various sorts of arms are generally ranged; but there is a sort which blazoners call assumptive arms, being such as are taken up by the caprice or fancy of upstarts, though of ever so mean extraction, who, being advanced to a degree of fortune, assume them without a legal title. This, indeed, is a great abuse of heraldry; and common only in Britain, for on the continent no such practice takes place. The essential and integral parts of arms are these: 1. The **ESCUTCHEON**: 2. The **TINCTURES**: 3. The **CHARGES**: 4. The **ORNAMENTS**.

OF THE SHIELD OR ESCUTCHEON.

The Shield or Escutcheon is the field or ground whereon are represented the figures that make up a coat of arms: for these marks of distinction were put on bucklers or shields before they were placed on banners, standards, flags, and coat-armour; and wherever they may be fixed, they are still on a plane or superficies whose form resembles a shield. Shields, escutcheons, or scutcheons, are of different forms, according to different times and nations. Amongst ancient shields, some were almost like a horse-shoe such as is represented in the figure of Escutcheons, Plate LXXXVI. others triangular, somewhat rounded at the bottom. That of knights banneret was square, like a banner. As to modern escutcheons, those of the Italians, particularly of ecclesiastics, are generally oval. The English, French, Germans, and other nations, have their escutcheons formed different ways, according to the carver's or painter's fancy: see the various examples in the plates. But the escutcheons of maids, widows, and of such as are born ladies, and are married to private gentlemen, is in the form of a lozenge. Amorists distinguish several parts or points in escutcheons, in order to determine exactly the position of the bearings they are charged with; they are here denoted by the first nine letters of the alphabet ranged in the following manner:

- A — the dexter chief.
- B — the precise middle chief.
- C — the sinister chief.
- D — the honour point.
- E — the fess point.
- F — the nombril point.
- G — the dexter base.
- H — the precise middle-base.
- I — the sinister base.



The knowledge of these points is of great importance, for they are frequently occupied with several things of different kinds. The dexter side of the escutcheon is opposite to the left hand, and the sinister side to the right of the hand of the person that looks on it.

OF TINCTURES.

By tinctures is meant, that variable hue of arms which is common both to shields and their bearings. The seven tinctures chiefly used are differently expressed as follows.

The Proper Colours.	By tinctures for Commoners.	By Precious Stones for Peers.	By Planets for Princes, Kings, and Emperors.
Yellow	Or	Topaz	Sol
White	Argent	Pearl	Luna
Red	Gules	Ruby	Mars
Blue	Azure	Sapphire	Jupiter
Purple	Purpure	Amethyst	Mercury
Black	Sable	Diamond	Saturn
Green	Vert	Emerald	Venus

When natural bodies, such as animals, plants, celestial bodies, &c. are

&c. are introduced into coats of arms, they frequently retain their natural colours, which is expressed in this science by the word proper. Besides the colours abovementioned, the English writers on heraldry admit two others, viz.

Orange,
Blood-colour, } termed { Tenny.
Sanguine.

But these two are rarely to be found in British bearings. These tinctures are represented in engravings and drawings (the invention of the ingenious Silvester Petra Sancta, an Italian author of the last century) by dots and lines, as in Plate LXXXVI. Or is expressed by dots. Argent needs no mark, and is therefore plain. Azure, by horizontal lines. Gules, by perpendicular lines. Vert, by diagonal lines from the dexter chief to the sinister base points. Purpure, by diagonal lines from the sinister chief to the dexter base points. Sable, by perpendicular and horizontal lines crossing each other. Tenny, by diagonal lines from the sinister chief to the dexter base points, traversed by horizontal lines. Sanguine, by lines crossing each other diagonally from dexter to sinister, and from sinister to dexter. The English heralds give different names to the roundlet, according to its colour. Thus, if it be Or, it is called a Bezant; Argent, a Plate; Azure, a Hurt; Gules, a Torteaux; Vert, a Pomey; Purpure, a Golpe; Sable, a Pellet; Tenny, an Orange; and Sanguine, Guze.

OF FURS.

Furs represent the hairy skin of certain beasts, prepared for the doublings or linings of robes and garments of state; and as shields were anciently covered with furred skins; they are therefore used in heraldry, and are,

1. *Ermine*; which is a field-argent, powdered with black spots, their tails terminating in three hairs.
2. *Ermines*; or *Counter-ermine*, where the field is sable, and the powdering white.
3. *Erminoise*; the field Or, the powdering Sable.
4. *Vair*, which is expressed by blue and white skins, cut into the forms of little bells, ranged in rows opposite to each other, the base of the white ones being always next to that of the blue ones. Vair is usually of six rows; if there be more or fewer, the number ought to be expressed; and if the colours are different from those above mentioned, they must likewise be expressed.
5. *Pean*; the field is Sable, the powdering Or.
6. *Potent*, anciently called *Vairy-cuppy*, as when the field is filled with crutches or potents counter-placed. Vair and Potent may be any two colours. See Plate LXXXVI.

OF THE LINES USED IN THE PARTING OF FIELDS.

Escutcheons are either of one tincture, or more than one. Those that are of one only, that is, when some metal, colour, or fur, is spread all over the surface or field, such a tincture is said to be predominant: but in such as have on them more than one, as most have, the field is divided by lines; which according to their divers forms, receive various names. Lines may be either straight or crooked. Straight lines are carried evenly through the escutcheon: and are of four different kinds; viz. a perpendicular line |; a horizontal, —; a diagonal dexter, /; a diagonal sinister, \. Crooked lines are those which are carried unevenly through the escutcheon with rising and falling, the figures and names of which are as in Plate LXXXVI. viz. 1. The engrailed. 2. The invected. 3. The wavy. 4. The nebule. 5. The embattled or crenelle. 6. The raguly. 7. The indented. 8. The dancette. 9. The dove-tail. The principal reason why lines are thus used in heraldry, is to difference bearings which would be otherwise the same; for an escutcheon charged with a chief engrailed differs from one charged with a chief wavy, as much as if the one bore a cross and the other a saltier. As the forementioned lines serve to divide the field, if the division consists of two equal parts made by the perpendicular line, it is called parted per pale; by the horizontal line, parted per fess; by the diagonal dexter, parted per bend; by the diagonal sinister, parted per bend sinister; examples of which will be given in the sequel of this treatise. If a field be divided into four equal parts by any of these lines, it is said to be quartered; which may be done two ways, viz. Quartered or parted per cross; which is made by a perpendicular and horizontal line, which, crossing each other at the centre of the field, divide it

into four equal parts called quarters. Quartered or parted per saltier; which is made by two diagonal lines, dexter and sinister, that cross one another in the centre of the field, and likewise divide it into four equal parts. The escutcheon is sometimes divided into a greater number of parts, in order to place in it the arms of the several families to which one is allied; and in this case it is called a genealogical achievement. These divisions may consist of six, eight, 12, and 16, quarters, [as the royal arms,] and even sometimes of 20, 32, 64, and upwards; there being examples of such divisions frequently exhibited at pompous funerals. But Sir William Dugdale very justly objects to so many arms being clustered together in one shield or banner, on account of the difficulty of discerning and knowing asunder one coat of arms from another.

OF THE DIFFERENCES OF COATS OF ARMS.

Armorists have invented many differences or characteristical marks, whereby bearers of the same coat of arms are distinguished each from others, and their nearness to the principal bearer demonstrated. According to J. Guillim, these differences are to be considered either as ancient or modern. Those he calls ancient differences consist in bordures; which is a bearing that goes all round, and parallel to the boundary of the escutcheon. Bordures were used in ancient times for the distinguishing not only of one nation or tribe from another, but also to note a diversity between particular persons descended of one family and from the same parents. The bordure is generally one-sixth part of the breadth of the shield, and is engrailed, indented, charged, componed, and countered. If the inner line of the bordure is straight and the latter plain, the colour of the bordure alone is named in blazoning; if it is charged with parts of plants or flowers, it is described as verdoy of trefoils. If it consists of ermines, Vair or vairy, or any of the furs, the heralds say purflew of ermines. When charged with martlets, charged with an enaluron of martlets. There are bordures of different forms and tinctures, as in the examples, in Plate LXXXVI. Bordures are generally used as a difference between families of the same name, and also as marks of illegitimacy. The modern differences, which the English have adopted, not only for the distinguishing of sons issued out of one family, but also to denote the difference and subordinate degrees in each house from the original ancestors, are nine, viz. For the heir or first son, the Label. Second son, the Crescent. Third son, the mullet. Fourth son, the martlet. Fifth son the Annulet. Sixth son, the Flower-de-lis. Seventh son, the Rose. Eighth son, the Cross-moline. Ninth son, the Double Quarter foil. See Plate LXXXVI. But of all these marks of distinction, none but the label is affixed on the coats of arms belonging to any of the royal family. As to the distinction to be made in the arms of the offspring belonging to each of the above-mentioned brothers, it is expressed by figures on the table of houses, given in Plate LXXXVI. For instance, The heir or first son of the second house, bears a crescent charged with a label during his father's life only. The second son of the second house, a crescent charged with another crescent. The third son of the second house, a crescent charged with a mullet. The fourth son of the second house, a crescent charged with a martlet. The fifth son of the second house, a crescent charged with an annulet. The sixth son of the second house, a crescent charged with a fleur-de-lis; and so on of the other sons, taking care to have them of a different tincture. In like manner the seventh son of the eighth house, a rose charged with a cross moline; this is easily understood, though the table does not extend so far. The daughters of families are permitted to bear their fathers arms, with the same distinctions used by them. An abatement is a casual mark annexed to coat-armour, which announces some dishonourable act of the bearer. Abatements consist of diminution and reversing, the first is the blemishing of some particular point of the escutcheon by sanguine and tennue, which are stains; were the metals used they would be considered additions of honour. See Plate LXXXVI. Augmentations are additional charges borne on an escutcheon, a canton, or chief, and given as particular marks of honour. See Plate LXXXVI.

OF THE CHARGES.

Whatsoever is contained in the field, whether it occupy the whole or only a part thereof, is called a charge. All charges are distinguished

distinguished by the names of honourable ordinaries, sub-ordinaries, and common charges.

1. **HONOURABLE ORDINARIES**, the principal charges in heraldry, are made of lines only, which, according to their disposition and form, receive different names.

2. **SUB-ORDINARIES** are ancient heraldic figures, frequently used in coats of arms, and which are distinguished by terms appropriated to each of them.

3. **COMMON CHARGES** are composed of natural, artificial, and even chimerical things; such as planets, creatures, vegetables, instruments, &c.

1. The most judicious armorists admit only of nine honourable ordinaries, viz. The chief; the Pale; the Bend; the Bend Sinister; the Fess; the Bar; the Chevron; the Cross; and the Saltier.

1. The **CHIEF** is an ordinary determined by an horizontal line, which, if it be of any other form but straight, must be expressed. It is placed in the upper part of the escutcheon, and contains in depth the third part of the field. Its diminutive is a fillet, the content of which is not to exceed one-fourth of the chief, and stands in the lowest part thereof. This ordinary is subject to be charged with variety of figures; and may be indented, wavy, nebule, &c. It is peculiar to those who have obtained it by extraordinary merit. The examples in plate LXXXVI. are Or, a chief Gules, and Azure, a chief, invecked, Or.

The **PALE** is an ordinary, consisting of two perpendicular lines drawn from the top to the base of the escutcheon, and contains the third middle-part of the field. Its diminutives are, the pallet, which is the half of the pale; and the endorse, which is the fourth part of a pale. This ordinary and the pallet may receive any charge, but the endorse should not be charged. The example is Gules, a pale Or.

3. The **BEND** is an ordinary formed by two diagonal-lines, drawn from the dexter chief to the sinister base; and contains the fifth part of the field in breadth, if uncharged; but if charged, then the third. Its diminutives are, the bendlet, which is the half of a bend; the cost or cotice, when two of them accompany a bend, which is the fourth part of a bend; and the ribband, the moiety of a cost, or the 8th part of a field. Example, Or, a bend Azure.

The **BEND SINISTER** is of the same breadth as the bend, but drawn the contrary way: this is subdivided into a scrape, which is the half of the bend, and into a bâton, which is the fourth part of the bend, but does not extend itself to the extremities of the field, there being part of it seen at both ends. See Plate LXXXVI. Example, Gules, a bâton argent.

4. The **FESS** is situated in the centre of the shield, and contains in breadth the third part of the escutcheon. See Plate LXXXVII. the example is Azure, a fess Argent.

5. The **BAR** differs from the fess only, as it is but the fifth part of the shield. It is divided into the closet, or a moiety of the bar; and the barulet, or half the closet. When the shield contains a number of bars of metal and colour alternate, of even number, that is called barry of so many pieces, expressing their number.

6. The **CHEVRON**, which represents two rafters of a house well joined together, or a pair of compasses half open, takes up the fifth part of the field with the English, but the French gave it the third. Its diminutives are, The cheveronnel, which contains the half of a chevron; and the couple-close, which is the half of a cheveronnel, that is, its breadth is but the fourth part of a chevron. See Plate LXXXVII. Example, Gules, a cheveron Or.

7. The **CROSS** is an ordinary formed by the meeting of two perpendicular with two horizontal lines in the fess point, where they make four right angles; the lines are not drawn throughout, but discontinued the breadth of the ordinary, which takes up only the fifth part of the field when not charged; but if charged, then the third. It is borne as well engrailed, indented, &c. as plain. The example, Plate LXXXVII. is, Or, a cross Sable. There is a great variety of crosses used in heraldry. The moline is a cross which turns round both ways, at each of the four extremities like a hook. The crosslet is a cross crossed again near the extremities at each end. See Plate LXXXVI. Argent, a crosslet vert.

8. **SALTIER** which is formed by the bend and bend sinister crossing each other in right angles, as the intersecting of the pale and fess forms the cross, contains the fifth part of the field; but if charged, then the third. It may, like the others, be borne engrailed, wavy, &c. as also between charges, or charged with any thing.

See Plate LXXXVII. example, Sable a saltier embattled, counter embattled, Argent.

II. The heraldic figures, called Sub-Ordinaries, or Ordinaries only, which, by reason of their ancient use in arms, are of worthy bearing, viz. The Gyron, Franc-quarter, Canton, Paire, Fret, Pile, Orle, Inescutcheon, Tressure, Annulet, Flanches, Flasques, Voiders, Billet, Lozenge, Guttés, Fusil, Rustré, Mascle, Papilone, and Diaper. See Plate LXXXVII.

The **GYRON** is a triangular figure formed by two lines, one drawn diagonally from one of the four angles to the centre of the shield, and the other is drawn either horizontal or perpendicular, from one of the sides of the shield, meeting the other line at the centre of the field. The figure, Plate LXXXVII. Or, a gyron, Azure. Gyronny is when the field is covered with six, eight, or twelve gyrons in a coat of arms.

The **FRANC-QUARTER** is a square figure, which occupies the upper dexter quarter of the shield. It is but rarely carried as a charge. Example, Or, a quarter Azure.

The **CANTON** is a square part of the escutcheon, somewhat less than the quarter, but without any fixed proportion. It represents the banner that was given to ancient knights bannerets, and, generally speaking, possesses the dexter-chief point of the shield, as in the figure; but should it possess the sinister corner, which is but seldom, it must be blazoned by a canton sinister. It is added to coats of arms of military men as an augmentation of honour. See Plate LXXXVII. Argent, a canton Gules.

The **PAIRLE** is a figure formed by the conjunction of the upper half of the saltier with the under half of the pale.

The **FRET** is a figure representing two little sticks in saltier, with a mascle in the centre interlaced. Fretty is said when the field or bearings are covered with a fret of six, eight, or more pieces, as in Plate LXXXVII. The word fretty may be used without addition, when it is of eight pieces; but if there be less than that number, they must be specified.

The **PILE**, which consists of two lines, terminating in a point, is formed like a wedge, and is borne engrailed, wavy, &c. It issues in general from the chief, and extends towards the base; yet there are some piles borne in bend, and issuing from other parts of the field. The figure, Plate LXXXVII. is Azure, a pile ermine.

The **ORLE** is an ordinary composed of two lines going round the shield, the same as the bordure, but its breadth is but one-half of the latter, and at some distance from the brim of the shield.

The **INESCUTCHEON** is a little escutcheon borne within the shield. That which is fixed on the fess point is called escutcheon of pretence, which is to contain the arms of a wife that is an heiress. The fig. Plate LXXXVII. is ermine, an inescutcheon gules.

The **TRESSURE** is an ordinary commonly supposed to be the half of the breadth of an orle, and is generally borne flowery and counter-flowery, as it is also very often double, and sometimes treble. Example, Argent, a tressure gules.

The **ANNULET**, or **RING**, is a well-known figure, and is frequently to be found in arms through every kingdom in Europe. See Plate LXXXVI.

The **FLANCHES** are formed by two curved lines, or semicircles, being always borne double. Plate LXXXVII. Or, Flanches, gules.

FLAQUES resemble the flanches, except that the circular lines do not go so near the centre of the field.

The **VOIDERS** are by Guillim considered as a sub-ordinate ordinary, and are not unlike the flasques, but they occupy less of the field.

The **BILLET** is an oblong square, twice as long as broad. Some heralds imagine, that they represent bricks for building; others more properly consider them as representing folded paper or letters. See Plate LXXXVI.

The **LOZENGE** is an ordinary of four equal and parallel sides, but not rectangular; two of its opposite angles being acute, and the other two obtuse. Plate LXXXVII. Or, a lozenge azure.

GUTTES, or **DROPS**, are round at bottom, waved on the sides, and terminate at the top in points. Herald's have given them different names according to their different tinctures: thus, if they are yellow, they are called Goutte d'Or; if white, d'Eau; if red, de Sang; if blue, de Larmes; if green, de Vert; if black, de Poix. See Plate LXXXVII. Argent, goutte de sang.

The **FUSIL** is longer than the lozenge, having its upper and lower part more acute and sharp than the other two collateral mid-

dle parts, which acuteness is occasioned by the short distance of the space between the two collateral angles; which space, if the fusil is rightly made, is always shorter than any of the four equal geometrical lines whereof it is composed. See Plate LXXXVII. Gules, a fusil argent.

The **RUSTRE** is a lozenge pierced round in the middle, called by the Germans *rutten*.

The **MASCLE** is pretty much like a lozenge, but voided or perforated through its whole extent, shewing a narrow border. See Plate LXXXVI.

PAPILLONE is an expression used for a field or charge that is covered with figures like the scales of a fish. The proper term for it in English would be scallop-work.

DIAPERING is said of a field or charge, shadowed with flourishing or foliage with a colour a little darker than that on which it is wrought, only serves to embellish the coat. Partitions are such in which there is no tincture from metal, colour, or fur, predominating in them, and are formed of various lines of partition, often causing counterchanging and transmutation. This kind of bearing may be engrailed, &c. See fig. A, Plate LXXXVII. Parted per pale argent and gules. An example of counterchanges is given in fig. B, Argent, a cross per pale, gules and sable. Another example is exhibited in fig. C. Gules on a chevron argent, three bars, gemell's sable. If the fore-mentioned ordinaries have any attributes, that is, if they are engrailed, indented, wavy, &c. they must be distinctly specified, after the same manner as the honourable ordinaries.

III. THE COMMON CHARGES ARE VERY NUMEROUS.

As in all ages men have made use of representations of animals and other symbols to distinguish themselves in war, human ingenuity has been not a little exerted, in multiplying these marks of distinction, by all sorts of figures, some natural, others artificial, and many chimerical; in allusion to the state, quality, or inclination, of the bearer. Hence the sun, moon, stars, comets, meteors, &c. have been introduced to denote glory, grandeur, power, &c. Lions, leopards, tigers, serpents, stags, &c. have been employed to signify courage, strength, prudence, swiftness, &c. War, hunting, music, &c. have furnished lances, swords, pikes, arms, fiddles, &c. Architecture, columns, cheverons, &c.; and the other arts various things that relate to them. Human bodies, or parts of them, as well as clothes, and ornaments, have, for particular intentions, found place in armory. Trees, plants, fruits, and flowers, have also been adopted, to denote the rarities, advantages, and singularities, of different countries. The relation of some creatures, figures, &c. to particular names, has been likewise a very fruitful source of variety in arms. Thus the family of *Corningsby* bears three coney; of *Arundel*, six swallows, from *hirundo*, the Latin for a swallow; of *Urson*, a bear, from the Latin *ursus*; of *Lucie*, three pikes, in Latin *tres lucius pisces*; of *Starkey*, a stork; of *Castleman*, a castle triple-towered; of *Shuttleworth*, three weaver's shuttles, &c. Besides these natural and artificial figures, many chimerical or imaginary ones are used in heraldry, the result of fancy and caprice; such as centaurs, hydras, phenixes, griffons, dragons, &c. This great variety of figures prevents us from comprehending all common charges in a work of this nature; therefore such only are treated of as are most frequently borne in coats of arms. Celestial figures are borne single, upon or between any of the honourable ordinaries, and then three are the usual number. See fig. D, Plate LXXXVII. Diamond, a fess ermine, between three crescents pearl. Fig. E is an example of vegetables used in arms. Vert five fig-leaves in saltier. Of animals the lion is the most honourable; and all bearings of quadrupeds are more honourable than fowls, and fowls than fishes. Fig. F. Or, a lion rampant sable. Fig. G. Gules, a talbot passant, a chief ermine. Fig. H. Ermine, an eagle displayed, gules. Fig. I. Azure, three trouts fretted in triangle argent. These charges have, as well as ordinaries, various attributes or epithets, which express their qualities, positions, and dispositions. Thus the sun is said to be in his glory, eclipsed, &c. The moon, in her complement, increscent, &c. Animals are said to be rampant, passant, &c. Birds have also their denominations, such as close, displayed, &c. Fishes are described to be hauriant, naiant, &c. Lions are termed *lioncels*, if more than two in a field, and eagles *eaglets*. A lion is said to be couchant, when ly-

ing down; and rampant, when standing on his hind-legs, and rearing up his fore-feet, as if climbing. Trees and plants are also said to be trunked, eradicated, fructuated, or raguled, according as they are represented in arms. Artificial figures have different epithets, serving either to express their position, disposition, or make: viz. swords are said to be erect, pommeled, hilted, &c.; arrows, armed, feathered, &c.; towers, covered, embattled, &c.; and so on of all others. Some of these epithets are exemplified in Plate LXXXVII.

OF THE EXTERNAL ORNAMENTS OF ESCUTCHEONS.

The ornaments that accompany or surround escutcheons were introduced to denote the birth, dignity, or office, of the persons to whom the coat of arms appertaineth; which is practised both among the laity and clergy. Those most in use are of ten sorts, viz. Crowns, Coronets, Mitres, Helmets, Mantlings, Chapeaux, Wreaths, Crests, Scrolls, and Supporters.

CROWNS. The first crowns were only diadems, bands, or fillets; afterwards they were composed of branches of trees, and then flowers were added to them. Among the Greeks, the crowns given to those who carried the prize at the Isthmian games, were of pine; at the Olympic, of laurel; and at the Nemean, of smallage. The Romans had various crowns to reward martial exploits and extraordinary services done to the republic; for which see the article **CROWN**.

Examples of some of these **ANCIENT CROWNS** are frequently met with in modern achievements, as 1. The mural crown. 2. The naval or rostral crown. 3. The castense or vallary crown. 4. The civic crown. 5. The radiated crown. 6. The celestial crown, formed like the radiated, with the addition of a star on each ray; is only used upon tomb-stones, monuments, and the like. Others of the ancient crowns are still borne as crests.

But **MODERN CROWNS** are only used as ornaments, which emperors, kings, and independent princes, set on their heads, in great solemnities, to denote their sovereign authority. These are the most in use in heraldry, and are as follows:

The **IMPERIAL CROWN** is made of a circle of gold, adorned with precious stones and pearls, heightened with fleurs-de-lis, bordered and seeded with pearls, raised in the form of a cap voided at the top, like a crescent. From the middle of this cap rises an arched fillet enriched with pearls, and surmounted of a mound, whereon is a cross of pearls. See Plate LXXXVII.

The **CROWN of the KINGS of GREAT BRITAIN**, is a circle of gold, bordered with pearls and precious stones, and heightened up with four crosses pattee and four large fleurs-de-lis alternately; from these rise four arched diadems adorned with pearls, which close under a mound, surmounted of a cross like those at bottom. Mr. Sandford, in his *Genealogical History*, p. 381, remarks, that Edward IV. is the first king of England, who in his seal, or on his coin, is crowned with an arched diadem. See Plate LXXXVII.

The crowns of Spain and Portugal, are a ducal coronet, heightened up with eight arched diadems that support a mound, ensigned with a plain cross. Those of Denmark and Sweden consist of eight arched diadems, rising from a marquis's coronet, which conjoin at the top under a mound ensigned with a cross botone.

The crowns of most other kings of Europe are circles of gold, adorned with precious stones, and heightened up with large trefoils, and closed by four, six, or eight diadems, supporting a mound, surmounted of a cross.

The **Grand Signior** bears over his arms a turban, enriched with pearls and diamonds, under two coronets, the first of which is made of pyramidal points heightened up with large pearls, and the uppermost is surmounted with crescents.

The **Pope** appropriates to himself a Tiara, or long cap of golden cloth, from which hang two pendants embroidered and fringed at the ends, semee of crosses of gold. This cap is inclosed by three marquis's coronets; and has on its top a mound of gold.

CORONETS. The **Coronet of the PRINCE of WALES**, or eldest son of the king of Great Britain was anciently a circle of gold set round with four crosses-pattee, and as many fleurs-de-lis alternately; but since the restoration, it has been closed with one arch only, adorned with pearls, and surmounted of a mound and cross, and bordered with ermine like the king's. See Plate LXXXVII. But besides the coronet, his royal highness has another distinguish-

ing mark of honour, peculiar to himself, viz. A plume of three ostrich-feathers, with a coronet of the ancient princes of Wales. Under it in a scroll, is this motto, *Ich Dien*, which in the German or old Saxon language signifies, *I serve*. This device was at first taken by Edward prince of Wales, commonly called the Black Prince, after the battle of Cressy, in 1346, where having with his own hand killed John king of Bohemia, he took from his head such a plume, and put it on his own.

The coronet of all the PRINCES, immediate sons and brothers of the kings of Great Britain, is a circle of gold, bordered with ermine, heightened up with four fleurs-de-lis, and as many crosses-patee alternate. The particular and distinguished form of such coronets as are appropriated to princes of the blood-royal, is described and settled in a grant of the 13th of Charles II.

The coronet of the PRINCESSES of Great Britain is a circle of gold, bordered with ermine, and heightened up with crosses-patee, fleurs-de-lis, and strawberry leaves alternate.

A DUKE's coronet is a circle of gold bordered with ermine, enriched with precious stones and pearls, and set round with eight large strawberry or parsley leaves.

A MARQUIS's coronet is a circle of gold, bordered with ermine, set round with four strawberry leaves, and as many pearls on pyramidal points equal height, alternate.

An EARL's coronet is a circle of gold, bordered with ermine, heightened up with eight pyramidal points or rays, on the tops of which are as many large pearls, and are placed alternately with as many strawberry-leaves, but the pearls much higher than the leaves.

A VISCOUNT's coronet differs from the preceding ones as being only a circle of gold bordered with ermine, with large pearls set close together on the rim, without any limited number, which is his prerogative above the baron, who is limited.

A BARON's coronet, which was granted by king Charles II. is formed with six pearls set at equal distances on a gold-circle, bordered with ermine, four of which only are seen on engravings, paintings, &c. to shew he is inferior to the viscount.

The eldest sons of peers, above the degree of a baron, bear their father's arms and supporters with a label, and use the coronet appertaining to their father's second title; and all the younger sons bear their arms with proper differences, but use no coronets. See Plate LXXXVII.

MITRES. The archbishops and bishops of England and Ireland place a mitre over their coats of arms. It is a round cap pointed and cleft at the top, from which hang two pendants fringed at both ends; with this difference, that the bishop's mitre is only surrounded with a fillet of gold, set with precious stones; whereas the archbishop's issues out of a ducal coronet. See Plate LXXXVIII. This ornament, with other ecclesiastical garments, is still worn by the archbishops and bishops of the church of Rome, whenever they officiate with solemnity; but it is never used in England, except on coats of arms.

HELMETS. The helmet was formerly worn as a defensive weapon, to cover the bearer's head and face; and is now placed over a coat of arms as its chief ornament, and the true mark of gentility. The helmets of sovereigns were of burnished gold damasked; those of princes and lords, of silver figured with gold; those of knights, of steel adorned with silver; and those of private gentlemen, of polished steel. As to their form; Those of the kings and royal family, and noblemen, of Great Britain, are open-faced and grated, and the number of bars serves to distinguish the bearer's quality; that is, the helmet appropriated to the dukes and marquises is different from the king's, by having a bar exactly in the middle, and two on each side, making but five bars in all, whereas the king's helmet has six bars, viz. three on each side. The other grated helmet with four bars is common to all degrees of peerage under a marquis. The open-faced helmet without bars denotes baronets and knights. The close helmet is for all esquires and gentlemen. Their position is also looked upon as a mark of distinction. The grated helmet in front belongs to sovereign princes. The grated helmet in profile is common to all degrees of peerage. The helmet standing direct without bars, and the beaver a little open, denote baronets and knights. Lastly, the side-standing helmet, with beaver close, is the way of wearing it amongst esquires and gentlemen. See Plate LXXXVIII.

MANTINGS. These are pieces of cloth jagged or cut into

flowers and leaves, which serve as an ornament for escutcheons. They were the ancient coverings of helmets, to preserve them, or the bearer, from the injuries of the weather; as also to prevent the ill consequences of their too much dazzling the eye in action. But Guillim very judiciously observes, that their shape must have undergone a great alteration since they have been out of use, and therefore might more properly be termed flourishings than mantlings.

CHAPEAU. This is an ancient hat, or rather cap, of dignity, worn by dukes, generally scarlet-coloured velvet on the outside, lined and turned up with fur; of late frequently to be met with above an helmet, instead of a wreath, under gentlemen's and noblemen's crests. See Plate LXXXVIII.

WREATH. This is a kind of roll, made of two skains of silk of different colours twisted together, which ancient knights wore as a head-dress when equipped for tournaments. The colours of the silk are always taken from the principal metal and colour contained in the bearer's coat of arms. They are still accounted one of the lesser ornaments of escutcheons, and are placed between the helmet and the crest.

The CREST is the highest part of the ornaments of a coat of arms. It is called crest, from the Latin word *crista*, which signifies comb or tuft, such as many birds have upon their heads, as the peacock, pheasant, &c. in allusion to the place on which it is fixed. Crests were formerly great marks of honour, because they were only worn by heroes of great valour, or by such as were advanced to some superior military command, that they might be the better distinguished in an engagement, and thereby rally their men if dispersed; but they are at present considered as mere ornaments.

The SCROLL. The scroll is the ornament placed sometimes above the crest, but most usually below the shield and supporters; containing a motto, or short sentence, alluding thereto, or to the bearings; or to the bearer's name, as in the two following instances. The motto of the noble earl of Cholmondeley is, *Cassid tutissima virtus*; i. e. "Virtue is the safest helmet;" on account of the helmet in the coat of arms. The motto of the right hon. lord Fortescue is, *Forte scutum salus ducum*; i. e. "A strong shield is the safety of the commanders;" alluding to the name of that ancient family. Sometimes it has reference to neither, but expresses something divine or heroic; as that of the earl of Scarborough, which is, *Murus areus conscientia sana*; i. e. "A good conscience is a wall of brass." Others are enigmatical; as that of the royal achievement, which is, *Dieu et mon droit*, i. e. "God and my right;" introduced by Edward III. in 1340.

SUPPORTERS. These are figures standing on the scroll, and placed at the side of the escutcheon; they are so called, because they seem to support or hold up the shield. The rise of supporters is, by F. Menestrier, traced up to ancient tournaments, wherein the knights caused their shields to be carried by servants or pages under the disguise of lions, bears, griffons, blackmoors, &c. who also held and guarded the escutcheons, which the knights were obliged to expose to public view for some time before the lists were opened. Sir George Mackenzie, who dissents from this opinion, says, in his "Treatise on the Science of Heraldry," chap. xxxi. p. 93. "That the first origin and use of them was from the custom which ever was, and is, of leading such as are invested with any great honour to the prince who confers it: thus, when a man is created a duke, marquis, or knight of the garter, or any other order, he is supported by, and led to the prince betwixt two of the quality, and so receives from him the symbols of that honour; and in remembrance of that solemnity, his arms are thereafter supported by any two creatures he chooses." Supporters have formerly been taken from such animals or birds as are borne in the shields, and sometimes they have been chosen as bearing some allusion to the names of those whose arms they are made to support. The supporters of the arms of Great Britain, since king James the First's accession to the throne, are a Lion rampant guardant crowned Or, on the dexter side, and an Unicorn Argent, crowned, armed, unguled, maned and gorged with an antique Crown, to which a chain is affixed, all Or, on the sinister. See Plate LXXXVIII. Bearing coats of arms supported, is, according to the heraldic rules of England, the prerogative, 1st, Of those called nobles majores, viz. dukes, marquises, earls, viscounts, and

barons: 2d, Of all knights of the garter, though they should be under the degree of barons; and 3d, Of knights of the Bath, who both receive on their creation a grant of supporters. And, lastly, of such knights as the king chooses to bestow this honour upon; as in the instance of Sir Andrew Fountain, who was knighted by Philip earl of Pembroke, when lord lieutenant of Ireland, Fountain being then secretary; and on his return to England, King William granted him supporters to his arms, viz. two Griffons, Gules, and Or. In Scotland, all the chiefs of clans or names have the privilege of claiming supporters; also the barons.

RULES OF BLAZONING.

I. The first and most general rule is, to express heraldic distinctions in proper terms, so as not to omit any thing that ought to be specified, and at the same time to be clear and concise without tautology.

II. Begin with the tincture of the field, and then proceed to the principal charges which possess the most honourable place in the shield, such as Fess, Chevron, &c. always naming that charge first which lies next and immediately upon the field.

III. After naming the tincture of the field, the honourable ordinaries, or other principal figures, specify their attributes, and afterwards their metal or colour.

IV. When an honourable ordinary, or some one figure, is placed upon another, whether it be a Fess, Chevron, Cross, &c. it is always to be named after the ordinary or figure over which it is placed, with one of these expressions, sur tout, or over all.

V. In blazoning such ordinaries as are plain, the bare mention of them is sufficient; but if an ordinary should be made of any of the crooked lines mentioned above, its form must be specified; that is, whether it be Engrailed, Wavy, &c.

VI. When a principal figure possesses the centre of the field, its position is not to be expressed: or (which amounts to the same thing) when a bearing is named, without specifying the point where it is placed, then it is understood to possess the middle of the shield.

VII. The number of the points of mullets or stars must be specified when more than five; and also if a mullet or any other charge be pierced, it must be mentioned as such, to distinguish it from what is plain.

VIII. When a ray of the sun, or other single figure, is borne in any other part of the escutcheon than the centre, the point it issues from must be named.

IX. The natural colour of trees, plants, fruits, birds, &c. is no otherwise to be expressed in blazoning but by the word proper; but if discoloured, that is, if they differ from their natural colour it must be particularized.

X. When three figures are in a field, and their position is not mentioned in the blazoning, they are always understood to be placed two above, and one below.

XI. When there are many figures of the same species borne in a coat of arms, their number must be observed as they stand, and distinctly expressed.

There are other positions called irregular; as for example, when three figures which are naturally placed two and one, are disposed one and two, &c. It must also be observed, that when the field is strewn with the same figures, this is expressed by the word semee; but if the figures strewn on the field are whole ones, it must be denoted by the words sans nombre; whereas, if part of them is cut off at the extremities of the escutcheon, the word semee or semi is then to be used.

We shall add a few examples to illustrate these rules, and for other examples refer the reader to the different works on this subject.

Plate LXXXVII. fig. K, Or, on a chief gules, three plates. Fig. L, Argent, three torteauxes in chief. Fig. M, Argent, a fess, in chief three lozenges sable. Fig. N, Ermine, on a chevron engrailed azure, three stars argent. Fig. O, Or, a lion passant sable, in chief three pales of the second. Fig. P, Azure, a tortoise erect, Argent. Fig. Q, Argent, a dragon's head erased vert, holding in his mouth a sinister hand, couped at the wrist, gules. Fig. R, Sable, a pile argent, surmounted of a chevron gules. Fig. S, Quarterly, first and fourth azure, a pale argent; second and third gules, a bend argent.

OF MARSHALLING COATS OF ARMS.

By marshalling coats of arms, is to be understood the art of disposing divers of them in one escutcheon, and of distributing their contingent ornaments in proper places. Various causes may occasion arms to be thus conjoined.

I. When the coats of arms of a married couple, descended of distinct families, are to be put together in one escutcheon, the field of their respective arms is conjoined pale-ways, and blazoned parted per Pale, Baron and Femme, two coats; first, &c. In which case the baron's arms are always to be placed on the dexter side, and the femme's arms on the sinister side. See Plate LXXXVIII.

II. If a widower marry again, his late and present wife's arms are, according to G. Leigh, "to be both placed on the sinister side, in the escutcheon with his own, and parted per Pale. The first wife's coat shall stand on the Chief, and the second on the Base; or he may set them both in Pale with his own, the first wife's coat next to himself, and his second outermost. If he should marry a third wife, then the two first matches shall stand on the Chief, and the third shall have the whole Base. And if he take a fourth wife, she must participate one-half of the Base with the third wife, and so will they seem to be so many coats quartered." But these forms of impaling are meant of hereditary coats, whereby the husband stands in expectation of having the hereditary possessions of his wife united to his patrimony. If a man marry a widow, he marshals her maiden arms only. See Plate LXXXVIII.

III. In the arms of femmes joined to the paternal coat of the baron, the proper differences by which they were borne by the fathers of such women must be inserted.

IV. If a coat of arms that has a Bordure be impaled with another, as by marriage, then the Bordure must be wholly omitted in the side of the arms next the centre.

V. The person who marries an heiress, instead of impaling his arms with those of his wife, is to bear them in an escutcheon placed in the centre of his shield, and which, on account of its shewing forth his pretension to her estate, is called an escutcheon of pretence, and is blazoned sur-tout, i. e. over all. But the children are to bear the hereditary coat of arms of their father and mother quarterly, which denotes a fixed inheritance, and to transmit them to posterity. The first and fourth quarters generally contain the father's arms, and the second and third the mother's; unless the heirs should derive not only their estate, but also their title and dignity, from their mother.

VI. If a maiden or dowager lady of quality marry a commoner, or a nobleman inferior to her rank, their coats of arms may be set beside one another in two separate escutcheons, upon one mantle or drapery, and the lady's arms ornamented according to her title. See Plate LXXXVIII.

VII. Archbishops and bishops impale their arms differently from the fore-mentioned coats, in giving the place of honour, that is, the dexter side, to the arms of their dignity, as it is expressed in Plate LXXXVIII.; which represents the coat of arms of an archbishop of Canterbury, and a bishop of an English see. These prelates thus bear their arms parted per Pale, to denote their being joined to their cathedral-church in a sort of spiritual marriage.

With respect to such armorial ensigns as the sovereign thinks fit to augment a coat of arms with, they may be marshalled various ways, as may be seen by the arms of his grace the duke of Rutland, and many others. When coats of arms are marshalled in such a manner, that no probable reason can be given why they are so conjoined, they must be left to heralds to explain.

OF THE ORDER OF KNIGHTHOOD, &c.

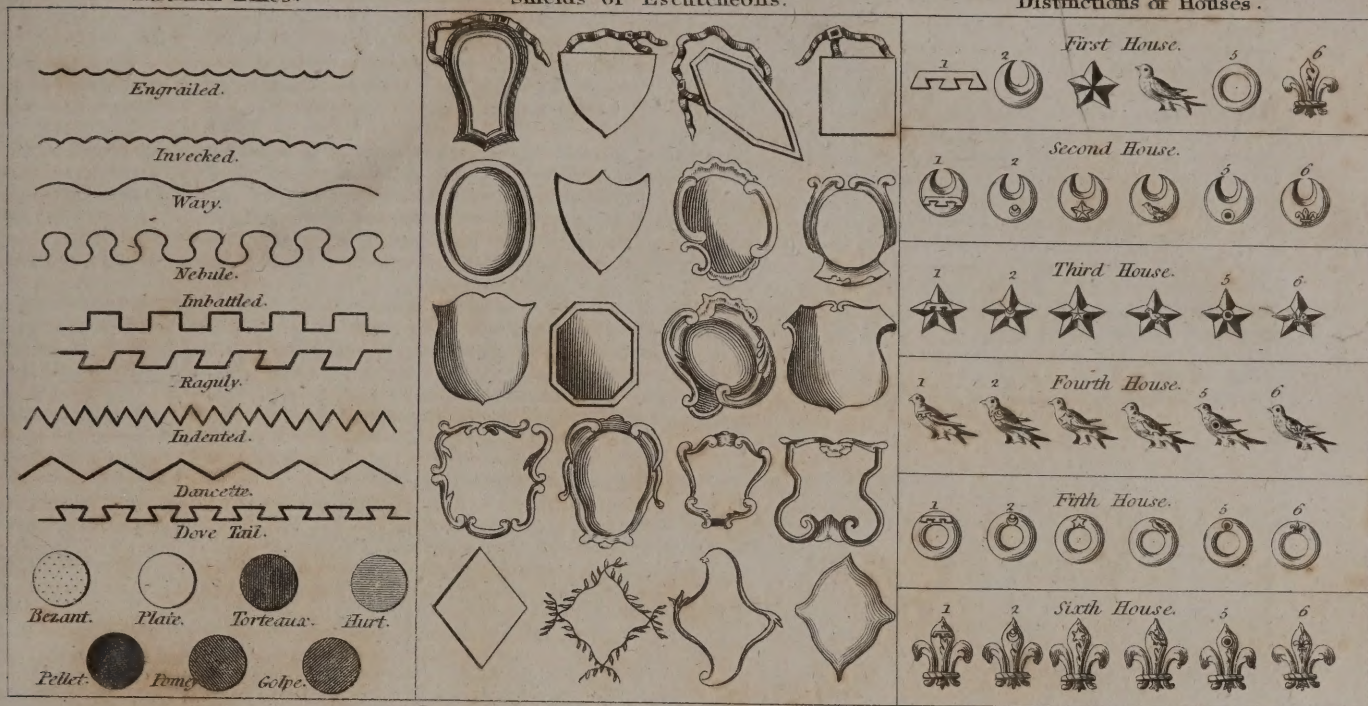
To the augmentations above-mentioned may be added,

1. The Baronet's mark of distinction, or the arms of the province of Ulster in Ireland, granted and made hereditary in the male-line by king James I. who erected this dignity on the 22d of May 1611, in the seventh year of his reign, in order to propagate a plantation in the fore-mentioned province. This mark is Argent, a sinister Hand couped at the Wrist, and erected Gules; which may be borne either in a canton, or in an escutcheon, as will best suit the figures of the arms. See Plate LXXXVIII.

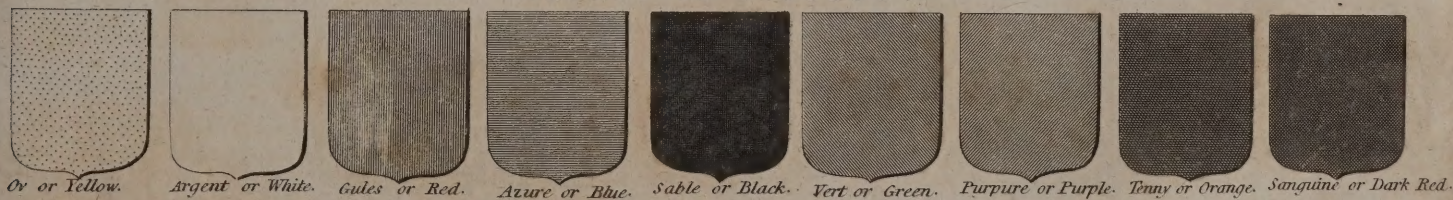
Partition Lines.

Shields or Escutcheons.

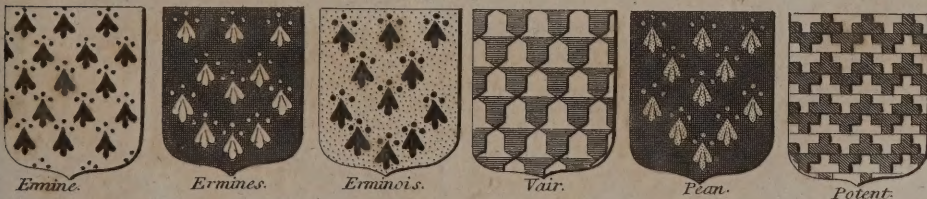
Distinctions of Houses.



Colours or Tintures

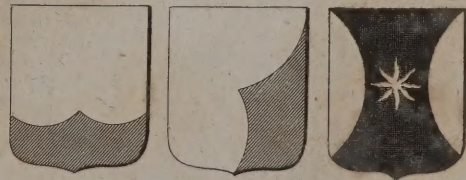


Furs



Abatement

Addition



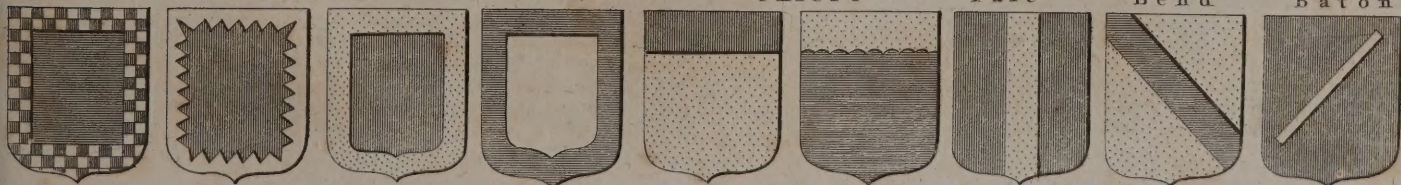
Bordures

Chiefs

Pale

Bend

Bâton



2. The ancient and respectable badge of the most noble Order of the Garter, instituted by king Edward III. 1349, in the 27th year of his reign. This honourable augmentation is a deep blue garter, surrounding the arms of such knights, and inscribed with this motto, "Honi soit qui mal y pense." See Plate LXXXVIII.

The arms of those who are knights of the orders of the Bath, of the Thistle, or of St. Patrick, are marshalled in the same manner, with this difference only, that the colour and motto accord with the order to which it belongs. Thus the motto "Quis separabit 1783" on the light blue ribbon of the order, surrounds the escutcheon of a knight of St. Patrick. "Nemo me impune lacessit," on a green ribband, distinguishes a knight of the Thistle; and, "Tria juncta in uno," on red, a knight of the Bath. None of these orders of Knighthood are hereditary; but the honours of a Baronet of Ulster, and of a Baronet of Nova Scotia (created by patent in 1602,) descend to the heirs male. With regard to the emblazoning of the wife's arms in the case of the husband being noble, or a knight of the Garter, of the Bath, &c. or where, on

the other hand, the wife is noble in her own right, and the husband a commoner, these will be found exemplified in Plate LXXXVIII. For representations of the Badges of the several Orders of Knighthood. See Plate LXXXVIII.

HATCHMENTS. These are funeral-escutcheons, whereby may be known, after any person's decease, what rank he or she held when living; and if it be a gentleman's hatchment, whether he was a bachelor, married man, or widower, with the like distinctions for gentlewomen. The hatchment is usually affixed to the fronts of houses, when any of the nobility or gentry die. 1. The arms, if the deceased be a private gentleman, are parted per Pale with those of his wife. The ground without the escutcheon being black denotes the man to be dead; and the ground on the sinister side being white signifies that the wife is living; which is represented on Plate LXXXIX. with some other varieties of hatchments.

For further information on the subject of heraldry see the articles **ARMS, BLAZONING, PRECEDENCY,** and the several terms of **HERALDRY.**

HERAULT, a river of France, which rises among the Sevennes mountains, and falls into the gulf of Lyons, below Agde.

HERAULT, a department of France, so named from the river, bounded on the N. by those of Tarn and Aveyron. It comprehends part of the late province of Languedoc. Montpellier is the capital.

HERB, [*herba*, Lat.] in botany, is used by Linnæus, to denominate that portion of every vegetable which arises from the root, and is terminated by the fructification. It comprehends, 1. The trunk, stalk, or stem. 2. The leaves. 3. Those minute external parts called by him the fulcra or supports of plants. 4. The buds, or, as he also terms them, the winter-quarters of the future vegetable. See **BOTANY.**

HERB BENNET. See **GEUM.**

HERB CHRISTOPHER. See **ACTEA.**

HERB GERARD. See **ÆGOPIDIUM.**

HERBACEOUS PLANTS are those which have succulent stems or stalks that lie down to the ground every year. Of herbaceous plants, those are annual which perish stem and root every year; biennial, which subsist by the roots two years; perennial which are perpetuated by their roots for a series of years, a new stem being produced every spring.

HERBAGE, in law, signifies the pasture provided by nature for the food of cattle; also the liberty to feed cattle in the forest, or in another person's ground.

HERBAL, [*herbarium*, Lat.] generally speaking, signifies a book, containing a methodical arrangement of the classes, genera, species, and varieties, of plants, together with an account of their properties. It is also applied to a hortus siccus, or dry garden; an appellation given to a collection of specimens of plants carefully dried and preserved. See **HORTUS SICCUS.**

HERBORN, a town in Westphalia, 3 miles S. S. E. of Dillenburg.

HERCULANEUM, an ancient city of Campania in Italy, which was destroyed by an eruption of Vesuvius in the first year of the emperor Titus, or the 79th of the Christian era, and lately rendered famous on account of the curious monuments of antiquity discovered in its ruins; an account of which has been published by order of the king of Naples, in a work of six volumes folio. The epocha of the foundation of Herculanum is unknown. Dionysius Halicarnassensis conjectures that it may be referred to 60 years before the war of Troy, or about B. C. 1242; and therefore that it lasted about 1400 years. The thickness of the heap of lava, by which the city was overwhelmed, has been much increased by fiery streams vomited since that catastrophe; and now forms a mass 24 feet deep of dark grey stone, which is easily broken to pieces. By its non-adhesion to foreign bodies, marbles and bronzes are preserved in it as in a case made to fit them, and exact moulds of the faces and limbs of statues are frequently found in this substance. The precise situation of this subterraneous city was not known till 1713, when it was accidentally discovered by

some labourers, who, in digging a well struck, upon a statue on the benches of the theatre. Many others were afterwards dug out and sent to France by the prince of Elbœuf. But little progress was made in the excavations, till Charles infant of Spain ascended the Neapolitan throne, by whose unwearied efforts and liberality a very considerable part of Herculanum has been explored, and such treasures of antiquity drawn out as form the most curious museum in the world. It being too arduous a task to attempt removing the covering, the king contented himself with cutting galleries to the principal buildings, and causing the extent of one or two of them to be cleared. Of these the theatre is the most considerable. On a ballustrade which divided the orchestra from the stage was found a row of statues; and, on each side of the pulpitum, the equestrian figure of a person of the Nonian family. They are now placed under porticos of the palace; and from the great rarity of equestrian statues in marble would be very valuable objects, were the workmanship even less excellent than it is: one of them in particular is a very fine piece of sculpture. Since the king of Spain left Naples, the digging has been continued, but with less spirit and expenditure: indeed the collection of curiosities brought out of Herculanum and Pompeii is already so considerable, that a relaxation of zeal and activity becomes excusable. They consist of statues, busts, altars, inscriptions, and other ornamental appendages of opulence and luxury; and also an entire assortment of the domestic, musical, and chiralurgical instruments used by the ancients; tripods of elegant form and exquisite execution, lamps in endless variety, vases and basons of noble dimensions, chandeliers of the most beautiful shapes, pateras, and other appurtenances of sacrifice, looking-glasses of polished metal, coloured glass, so hard, clear, and well stained, as to appear emeralds, sapphires, and other precious stones; a kitchen completely fitted up with copper-pans lined with silver, kettles, cisterns for heating water, and every utensil necessary for culinary purposes; specimens of various sorts of combustibles, retaining their form though burnt to a cinder; corn, bread, fish, oil, wine, and flour: a lady's toilet, fully furnished with combs, thimbles, rings, paint, ear-rings, &c. Among the statues, which are numerous, a Mercury and a sleeping faun are most admired by connoisseurs. A large parcel of M.SS. was found among the ruins. Hopes were entertained, that many works of the ancients were now going to be restored to light, and that a new mine of science was on the point of being opened. But the difficulty of unrolling the burnt parchment, of pasting the fragments on a flat surface, and of decyphering the obscure letters, have proved such obstacles, that very little progress has been made in the work. A priest invented a method of proceeding; but it would require the joint labours of many learned men to carry on so nice and tedious an operation with success. The plan is dropped; and the M.SS. now lie in dusty heaps, as useless to the learned world as they had been for the preceding 17 centuries.

HERCULES, in fabulous history, a most renowned Grecian hero, who after death was ranked among the gods, and received divine

divine honours. According to the ancients, there were many persons of this name. Diodorus mentions 3, Cicero 6, and some authors no less than 43. Of all these, one generally called the Theban Hercules, is the most celebrated; and to him the actions of the others have been attributed. He is reported to have been the son of Jupiter by Alcmena. In his 18th year he delivered the neighbourhood of mount Citharon from a huge lion which preyed on the flocks of Amphitryon, and laid waste the adjacent country. He went to the court of Thespius king of Thespiis, who shared in the general calamity, by whom he was hospitably entertained for 50 days; but he made a bad return, for the king's 50 daughters became mothers by him during his stay at Thespiis, and some say in one night. He next delivered his country from the tribute of 100 oxen, annually paid to Erginus. Such public services became universally known; and Creon king of Thebes, rewarded his patriotic deeds by giving him his daughter in marriage, and entrusting him with the government. Eurystheus, the son of Amphitryon, having succeeded his father, became jealous of Hercules; and lest he should deprive him of his crown, left no means untried to get rid of him. On this Hercules consulted the oracle; but being answered that it was the pleasure of the gods that he should serve Eurystheus 12 years, he fell in a deep melancholy which at last ended in a furious madness; during which, among other desperate actions, he put away his wife, Megara, and murdered all the children he had by her. As an expiation of this crime, the king imposed upon him 12 labours surpassing the power of all other mortals to accomplish, which nevertheless our hero performed with ease, the favours of the gods having indeed completely armed him. He had received a coat of armour and helmet from Minerva, a sword from Mercury, a horse from Neptune, a shield from Jupiter, a bow and arrows from Apollo, and from Vulcan a golden cuirass and brazen buskin, with a celebrated club of brass. His first labour was the killing of a lion in Nemea, a wood of Achaia; whose hide was proof against any weapon, so that he was forced to seize him by the throat and strangle him. He carried the dead beast on his shoulders to Mycenæ, and ever after clothed himself with the skin. The second labour was to destroy the Lernaean hydra, which had seven heads according to Apollodorus, 50 according to Simonides, and 100 according to Diodorus. This monster he first attacked with his arrows; but soon after by means of his heavy club he destroyed the heads of his enemy. This, however, was productive of no advantage; for as soon as one head was beaten to pieces by the club, two sprang up; and the labour of Hercules would have remained unfinished, had he not commanded his friend Iolaus to burn with a hot iron the root of the head which he had crushed to pieces. This succeeded; and Hercules became victorious, opened the belly of the monster, and dipped his arrows in the gall to render the wounds they should give incurable. He was ordered in his third labour to bring alive and unhurt into the presence of Eurystheus a stag, famous for its incredible swiftness, its golden horns, and brazen feet. This celebrated animal frequented the neighbourhood of Cnoe; and Hercules was employed for a whole year in pursuing it: at last he caught it in a trap, or when tired. The fourth labour was to bring alive to Eurystheus a wild boar which ravaged the neighbourhood of Erymanthus. In this expedition he destroyed the centaurs, and caught the boar by closely pursuing him through the deep snow. In his fifth labour Hercules was ordered to clean the stables of Augeas, where 3000 oxen had been confined for many years. For his sixth labour he was ordered to kill the carnivorous birds which ravaged the country near the lake Stympthalis in Arcadia. In his seventh labour he brought alive into Peloponnesus a prodigious wild bull which laid waste the island of Crete. In his eighth labour he was employed in obtaining the mares of Diomedes, king of Thrace, which fed upon human flesh. For his ninth labour, he was commanded to obtain the girdle of the queen of the Amazons. In his tenth labour he killed the monster Geryon king of Gades, and brought to Argos his numerous flocks which fed upon human flesh. His eleventh labour was the carrying away of the Hesperian golden apples kept by a dragon. The twelfth and last, and most dangerous of his labours, was to bring up to the earth the three-headed dog Cerberus. Descending into hell by a cave on mount Tarnarus, he was permitted by Pluto to carry away his friends Theseus and Pirithous, who were condemned to punishment in hell,

and Cerberus also was granted to his prayers, provided he made use of no arms to drag him away. Hercules carried him back to hell after he had brought him before Eurystheus. Many other exploits were performed by Hercules. He accompanied the Argonauts to Colchis before he delivered himself up to Eurystheus. He assisted the gods in their wars against the giants, and it was through him that Jupiter obtained the victory. He conquered Laomedon, and pillaged Troy. When Iole, the daughter of Eurystus king of Ecbalia, of whom he was deeply enamoured, was refused to his entreaties, he fell into a second fit of insanity, and murdered Iphitus, the only one of the sons of Eurystus who favoured his addresses to Iole. He was afterwards purified of the murder, and his insanity ceased; but he was visited by a disorder which obliged him to apply to the oracle of Delphi for relief. The coldness with which the Pythia received him irritated him, and he resolved to plunder Apollo's temple, and carry away the sacred tripod. Apollo opposed him, and a severe conflict was begun, which nothing but the interference of Jupiter with his thunderbolts could have settled. He was upon this told by the oracle that he must be sold as a slave, and remain three years in the most abject servitude to recover from his disorder. He complied, and Mercury by order of Jupiter, conducted him to Omphale, queen of Lydia, to whom he was sold as a slave. Here he cleared all the country from robbers; and Omphale, astonished at the greatness of his exploits, married him. Hercules had Agelaus and Lamon by Omphale, from whom Cressus king of Lydia was descended. Many other wondrous exploits are said to have been achieved by him: by the direction of the oracle he raised a burning pile on Mount Eta, where he finished his life. His friends raised an altar where the burning pile had stood; and Menætius the son of Actor sacrificed a bull, a wild boar, and a goat; and enjoined the people of Opus to observe these ceremonies annually. His worship soon became as universal as his fame; and Juno, forgetting her resentment, gave him her daughter Hebe in marriage. Hercules has many surnames, from the places where his worship was established, and from the labours he had achieved. His temples were numerous and magnificent, and his divinity revered. No dogs or flies entered his temple at Rome: and that of Gades, according to Strabo, was always forbidden to women and pigs. The Phenicians offered quails on his altars; and as he was supposed to preside over dreams, the sick and infirm were sent to sleep in his temples, that they might receive in their dreams the agreeable presages of their approaching recovery. The white poplar was particularly dedicated to his service. None even of the twelve great gods of antiquity have so many ancient monuments as Hercules. The famous statue of Hercules, in the Farnese palace at Rome, is well known to the connoisseurs. It represents him resting after the last of his twelve labours above recited, leaning on his club, and holding the apples of the Hesperides in his hand. HERCULES, in astronomy, a very large constellation of the northern hemisphere. See ASTRONOMY.

HERCULES'S PILLARS, in ancient geography, two lofty mountains, situated one on one of the most southern extremities of Spain, and the other on the opposite part of Africa. They were called Abyla and Calpe; (see these articles;) were reckoned the boundaries of the labours of Hercules; and were fabled to have been joined together till they were severed by that hero, and a communication opened between the Mediterranean and Atlantic.

HEREDITAMENTS, [*heredrum*, Lat.] all such things immoveable, whether corporeal or incorporeal, as a man may leave to his heirs, by way of inheritance; or not being otherwise devised, do naturally descend to him who is next heir of blood, and fall not within the compass of an executor or administrator, as chattels do. It is a word of large extent, and much used in conveyances; for by the grant of hereditaments, isles, seignories, manors, houses, and lands of all sorts, charters, rents, services, advowsons, commons, and whatever may be inherited, will pass. Co. Lit. 6. Hereditaments are of two kinds, corporeal and incorporeal. Corporeal hereditaments consist wholly of substantial and permanent objects, all which may be comprehended under the general denomination of land only: for land comprehends in its legal signification any ground, soil, or earth, whatsoever, as arable, meadows, pastures, woods, moors, waters, marshes, furzes, and heath. 1 Inst. 4. Incorporeal hereditaments are not the object of sensation, neither can they be seen or handled, are creatures of
the

the mind, and exist only in contemplation: they are principally of ten sorts, viz. advowsons, tithes, commons, ways, offices, dignities, franchises, corrolies or presents, and rents. Black.

HEREDITARY, [*hereditarius*, Lat.] possessed or claimed by right of inheritance; descending by inheritance.

HEREDITARY is also figuratively applied to good or ill qualities, either of body or mind, supposed to be transmitted from father to son: thus we say, virtue and piety are hereditary qualities in such a family; that in Italy the hatred of families is hereditary; and that the gout, king's evil, madness, &c. are hereditary diseases.

HEREDITAS JACENS, in Scots law. An estate is said to be in hereditate jacente, after the death of the proprietor till the entry of the heir.

HEREFORD, the capital of Herefordshire, 30 miles N. W. of Gloucester, and 130 W. N. W. of London. Lon. 2. 35. W. Lat. 52. 4. N.

HEREFORDSHIRE, a county of England, bounded on the E. by Gloucester, and Worcestershires, on the W. by Radnor and Brecknockshires, on the N. by Shropshire, and on the S. by Monmouthshire. It extends 35 miles from N. to S. and 47 from E. to W. It is divided into 11 hundreds; contains one city, eight market-towns, 176 parishes. Apples grow in greater abundance here than in any other county, being plentiful even in the hedges. Of these are various kinds; the most celebrated is the redstreak, which is peculiar to this county.

HEREGOVINZA, a territory of European Turkey, in Bosnia, near Dalmatia.

HERESIARCH, [*heresiarche*, French; *ἀρχηγός*,] a leader in heresy; the head of a herd of heretics.

HERESY, [*heresie*, Fr. *hæresis*, Lat. *hæresis*,] a denial of some of the essential doctrines of Christianity, publicly and obstinately avowed; being defined, "sententia rerum divinarum humano sensu excogitata, palam docta et pertinaciter defensa." And here it must be acknowledged, that particular modes of belief, or unbelief, not tending to overturn Christianity, or to sap the foundations of morality, are by no means the object of coercion by the civil magistrate. What doctrines shall therefore be adjudged heresy, was left by our old constitution to the determination of the ecclesiastical judge; who had herein a most arbitrary latitude allowed him. For the general definition of an heretic given by Lyndewode, extends to the smallest deviations from the doctrines of the holy church: "hæreticus est qui dubitat de fide catholica, et qui negligit servare ea, quæ Romana ecclesia statuit, seu servare decreverat." Or, as the statute 2 Hen. IV. c. 15, expresses it in English, "teachers of erroneous opinions, contrary to the faith and blessed determination of the holy church." Very contrary this to the usage of the first general councils, which defined all heretical doctrines with the utmost precision and exactness. And what ought to have alleviated the punishment, the uncertainty of the crime, seems to have enhanced it in those days of blind zeal and pious cruelty. The sanctimonious hypocrisy of the canonists, indeed, went at first no farther than enjoining penance, excommunication, and ecclesiastical deprivation, for heresy; but afterwards they proceeded boldly to imprisonment by the ordinary, and confiscation of goods in pious uses. But in the mean time they had prevailed upon the weakness of bigotted princes to make the civil power subservient to their purposes, by making heresy not only a temporal, but even a capital offence: the Romish ecclesiastics determining, without appeal, whatever they pleased, to be heresy, and shifting off to the secular arm the odium and drudgery of executions; with which they pretended to be too tender and delicate to intermeddle. Nay, they affected to intercede, on behalf of the convicted heretic, ut citra mortis periculum sententiæ circa eum moderetur: well knowing that at the same time they were delivering the unhappy victim to certain death. See **ACT OF FAITH**. Christianity being thus deformed by the demon of persecution upon the continent, our own island could not escape its scourge. Accordingly we find a writ de hæretico comburendo, i. e. of burning the heretic. But the king might pardon the convict by issuing no process against him; the writ de hæretico comburendo being not a writ of course, but issuing only by the special direction of the king in council. In the reign of Henry IV. when the eyes of the Christian world began to open, and the seeds of the Protestant religion under the opprobrious name of Lollardy took root in this kingdom; the clergy,

taking advantage from the king's dubious title to demand an increase of their own power, obtained an act of parliament, which sharpened the edge of persecution to its utmost keenness. See **HÆRETICO COMBURENDO**. By stat. 2. Hen. V. c. 7, Lollardy was also made a temporal offence, and indictable in the king's courts; which did not thereby gain an exclusive, but only a concurrent, jurisdiction with the bishop's consistory. Afterwards, when the reformation began to advance, the power of the ecclesiastics was somewhat moderated; for though what heresy is was not then precisely defined, yet we are told in some points what it is not; the statute 25 Henry VIII. c. 14, declaring that offences against the see of Rome are not heresy; and the ordinary being thereby restrained from proceeding in any case upon mere suspicion; 7. c. unless the party be accused by two credible witnesses, or an indictment of heresy be first previously found in the king's courts of common law. And yet the spirit of persecution was not abated, but only diverted into a lay-channel. For in the reign of Henry VIII, and in the two succeeding reigns, several severe laws were made, and repealed by turns till the reign of Queen Elizabeth; when the reformation was finally established with temper and decency, unsullied with party-rancour, or personal resentment. By stat. 1 Eliz. c. 1, all former statutes relating to heresy are repealed, which leaves the jurisdiction of heresy as it stood at common law; viz. as to the infliction of common censures, in the ecclesiastical courts; and in case of burning the heretic, in the provincial synod only. But the principal point now gained was, that by this statute a boundary is for the first time set to what shall be accounted heresy; nothing for the future being to be so determined, but only such tenets, which have been heretofore so declared, 1. by the words of the canonical scriptures; 2. by the first four general councils, or such others as have only used the words of the holy scriptures; or, 3. which shall hereafter be so declared by the parliament, with the assent of the clergy in convocation. Thus was heresy reduced to a greater certainty than before; though it might not have been the worse to have defined it in terms still more precise and particular: as a man continued still liable to be burnt, for what perhaps he did not understand to be heresy, till the ecclesiastical judge so interpreted the words of the canonical scriptures. For the writ de hæretico comburendo remained still in force, till it was totally abolished, and heresy again subjected only to ecclesiastical correction, pro salute anime, by stat. 29 Car. II. c. 9; when, in one and the same reign, our lands were delivered from the slavery of military tenures; our bodies from arbitrary imprisonment by the habeas corpus act; and our minds from the tyranny of superstitious bigotry, by demolishing this last badge of persecution in the English law. Every thing is now less exceptionable, with respect to the spiritual cognizance, and spiritual punishment, of heresy: unless perhaps that the crime ought to be more strictly defined, and no prosecution permitted, even in the ecclesiastical courts, till the tenets in question are by proper authority previously declared to be heretical. Under these restrictions, some think it necessary for the support of the national religion, that the officers of the church should have power to censure heretics; yet not to harass them with temporal penalties, much less to exterminate or destroy them. The legislature has indeed thought it proper, that the civil magistrate should interpose, with regard to one species of heresy, very prevalent in modern times; for by stat. 9 and 10 W. III. c. 32, if any person educated in the Christian religion, or professing the same, shall, by writing, printing, teaching, or advised speaking, deny any one of the Persons in the Holy Trinity to be God, or maintain that there are more gods than one, he shall undergo the same penalties and incapacities which were inflicted on apostasy by the same statute.

HERETIC, a general name for all such persons under any religion, but especially the Christian, as profess or teach religious opinions contrary to the established faith; or to what is made the standard of orthodoxy. See **HERESY**.

HERETOCH, among the Anglo-Saxons, signified the same with Dux or duke, denoting the commander of an army.

HERGRUNDT, a town of Upper Hungary, 65 miles N. of Buda.

HERICOUR, a town of France, in the department of Upper Saone, 12 miles S. E. of Lure.

HERIOT, [*hergild*, Saxon,] in law, is a customary tribute of goods and chattels, payable to the lord of the see on the de-

cease of the owner of the land. See **TENURE**. It is of two sorts, viz.

I. HERIOT-CUSTOM, where heriots have been paid time out of mind by custom, after the death of a tenant for life. In some places, there is a customary composition in money, as 10 or 20 shillings in lieu of a heriot, by which the lord and tenant are both bound, if it be an indisputably ancient custom; but a new composition of this sort will not bind the representatives of either party.

II. HERIOT-SERVICE, when a tenant holds by such service to pay heriot at the time of his death; which service is expressed in the deed of feoffment. For this latter the lord shall distrain; and for the other he shall seize, and not distrain. If the lord purchase part of the tenancy, heriot-service is extinguished; but it is not so of heriot-custom.

HERISSON, in fortification, a beam armed with a great number of iron-spikes with their points outwards, and supported by a pivot on which it turns. These serve as a barrier to block up any passage, and are frequently placed before the gates, and more especially the wicket-doors, of a town or fortress, to secure those passages which must be often opened and shut.

HERITABLE RIGHTS, in Scots law, signify all rights affecting lands, houses, &c. or any immovable subject.

HERITAGE, in Scots law, implies lands, houses, and all immovable subjects, in contradistinction to moveables or moveable subjects. It also signifies such immovable property, as a person succeeds to as heir to another, in contradistinction to that which he himself purchases, or acquires otherwise, called conquest.

HERTIERA, a genus of the monœcia monadelphia class and order. Calyx five-toothed; corolla none. Male; anthers ten, without filaments. Female; germ five; drupes with one globular seed. There is one species, a tree of the East-Indies, called the looking-glass-tree.

HERK, a river of Germany, in the late bishopric of Liege.

HERK, a town of France, in the department of Ourte, and late bishopric of Liege, 20 miles N. W. of Maestricht.

HERKEMER, a town and county of New York.

HERMÆA, in antiquity, ancient Greek festivals in honour of Mercury. One of these was celebrated by the Pheneatæa in Arcadia; a second by the Cylleians in Elis; and a third by the Tanagraeans.

HERMAN, PAUL, a famous botanist in the 17th century, born at Hall in Saxony. He practised physic in the isle of Ceylon, and was afterwards professor of botany at Leyden, where he died in 1695. He wrote, 1. A Catalogue of the Plants in the public garden at Leyden. 2. *Cynosura Materie Medicæ*. 3. *Floræ Lugduno Batavæ Flores*. 4. *Paradisus Batavus*: and, 5. *Musæum Zeylanicum*.

HERMANN, JAMES, a learned mathematician of the academy at Berlin, and a member of the academy of sciences at Paris, was born at Basil in the year 1678. He was a great traveller, and for six years was professor of mathematics at Padua. He afterwards went to Muscovy, being invited thither by Peter the Great, in 1724. On his return to Basil, he was made professor of morality and natural law; and died there in 1733, aged 55. He wrote "Responso ad Considerationes circa Principia Calculi differentialis;" "De Phoronomia;" "De nova Accelerationis Lege;" "Disquisitio de Vibrationibus Chordarum Censuram;" "Solutio Problematis de Trajectoriis Curvis inveniendis."

HERMANNIA, in botany, a genus of the pentandria order, and monadelphia class of plants; natural order, Columniferæ. Styles five; capsule five-celled; petals semitubular at the base, oblique. There are twenty-one species. The hermannias are shrubs from two to seven feet in height. Natives of the Cape of Good Hope.

HERMAPHRODITE, a person of both sexes, or who has the parts of generation both of male and female. The term is applied to other animals besides man, and even to plants. The word is a compound of *Ἑρμης*, Mercury, and *Ἀφροδίτη*, Venus; *g. d.* a mixture of Mercury and Venus, *i. e.* of male and female. The Greeks also call hermaphrodites, *ἀνδρόγυνος*, androgyni, *g. d.* men-women. See **ANDROGYNES**. In a paper by Mr. Hunter, in the 69th volume of the Philosophical Transactions, hermaphrodites are divided into natural, and unnatural or monstrous. The first

belongs to the more simple orders of animals, of which there is a much greater number than of the more perfect. The unnatural takes place in every tribe of animals, having distinct sexes, but is more common in some than in others. The human species, he imagines, has the fewest, never having seen them in that species, nor in dogs; but in the horse, sheep, and black cattle, they are very frequent. From Mr. Hunter's account, however, it does not appear that such a creature as a perfect hermaphrodite has ever existed. In most species of animals, the production of hermaphrodites appears to be the effect of chance; but in the black cattle it seems to be an established principle of their propagation. It is a well-known fact, and, as far as has yet been discovered, appears to be universal, that when a cow brings forth two calves, one of them a bull, and the other a cow to appearance, the cow is unfit for propagation, but the bull-calf becomes a very proper bull. The cows are known not to breed; they do not even shew the least inclination for the bull, nor does the bull ever take the least notice of them. Among the country-people in England, this kind of calf is called a free-martin; and this singularity is just as well known among the farmers, as either cow or bull. When they are preserved, it is for the purposes of an ox or spayed heifer; viz. to yoke with the oxen, or fatten for the table. They are much larger than either the bull or the cow, and the horns grow longer and bigger, being very similar to those of an ox. The bellow of a free-martin is similar to that of an ox, and the meat is similar to that of the ox or spayed heifer, viz. much finer in the fibre than either the bull or cow: and they are more susceptible of growing fat with good food. By some they are supposed to exceed the ox and heifer in delicacy of taste, and bear a higher price at market; this, however, does not always hold, and Mr. Hunter gives an instance of the contrary. The Romans, who called the bull *taurus*, spoke also of *tauræ*, in the feminine gender, different from *vaccæ* or cows. Stephens observes, that it was thought they meant by this word barren cows, who obtained this name because they did not conceive any more than bulls. He quotes a passage from Columella, lib. vi. cap. 22, "And, like the *tauræ*, which occupy the place of fertile cows, should be rejected or sent away." Among the reptile tribe, such as worms, snails, leeches, &c. hermaphrodites are very frequent. In the Memoirs of the French Academy, we have an account of this very extraordinary kind of hermaphrodites, which not only have both sexes, but do the office of both at the same time. Such are earth-worms, round-tailed worms found in the intestines of men and horses, land-snails, and those of fresh waters, and all the sorts of leeches. And, as all these are reptiles, and without bones, M. Poupert concludes it probable, that all other insects which have these two characters are also hermaphrodites. The method of coupling practised in this class of hermaphrodites, may be illustrated in the instance of earth-worms. These creep two by two, out of holes proper to receive them, where they dispose their bodies in such a manner as that the head of the one is turned to the tail of the other. Being thus stretched lengthwise, a little conical button or papilla is thrust forth by each, and received into an aperture of the other. Among the insects of the soft or boneless kind, there are great numbers, which are so far from being hermaphrodites, that they are of no sex at all. Of this kind are all the caterpillars, maggots, and worms, produced of the eggs of flies of all kinds: but the reason of this is plain; these are not animals in a perfect state, but disguises under which animals lurk. They have no business with the propagating of their species, but are to be transformed into winged animals, by putting off their coverings; and then only they are in their perfect state, and therefore then only shew the differences of sex, which are always in distinct animals, each being only male or female. These copulate, and their eggs produce these creatures, which shew no sex till they arrive at that perfect state again.

HERMAPHRODITE FLOWERS, in botany, are so called by the sexualists on account of their containing both the antheræ and stigma, the organs of generation, within the same calyx and petals. Of this kind are the flowers of all the classes in Linnaeus's sexual method, except the classes monœcia and diœcia; in the former of which, male and female flowers are produced on the same root; in the latter, on distinct plants from the same seed. In the class polygamia, they are always hermaphrodite flowers mixed with male or female, or both, either on the same or distinct roots.

In the plantain-tree the flowers are all hermaphrodite; in some, however, the anthera or male organ, in others the stigma or female organ, proves abortive. The flowers in the former class are styled female hermaphrodites; in the latter, male hermaphrodites. Hermaphrodites are thus as frequent in the vegetable kingdom as they are rare in the animal one. See BOTANY.

HERMAS, in botany, a genus of the monœcia order, and polygamia class of plants. Hermaphrodite; umbel terminating; involucre universal and partial; umbellets with truncate rays, the central one floriferous; petals five; stamina five, barren; seeds in pairs, suborbiculate; male, umbels lateral, with universal and partial involucre; umbellets many-flowered; petals five; stamina five, fertile. There are five species.

HERMATA, a kingdom and town in Borneo.

HERMES, [*Ἑρμης*, Gr. from *ἑρμηνεύς*, an interpreter,] the Greek name of the god Mercury. See MERCURY, and THOTH.

HERMES, surnamed **TRISMEGISTUS**, *i. e.* thrice greatest, an Egyptian or Phœnician priest or philosopher, and according to some a king; which triple office, they say, was the reason of this surname; though Suidas alleges, it was given him because he taught the doctrine of the Trinity. It is more probable, however, that he was so named on account of his great learning; for he is said to have wrote thirty-six books on divinity and philosophy, and six on physic. Clemens Alexandrinus has given a catalogue of his works; but none of them are extant, except a piece entitled *Poemander*, which is reckoned spurious. He taught the Egyptians chemistry, the art of land-measuring, the cultivation of the olive, the division of time into hours, and the use of hieroglyphics. He is supposed to have flourished under Ninus or Osiris, about A. M. 2076.

HERMES, or **HERMA**, among antiquaries, a sort of square or cubical figure of the god Mercury, usually made of marble, though sometimes of brass or other materials, without arms or legs, and planted by the Greeks and Romans in their cross-ways.

HERMETICAL ART, a name given to chemistry, on a supposition that Hermes Trismegistus was the inventor of the art, or that he excelled therein. See HERMES.

HERMETICAL PHILOSOPHY, is that which undertakes to solve and explain all the phenomena of nature, from the three chemical principles, salt, sulphur, and mercury.

HERMETICAL PHYSIC, or **MEDICINE**, is that system or hypothesis in the art of healing, which explains the causes of diseases, and the operations of medicine, on the principles of the hermetical philosophy, and particularly on the system of alkali and acid. It has been long exploded.

HERMETICAL SEAL, a manner of closing glass-vessels, for chemical operations, so very accurately, that nothing can exhale, not even the most subtle spirits. It is performed by heating the neck of the vessel in the flame of a lamp till it be ready to melt, and then with a pair of pincers twisting it close together. This chemists call putting on Hermes's seal. Vessels are also sealed hermetically; by stopping them with a stopple of glass, well luted, into the neck of the vessel; or, by turning another ovum philosophicum upon that wherein the matter is contained.

HERMHARPOCRATES, or **HERMARPOCRATES**, in antiquity, a deity, or figure of a deity, composed of Mercury and Harpocrates the god of Silence.

HERMIANI, or **HERMIATITÆ**, a sect of heretics in the second century, thus called from their leader Hermias, and also denominated Seleuciani. One of their distinguishing tenets was, that God is corporeal. Another, that Jesus Christ did not ascend into heaven with his body, but left it in the sun.

HERMIONE, in fabulous history, the daughter of Menelaus and Helen, who was betrothed to her cousin Orestes, but afterwards married to Pyrrhus, whom Orestes therefore killed in the temple of Apollo, and recovered Hermione.

HERMIONE, in ancient geography, a considerable city of Argolis. It was in ruins, except a few temples, in the time of Pausanias. It gave name to the

HERMIONICUS SINUS, a part of the Sinus Argolicus.

HERMIT, is derived from the Greek *ἡρετικός*, a desert, and, therefore should rather be written Eremit. Paul, surnamed the Hermit, is usually reckoned the first hermit; though St. Jerome at the beginning of the life of that saint, says, it is not known who was the first. Some think John the Baptist, others Elijah; others

make St. Anthony the founder of the eremitical life; but others say that he only re-kindled and heightened the fervour thereof, and that his disciples owned St. Paul of Thebes for the first that practised it. The persecutions of Decius and Valerian are supposed to have been the occasion. Several of the ancient hermits, though they lived in deserts, had numbers of religious accompanying them. There are also various orders and congregations of religious distinguished by the title of hermits; as, hermits of St. Augustine, of St. John Baptist, of St. Jerome, of St. Paul, &c.

HERMITAGE, the cell or habitation of a hermit; also any religious cell, built and endowed in a recluse place, and annexed to some large abbey, of which the superior was called a Hermit.

HERMOGENES, the first and most celebrated architect of antiquity, was, according to Vitruvius, born at Alanbada, a city in Caria. He built a temple of Diana at Magnesia; another of Bacchus at Tros; and was the inventor of several parts of architecture. He wrote a book on the subject, which is lost.

HERMOGENIANS, a sect of ancient heretics, so denominated from their leader Hermogenes, an African born in the second century. Their opinions were warmly opposed by Tertullian.

HERMON, or **AERMON**, in ancient geography, a mountain of the Amorites, called Sanior by the Phœnicians, and Sanir or Senir by the Amorites, on the E. of Jordan. It is also called Sion by Moses; but must not be confounded with the Sion of Jerusalem. It is comprised by profane writers under Libanus, or Antilibanus, with which it is joined on the E.

HERMUS, in ancient geography, a river of Ionia.

HERNANDRIA, **JACK-IN-A-BOX TREE**; a genus of the triandria order, and monœcia class of plants; natural order, Tricocœ. Male, calyx three-parted; corolla three-petaled; female, calyx truncate, quite entire; corolla six-petaled; drupe hollow, with an open mouth, and a moveable nucleus. There are two species, viz. *H. sonora*, whistling hernandria; and *H. ovigera*, egg-fruited hernandria. The first is an upright lofty tree; the flowers are of a pale yellow colour, in panicked racemes; the calyxes of the fruit are also yellow; the seeds are very oily. It is very common in the West Indies. Dr. Patrick Browne attributes the whistling noise to the cups that sustain, and partly envelope, the nuts; these, he adds, are very large, and as they move in the wind, produce sound enough to alarm unwary travellers.

HERNIA, a descent of a portion of the intestines or omentum out of their natural place; or rather, the tumour formed by that descent, popularly called a rupture. The word originally signifies the same with tumor scroti, called also ramex. Priscian says, that the ancient Marsi gave the appellation hernia to rocks; whence some think hernias thus called on account of their hardness. Scallinger derives it from the Greek *ἑρνος*, a branch. See SURGERY.

HERNIARIA, **RUPTURE-WORT**; a genus of the digynia order, and pentandria class of plants; natural order, Sarmientaceæ. Calyx five-parted; corolla none; stamina five, barren, besides the fertile ones; capsule one-seeded. There are four species. As none of these plants possess any beauty, they are rarely cultivated in gardens.

HERNOSAND, or **HERNOSUND**, a sea-port of Sweden on an island in the gulph of Bothnia. It has a great trade in linen. Lon. 17° 50½' E. Lat. 62. 38. N.

HERO, [*ἥρως*, Lat. *hæros*,] a man eminent for bravery; a man of the highest class in any respect, as "a hero in learning." A hero is thus distinguished, by F. Bouhours, from a great man, that the former is more daring, fierce, and enterprising, and the latter more prudent, thoughtful, and reserved. In this sense we say, Alexander was a hero, Julius Cæsar a great man.

HERO, in Pagan mythology, a great and illustrious person, of a mortal nature, but supposed to partake of immortality, and after his death to be placed among the number of the gods. The Greeks erected columns and other monuments over the tombs of their heroes, and established a kind of worship in honour of the manes both of their heroes and heroines. The Romans also raised statues in honour of their heroes; but there were six of a superior order, who were supposed to be admitted into the community of the twelve great gods; viz. Hercules, Bacchus, Æsculapius, Romulus, Castor, and Pollux. Authors distinguish between the worship which the ancients paid to their heroes, and that offered to their gods. The latter consisted of sacrifices and libations; the former

former was only a kind of funeral-honour, in which they celebrated their exploits, concluding the rehearsal with feasts.

HERO OF A POEM, or ROMANCE, is the principal personage, or he who acts the chief part in it. Thus the hero of the Iliad is Achilles; of the Odyssey, Ulysses; of the Æneid, Æneas; of Tasso's Jerusalem, Godfrey of Bulloign; of Milton's Paradise Lost, Adam; though Mr. Dryden will have the Devil to be Milton's hero, because he gets the better of Adam, and drives him out of Paradise.

HEROD, improperly styled the Great, the execrable tyrant of Judæa, was born at Ascalon, about B. C. 68. His father, Antipater the Idumean, (or Edomite,) appointed him governor of Galilee; Mark Antony made him tetrarch, or ethnarch; and he afterwards obtained the kingdom of Judæa, which was confirmed to him by Augustus, a short time before the birth of our Saviour; and thus the prophecy was fulfilled, of "the sceptre departing from Judah," he being an alien by birth. At the birth of our Lord, in the vain hope of cutting off the Messiah, he caused all the infants of Bethlehem under two years of age to be massacred. His barbarity was as fatal to his own family as to his subjects; for he murdered his beautiful wife Mariamne, her mother Alexandra, her brother Aristobulus, her grandfather Hyrcanus II. and his own sons Alexander and Aristobulus; which led the emperor Augustus to say, that it was better to be Herod's swine than his sons. He died miserably within three years after the birth of Christ, aged 70.

HEROD ANTIPAS, the son of Herod the Great, by his wife Cleopatra, a native of Jerusalem. Herod, in his will, named his son Archelaus his successor, giving Antipas the title of Tetrarch of Galilee and Peræa. Antipas adorned and fortified the principal places of his dominions. He married the daughter of Aretas, King of Arabia; whom he divorced about A. D. 33, to marry his sister-in-law Herodias, wife to his brother Philip, who was still living. St. John the Baptist, exclaiming against this incest and adultery, was imprisoned in the castle of Machærus; and afterwards beheaded by Herod's order, as recorded in Mat. xiv. Mark vi. and Luke iii. Aretas to revenge the affront which Herod had offered to his daughter, declared war against him, and overcame him in a very obstinate engagement. Herod being afterwards detected as a party in Sejanus's conspiracy, was banished by the emperor Caligula into Lyons in Gaul; whither Herodias accompanied him. This Antipas is the Herod who, being at Jerusalem at the time of our Saviour's passion, (Luke xxiii. 11,) ridiculed him, by dressing him in a white robe, and sending him back to Pilate, as a mock king; whose ambition gave him no umbrage. The time when he died is not known, but it is certain he died in exile, as well as Herodias. Josephus says he died in Spain.

HERODIAN, an eminent Greek historian, who flourished at Rome in the third century, in the reigns of Severus, Caracalla, Heliogabalus, Alexander, and Maximin. His history begins from the death of Marcus Aurelius the philosopher; and ends with those of Balbinus and Maximin, and the beginning of the reign of Gordian. It is written in very elegant Greek; and there is an excellent translation of it into Latin, by Angelus Politianus. It was published by Henry Stephens in 4to, in 1581; by Boeder, at Strasburg, in 1662, in 8vo.; and by Hudson, at Oxford, in 1699, 8vo.

HERODIANS, a sect among the Jews, mentioned in Matth. xxii. 16, and Mark iii. 6. Commentators are much divided with regard to them. St. Jerome, in his dialogue against the Luciferians, takes the name to have been given to such as owned Herod for the Messiah; and Tertullian and Epiphanius are of the same opinion. But the same Jerome, in his Comment on St. Matthew, treats this opinion as ridiculous; and maintains, that the Pharisees gave this appellation by way of ridicule to Herod's soldiers, who paid tribute to the Romans; agreeable to this the Syrian interpreters render the word by the domestics of Herod, i. e. Herod's courtiers. M. Simon, in his notes on the twenty-second chapter of Matthew, advances a more probable opinion. The name he supposes to have been given to such as adhered to Herod's party and interest; and were for preserving the government in his family, about which there were great divisions among the Jews. F. Hardouin will have the Herodians and Sadducees to have been the same. Dr. Prideaux is of opinion, that they were distinguished from the other Jews by their concurrence with Herod's scheme,

of subjecting himself and his dominions to the Romans; and by complying with many of their heathen usages and customs. This symbolizing with idolatry upon views of interest and worldly policy, was probably that leaven of Herod, against which our Saviour cautioned his disciples. It is farther probable, that they were chiefly of the sect of the Sadducees; because the leaven of Herod is also called the leaven of the Sadducees.

HERODOTUS, an ancient Greek historian, the son of Lyxus and Dryo, born at Halicarnassus in Caria, in the first year of the seventy-fourth Olympiad, about B. C. 484. Halicarnassus being at that time under the tyranny of Lygdamis, grandson of Artemisia, Queen of Caria, Herodotus retired to Samos; from whence he travelled over Egypt, Greece, Italy, &c. and acquired the knowledge of the history and origin of many nations. He then began to digest the materials he had collected, and composed that history which has preserved his name ever since. He wrote it in the isle of Samos. Lucian informs us, that when Herodotus left Caria to go into Greece, he began to consider with himself,

What he should do to be for ever known,

And make the ages all to come his own.

His history, he presumed, would easily procure him fame, and raise his name among the Grecians, in whose favour it was written; but then he saw that it would be tedious to go through all the cities of Greece, and recite it to the inhabitants of each city. He thought it best therefore to take the opportunity of their assembling all together; and accordingly recited his work at the Olympic games, which rendered him more famous than even those who had obtained the prizes. None were ignorant of his name, nor was there a single person in Greece who had not either seen him at the Olympic games, or heard those speak of him who had seen him there. His work is divided into nine books; which, according to the computation of Dionysius Halicarnassensis, contain the most remarkable occurrences within a period of 240 years; from the reign of Cyrus to that of Xerxes, when the historian was living. These nine books are named after the nine Muses, each book being distinguished by the name of a Muse; and this has given birth to two disquisitions; viz. 1. Whether they were so called by Herodotus himself; and, 2. For what reason they were so called. As to the first, it is generally agreed that Herodotus did not impose these names himself; but it is not agreed why they were imposed by others. Lucian tells us, that these names were given them by the Grecians at the Olympic games, when they were first recited, as the best compliment that could be paid the man who had taken pains to do them so much honour. Others have thought, that the names of the Muses have been fixed upon them by way of reproach, to intimate, that Herodotus, instead of true history, had written a great deal of fable. Aldus Manutius, Joachim Camerarius, and Henry Stephens, have written apologies for him; and have very justly observed, that he seldom relates any thing of doubtful credit without producing the authority on which his narration is founded; and, if he has no certain authority to fix it upon, uses always the terms, *ut ferunt*, *ut ego audivi*, &c. There is ascribed also to Herodotus, but falsely, a Life of Homer, which is usually printed at the end of his work. He wrote in the Ionic dialect, and his style and manner have been admired by all people of taste. There have been several editions of his works; two by Henry Stephens, in 1570, and 1592; one by Gale at London in 1679; and one by Gronovius at Leyden in 1715, which is the best, though not the best printed.

HEROIC AGE, is that age or period of the world, wherein the heroes, or those called by the poets the children of the gods, are supposed to have lived. It coincides with the fabulous age.

HEROIC POEM is that which undertakes to describe some extraordinary action, or enterprise. Homer, Virgil, Statius, Lucan, Tasso, Camoens, Milton, and Voltaire, have composed heroic poems. In this sense, heroic poem coincides with epic poem.

HEROIC VERSE, is that wherein heroic poems are usually composed; or, it is that proper for such poems. In the Greek and Latin, hexameter verses are peculiarly denominated heroic verses, as being alone used by Homer, Virgil, &c. Alexandrine verses, of twelve syllables, were formerly called heroic verses, as being supposed the only verse proper for heroic poetry; but later writers use verses of ten syllables.

HERON, in ornithology. See ARDEA. This bird is a very great devourer of fish, and will do more mischief to a pond than even

even an otter. The readiest method of destroying this mischievous bird is by fishing for him in the manner of pike, with a baited hook; the bait consisting of small roach or dace, and the hook fastened to one end of a strong line, made of silk and wire twisted together. The wire should be entered under the gills of the roach, and run just under the skin to the tail; in which condition the fish will live several days: for if it be dead, the heron will not touch it. To the other end of the line is fastened a stone of a pound weight; and several of these baited lines being sunk by means of the stone in different parts of the pond, in a night or two the heron will certainly be taken.

HERPES, [*hɛrɪs*,] a cutaneous inflammation of two kinds: miliaris, or pustularis, which is like millet-seed upon the skin; and excedens, which is more corrosive and penetrating, so as to form little ulcers.

HERRING. See **CLUPEA**.

HERRING-FISHERY. Our great stations for this fishery are off the Shetland and Western Isles. There are two seasons for it; the first from June to the end of August; and the second in Autumn, when the fogs become very favourable for this kind of fishing. The Dutch begin their herring-fishing on the twenty-fourth of June, and employ a vast number of vessels therein; called busses, being between forty-five and sixty tons burden each, and carrying three or four small cannon. They never stir out of port without a convoy, unless there be enough together to make about eighteen or twenty cannon among them, in which case they are allowed to go in company. Before they go out, they make a verbal agreement, which has the same force as if it were in writing. The regulations of the admiralty of Holland are partly followed by other nations, and partly improved and augmented with new ones; as, that no fisher shall cast his net within 100 fathoms of another boat: that while the nets are cast, a light shall be kept on the hind part of the vessel: that when a boat is by any accident obliged to leave off fishing, the light shall be cast into the sea; that when the greater part of a fleet leaves off fishing, and casts anchor, the rest shall do the same, &c. The vast advantage of this fishery to our nation is very obvious, when we consider that though herrings are found upon the shores of North America, they are never seen there in such quantities as with us, and that they are not to be met with in considerable numbers in any of the southern kingdoms of Europe as Spain, Portugal, or the south parts of France on the side of the ocean, or in the Mediterranean, or on the coast of Africa. Numerous attempts have been made at different periods to secure this treasure to ourselves, but with little success. In the late reign, a very strong effort was made, and bounties allowed for the encouragement of British adventurers: the first was of 30s. per ton to every buss of seventy tons and upwards. This bounty was afterwards raised to 50s. per ton, to be paid to such adventurers as were entitled to it by claiming it at the places of rendezvous. The busses are from twenty to ninety tons burden, but the best size is eighty. A vessel of eighty tons ought to take ten lasts, or 120 barrels of herrings, to clear expences, the price of the fish to be admitted to be a guinea a barrel. A ship of this size ought to have eighteen men, and three boats: one of twenty tons should have six men; and every five tons above require an additional hand. To every ton are 280 yards of nets; so a vessel of eighty tons carries 20,000 square yards: each net is twelve yards long, and ten deep; and every boat takes out from twenty to thirty nets, and puts them together, so as to form a long train; they are sunk at each end of the train by a stone, which weighs it down to the full extent: the top is supported by buoys, made of sheep's skin, with a hollow stick at the mouth, fastened tight; through this the skin is blown up, and then stopped with a peg, to prevent the escape of the air. Sometimes these buoys are placed at the top of the nets; at other times the nets are suffered to sink deeper, by lengthening the cords fastened to them, every cord being for that purpose ten or twelve fathoms long. But the best fisheries are generally in more shallow water. Loch-broom has been celebrated for three or four centuries as the resort of herrings. They generally appear there in July: those that turn into this bay are part of the brigade that detaches itself from the western column of that great army which annually deserts the vast depths of the arctic circle, and come, heaven-directed, to the seats of population, offered as a cheap food to millions, whom wasteful luxury or iron-hearted avarice hath deprived, by enhancing the price of the wonted supports of the poor. The migration of these fish from

their northern retreat is regular; their visits to the western isles and coasts, certain; but their attachment to one particular loch, extremely precarious. All have their turns: that which swarmed with fish one year is totally deserted the following; yet the next loch to it may be crowded with the shoals. These changes of place give often full employ to the busses, who are continually shifting their harbour in quest of news respecting these important wanderers. They commonly appear here in July; the latter end of August they go into deep water, and continue there for some time, without any apparent cause: in November, they return to the shallows, when a new fishery commences, which continues till January; at that time the herrings become full of roe, and are useless as articles of commerce. Some doubt whether those herrings that appear in November are not part of a new migration; for they are as fat, and make the same appearance, as those that composed the first. The signs of the arrival of the herrings are flocks of gulls, who catch up the fish while they skim on the surface; and of gannets, who plunge and bring them up from considerable depths. Both these birds are closely attended to by the fishers. Cod-fish, haddocks, and dog-fish, follow the herrings in vast multitudes; these voracious fish keep on the outsides of the columns, and may concur in driving the shoals into bays and creeks. In summer, they come into the bays generally with the warmest weather, and with easy gales. During winter, the hard gales from N. W. are supposed to assist in forcing them into shelter. East winds are very unfavourable to the fishery.

HERRINGS, METHOD OF SALTING. The nets being hauled on board, the fishes are taken out, and put into the warbacks, which stand on one side of the vessels. When all the nets are thus unloaded, one fills the gippers' baskets. The gippers cut their throats, take out their guts, and fling out the full herrings into one basket, and the shotten into another. One man takes the full basket when they are gipped, and carries them to the rower back, wherein there is salt. One boy rows and stirs them about in the salt, and another takes them, thus rowed, and carries them in baskets to the packers. Four men pack the herrings into one barrel, and lay them, one by one, straight and even; and another man, when the barrel is full, takes it from the packers. It is left to stand a day or more open to settle, that the salt may melt and dissolve to pickle; after which it is filled up, and the cooper completes the work, by heading the casks very tight, and stowing them in the hold. The pickle is to be strong enough to sustain a herring; otherwise the fish decay in it.

HERRINGS, RED, must lie twenty-four hours in the brine, as they are to take all their salt there. When taken out, they are spitted, that is, strung by the head on little wooden spits, and then hung in a chimney made for that purpose. After which, a fire of brush-wood, which yields a great deal of smoke, but no flame, being made under them, they remain there till sufficiently smoked and dried, and are then barrelled up for keeping.

HERRNHUTTERS, a sect of Christians, named also Moravians and United Brethren. See **UNITED BRETHREN**.

HERSCHEL, the name given by most foreigners to the new planet, called Georgium Sidus by Mr. Herschel, who discovered it. See **ASTRONOMY**. This planet is also called Uranus.

HERSE, [*herce*, Fr. *h. c.* a harrow,] in fortification, a lattice, or portcullis, in form of a harrow, beset with iron-spikes. It is usually hung by a rope fastened to a maulinet; to be cut, in case of surprise, or when the first gate is broken with a petard, that the herse may fall, and stop up the passage of the gate or other entrance of a fortress. It is otherwise called a sarrasin, or cataract; and when it consists of straight stakes, without any cross pieces, it is called orgues.

HERSE is also a harrow, which the besieged, for want of chevaux de frise, lay in the way, or in breaches, with the points up, to incommode the march of the enemy's horse or infantry.

HERSFELD, a late territory of Germany, in the circle of the Upper Rhine, which belonged to the Prince of Hesse Cassel. It now forms a part of the kingdom of Westphalia, under the government of Jerome Napoleon.

HERSFELD, or **HIRSCHFELD**, the capital of the above territory, 32 miles S. S. E. of Cassel, and 50 W. of Erfurt.

HERSILLON, in the military art, a sort of plank or beam, ten or twelve feet long, whose two sides are driven full of spikes or nails, to incommode the march of the infantry or cavalry. The word is a diminutive of herse. See **HERSE**.

HERTFORD, the county of Hertfordshire. In the beginning of the heptarchy it was considered as one of the principal cities of the East Saxons. It is 21 miles N. of London.

HERTFORD, a county and town of North Carolina, in Edenton district.

HEREFORDSHIRE, or **HERTS**, a county of England, bounded on the north by Cambridgeshire, on the east by Essex, on the north west by Bedfordshire, on the west by Bucks, and on the south by Middlesex. It is 36 miles long from north to south, and 28 broad from east to west. It is divided into eight hundreds, which contain nineteen market-towns, and a hundred and seventy-four parishes. Flint-stones are scattered in great profusion over it, and beds of chalk are frequently met with. It is, however, with proper culture, extremely favourable to wheat and barley, which come to as great perfection here as in any part of the kingdom.

HERTHA, or **HERTHUS**, in mythology, a goddess worshipped by the ancient Germans. She is mentioned by Tacitus, in his book *De Moribus Germanorum*, cap. 40. Vossius supposes that this goddess was Cybele: but she was more properly Terra, or the Earth; for the Germans still use her for the earth, whence also the English word earth.

HERTZBERG, a considerable town of Saxony, 24 miles S.E. of Wittenberg, and 35 N.W. of Dresden.

HERVORDEN, or **HERWARDEN**, a town in Westphalia, 17 miles S.W. of Minden.

HESDIN, a strong town of France, in the department of the Straights of Calais, and late county of Aortis, 25 miles S.S.W. of St. Omer, and 165 N. of Paris.

HESIOD, a very ancient Greek poet; but whether contemporary with Homer, or a little older or younger, is not agreed among the learned. His father, as he tells us in his *Opera et Dies*, was an inhabitant of Cumæ, one of the Eolian isles, now called *Taio Nova*; and removed from thence to Ascra, a little village of Boeotia, at the foot of mount Helicon, where Hesiod was probably born, and called, as he often is, *Ascreus*, from it. Of what quality his father was it is no where said; but that he was driven by misfortunes from Cumæ to Ascra Hesiod himself informs us. His father seems to have prospered better at Ascra, than he did in his own country; yet Hesiod could arrive at no higher fortune than keeping sheep on the top of mount Helicon. Here the Muses met with him, and entered him into their service, as he boasts in his *Generatio Deorum*:

Erewhile as they the shepherd swain behold,
Feeding beneath the sacred mount his fold,
With love of charming song, his breast they fir'd:
There me the heav'nly muses first inspir'd;
There, when the maids of Jove the silence broke,
To Hesiod thus the shepherd swain they spoke, &c.

On the death of the father, an estate was left which ought to have been equally divided between Hesiod and his brother Perses; but Perses defrauded him in the division, by corrupting the judges. Hesiod was so far from resenting this injustice, that he expresses a concern for those mistaken mortals who place their happiness in riches only, even at the expence of their virtue. He let us know, that he was not only above want, but capable of assisting his brother in time of need, which he often did, though he had been so ill used by him. The last circumstance he mentions relating to himself is his conquest in a poetical contention. Archidamus, king of Eubœa, had instituted funeral-games in honour of his own memory, which his sons afterwards took care to have performed. Here Hesiod was a competitor for the prize in poetry; and won a tripod, which he consecrated to the muses. When he was grown old (for it is agreed by all that he lived to a very great age), he removed to Locris, a town about the same distance from mount Parnassus as Ascra was from Helicon. His death was tragical. The man with whom he lived at Locris, a Milesian born, ravished a maid in the same house; and though Hesiod was entirely ignorant of the fact, yet being maliciously accused to her brothers as an accomplice, he was unjustly slain with the ravisher, and thrown into the sea. The *Theogony*, and his *Works and Days*, are the only undoubted pieces of this poet now extant; but it is supposed that even these have not come to us complete. A good edition of Hesiod's works was published by Mr. Le Clerc, at Amsterdam in 1701.

HESIONE, in fabulous history, the daughter of Laomedon, king of Troy, and sister of king Priam.

HESPER, or **HESPERUS**, [*Ἑσπερος*,] in astronomy, the evening-star; an appellation given to Venus when she follows or sets after the sun. See **HESPERUS**.

HESPERIA, or **HESPERIA MAGNA**, an ancient name of Italy; so called by the Greeks from its western situation.

HESPERIDEÆ, in botany, from the *Hesperides*; golden, or precious fruit: the nineteenth order in Linnæus's *Natural Method*. See **BOTANY**.

HESPERIDES, in ancient mythology, the grand-daughters of Hesperus, the brother of Atlas. According to Diodorus, these brothers possessed great riches in the western parts of Africa. Hesperus had a daughter called Hesperia, who married her uncle Atlas, and from this marriage proceeded seven daughters, called *Hesperides* from the name of their mother, and *Atlantides* from that of their father. According to the poets, the *Hesperides* were three in number, *Ægle*, *Arethusa*, and *Hesperethusa*. Hesiod, in his *Theogony*, makes them the daughters of Nox, Night, and seats them in the same place with the Gorgons, viz. at the extremities of the west near mount Atlas; because the sun sets there.

HESPERIDES, **GARDENS OF THE**, in ancient geography, are placed by some authors at Larach, a city of Fez; by others, at Bernich, a city of Barca, which accords better with the fable. Others take the province of Susa in Morocco for the island where in the garden was seated.

HESPERIS, **ROCKET**, **DAME'S VIOLET**, or **QUEEN'S GIL-LIFLOWER**; a genus of the siliquosa order, and tetradynamia class of plants; natural order, *Siliquosæ*. Petals turned obliquely; glandule within the shorter stamina; siliqua almost upright; stigma forked at the base, connivent, or closing at the top; calyx close. There are seven species cultivated, on account of the great fragrancy of the flowers.

HESPERUS, in the mythology, the brother of Atlas, and grandfather of the *Hesperides*. Diodorus, lib. iii. relates that Hesperus, having ascended to the top of mount Atlas, the better to observe the stars, never returned; and hence he was fabled to have been changed into the evening-star.

HESSE, a country in the late circle of the Upper Rhine, in Germany, bounded on the north by the bishopric of Paderborn and duchy of Brunswick; on the east by Thuringia; on the south by the territory of Fulde and Weteravia; and on the west by the counties of Nassau, Witgenstein, Harzfeldt, and Waldeck. The house of Hesse is divided into four branches, namely, Hesse-Cassel, Homburg, Darmstadt, and Rhinefeldt, each of which has the title of landgrave, and takes its name from one of the four principal towns.

HESSIAN FLY, a very mischievous insect, native of the Land-gravate Hesse, whence it has received its name. This insect is particularly destructive to wheat-corn, in which it deposits its eggs close to the ground, while growing. When the young vermin are hatched, they continue for some time in a worm-state, feeding on the tender part of the stalk, the growth of which is thus effectually checked. The Hessian fly committed great depredations in the eastern counties of England, several years since; and in the year 1787, did incalculable damage in the provinces of Pennsylvania and Maryland, in America. Several remedies against this destructive insect have been proposed; the only efficacious one hitherto discovered, consists in facilitating the vigorous growth of the plants, by properly manuring and cultivating the soil. In order to prevent the depredations of this insect, it has been recommended to mix three pounds of turnip-seed with one ounce of flour of sulphur in a glazed earthen-pot, which should be closely covered. After standing twenty-four hours, another ounce of sulphur should be added, and the same quantity after forty-eight hours, so as to employ three ounces of this powder to three pounds of seed, carefully stirring the whole every time the vessel is opened, with a smooth piece of wood or ladle, that the seed may be thoroughly impregnated with the sulphur. It is then to be sown on an acre of ground, in the usual manner, where it will effectually keep off the insect till the third or fourth seeding-leaf is formed, which will acquire a bitterish taste, and thus be secured from the depredations of the fly. Another remedy is, to strew tobacco-dust over the land; and in some counties the seeds are steeped in soot and water for several hours previously to being sown, by which they acquire such a degree of bitterness, as to screen them completely against the ravages of this noxious insect.

HESYCHIUS, the most celebrated of all the ancient Greek grammarians,

lib. vi. cap. 16,) relates that Origen, after his return from Rome under Caracalla, learned Hebrew, and began to collect the several versions that had been made of the sacred writings, and of these to compose his Tetrapla and Hexapla. But others say that he did not begin till the time of Alexander, after he had retired into Palestine, about A. D. 231. Besides the translation of the sacred writings, called the Septuagint, made under Ptolemy Philadelphus, about B. C. 280, the Scriptures had been since translated into Greek by other interpreters. The first of those versions, or (reckoning the Septuagint) the second, was that of Aquila, a proselyte Jew, the first edition of which he published in the twelfth year of Adrian, or about A. D. 128; the third was that Symmachus, published, as is supposed, under Marcus Aurelius, but, as some say, under Septimius Severus, about A. D. 200; the fourth was that of Theodotion, prior to Symmachus's, under Commodus, or about A. D. 175. These Greek versions, says Dr. Kennicott, were made by the Jews from their corrupted copies of the Hebrew, and were designed to stand in the place of the Seventy, against which they were prejudiced, because it seemed to favour the Christians. The fifth was found at Jericho, in the reign of Caracalla, about A. D. 217; and the sixth was discovered at Nicopolis, in the reign of Alexander Severus, about A. D. 228; lastly, Origen himself recovered part of a seventh, containing only the Psalms. Origen, who had held frequent disputations with the Jews in Egypt and Palestine, observing that they always objected to those passages of Scripture quoted against themselves, and appealed to the Hebrew text; the better to vindicate those passages, and confound the Jews by shewing that the Seventy had given the sense of the Hebrew, or rather to shew, by a number of different versions, what the real sense of the Hebrew was, undertook to reduce all the several versions into a body along with the Hebrew text, so as they might be easily confronted, and afford a mutual light to each other. He made the Hebrew text his standard; and, allowing that corruptions might have happened, and the old Hebrew copies might and did read differently, he marked such words or sentences as were not in his Hebrew text, nor the latter Greek versions, and added such words or sentences as were omitted in the LXX, prefixing an asterisk to the additions, and an obelisk to the others. For this purpose, he made eight columns; in the first he gave the Hebrew text in Hebrew characters; in the second the same text in Greek characters; the rest were filled with the several versions above-mentioned; all the columns answering verse for verse, and phrase for phrase; and in the Psalms there was a ninth column for the seventh version. This work Origen called *Ἑξάπλη*, Hexapla, *q. d.* sextuple, or a work of six columns, as only regarding the first six Greek versions. St. Epiphanius, taking in likewise the two columns of the text, calls the work Octapla, as consisting of eight columns. This celebrated work, which Montfaucon imagines consisted of fifty large volumes, perished long ago, probably with the library at Casarea, where it was preserved in 653; though several ancient writers have preserved pieces of it, particularly St. Chrysostom on the Psalms, Philoponus in his Hexameron, &c. Some modern writers have earnestly endeavoured to collect fragments of the Hexapla, particularly Flaminii Nobilius, Drusius, and F. Montfaucon, in two folio volumes, printed at Paris in 1713.

HEXASTIC, [*ἑξάστις* and *ἑξάστις*] a poem of six lines.

HEXASTYLE, in architecture, a building with six columns in front.

HEXHAM, a town of Northumberland, on the Tyne, noted for its manufactory of tanned leather, shoes, and gloves; and is twenty-two miles W. of Newcastle.

HEYDON, a borough in the E. Riding of Yorkshire, six miles W. of Hull.

HELYSHEM, a town of France in the department of the Dyle, and late province of Austrian Brabant: 14 miles S. E. of Louvain.

HEYMERISEN, a town of Germany, in the late electorate of Cologne, 5 miles W. of Bonne.

HEZEKIAH, or **EZEKIAS**, [הזקיה, Heb. *i. e.* The strength of Jah, or Jehovah,] one of the best kings of Judea, succeeded his father Abaz, A. M. 3278. His reformation of his subjects from idolatry; his grand and solemn celebration of the passover; his invitation to the Israelites to assist at it; his throwing off the Assyrian yoke; his miraculous deliverance from the invasion by Sennacherib, after the blasphemous defiance of Rabshakeh; his mor-

tal disease, prophetic prayer, and miraculous recovery, with the fatal consequences of his vanity after it, are recorded in 2 Kings xviii.—xx. 2 Chron. xxix.—xxxii. and Isaiah xxxvi.—xxxix. The hymn he composed upon his recovery, (Isa. xxxviii.) entitles him to be ranked among the Types of Christ. He collected a part of Solomon's Proverbs. (See Prov. xxvi.) Upon the miraculous retrogression of the shadow on Abaz's dial, we need say little. Those who doubt the existence of a Deity, or deny his power over the material world, will not be convinced by any arguments. But those who believe that the Almighty, when he gave existence to matter, and subjected it to certain laws, did not thereby limit his own infinite power, will not think it more incredible, that he who created light by his word should invert the shadow of the gnomon, so as to make it appear to have gone 10 degrees backward, than that a watchmaker should turn back the hour or minute hand of a clock, in a direction contrary to the natural motion which he himself has given it. How this was done, whether by a momentary retrograde motion given to the terrestrial globe, or only by an inversion of the usual motion of the solar rays upon the gnomon, it is neither necessary nor possible to determine. The former supposition seems most probable. Upon this supposition it must have been observed over one half of the globe; and that it was observed by the Chaldean astronomers who resided at Babylon, seems evident from Merodach-Baladan's congratulatory embassy on Hezekiah's recovery. Hezekiah died in the 54th year of his age, and 29th of his reign; A. M. 3307.

HIAMEN, or **EMOUY**, an island near the S. E. coast of China, in the province of Fokien, about 15 miles in circumference; with an extensive port capable of containing several thousands of vessels, protected on one side by the island, and on the other by the main-land. The water is so deep that the largest ships may lie close to the shore without danger. Lon. 1. 52. E. of Pekin. Lat. 24. 30. N.

HIARBAS, in fabulous history, a king of the Getulians, who made war against Queen Dido.

HIATUS, [*hiatus*, Lat.] an aperture; a gaping breach; the opening of the mouth by the succession of an initial to a final vowel. It is particularly applied to those verses where one word ends with a vowel, and the following word begins with one, and thereby occasions the mouth to be more open, and the sound to be very harsh. It is also used in speaking of manuscripts, to denote their defects, or the parts that have been lost or effaced.

HIBERNIA, one of the ancient names of Ireland, is derived by some from *hibernum tempus*, winter-time, because in that season the nights are long there. But it appears more probable that it has been derived from *Erin*, the name given to the island by the original inhabitants: whence *Jerna*, the name given it by Claudian, *Iverna*, by Ptolemy, and *Juvena*, by Juvenal, are evidently derived.

HIBISCUS, **SYRIAN MALLOW**; a genus of the polyandria order, and monadelphia class of plants: natural order, Columnifera. Calyx double; outer many-leaved; capsule five-celled, with many seeds. There are forty-five species; most of these are perennials; several of them have shrubby stalks; and some are herbaceous; the leaves are alternate and commonly of a soft texture. The flowers are of the mallow-kind, axillary, and terminating; the bark in several is capable of being drawn into threads, and manufactured for packthread and ropes; the capsule in some is eatable; others are much esteemed for their ornamental flowers.

HICCUGH, or **HICKUP**, is a spasmodic affection of the stomach, œsophagus, and muscles, subservient to deglutition, arising from various causes, such as a fit of laughing, thirst, cold drinks, suppression of diarrhoea, antipathy, &c. It can by no means be considered as a disease, though a few instances have occurred, in which it has continued for three or four years; and one in which it became habitual, and could not be removed. Persons who eat large meals, and load the stomach by drinking profusely after them, or those liable to flatulency, are chiefly subject to this affection. The common hiccough seldom requires any medicine to remove it, as it generally disappears after drinking a few small draughts of water in quick succession.

HIDAGE, or **HIDAGIUM**, was an extraordinary tax payable to the kings of England for every hide of land. This taxation was levied not only in money, but in provision, armour, &c.; and when

when the Danes landed in Sandwich in 994, king Ethelred taxed all his lands by hides; so that every 310 hides found one ship furnished, and every 8 hides furnished one jack and one saddle, to arm for the defence of the kingdom, &c.

HIDALGO, in modern history, a title given in Spain to all who are of noble family. The Hidalgos claim a descent from those valiant soldiers who retired into Castile, and the mountains of Asturias, and other remote parts of Spain, on the invasion of the Moors, where having fortified themselves, they successively descended into the plains, in proportion to the success of their arms: from the notoriety of their persons, or the lands they became possessed of, they acquired the appellation of Hidalgos notorios, Hidalgos de dolor conocido, or de casa solariega.

HIDDEKEL, the third river in Paradise. (Gen. ii. 14.) It is supposed to be the same with the Tigris, called Diglat by the Arabs. It runs S. between Assyria on the E. and Mesopotamia on the W. and falls into the Euphrates. It is said by Moses to run toward the E. of Assyria, which it does in respect of his situation.

HIDE, [*hyde*, Sax.] generally speaking, signifies the skin of beasts, but is particularly applied to those of large cattle, such as bullocks, cows, horses, &c. Hides are either raw or green, that is, in the same state as when they were taken off the carcass; salted or seasoned, in which case they are dressed with salt, alum, and salt-petre, to prevent them from putrefying; or they are curried or tanned; for an account of which processes, See **TANNING**.

HIDE OF LAND, was as much as would maintain a family; some call it 60, some 80, and others 100 acres.

HIDBOUNDNESS. See **FARRIERY**.

HIERACUM, **HAWKWEED**; a genus of the polygamia æqualis order, and syngenesia class of plants; natural order, Compositæ. Receptacle naked; calyx imbricate, ovate; down simple, sessile. The species are fifty-five, most of them weeds.

HIERAPOLIS, in ancient geography, a town of Phrygia, abounding in hot springs, and having its name from the number of its temples. It is now called Pambouk; and is situated near the Scamander, on a portion of Mount Mesogis, 6 miles from Laodicea.

HIERARCH, [*ἱεραρχ*, and *αρχων*, Gr.] the chief of a sacred order.

HIERARCHY, a sacred government; rank or subordination of holy beings. Some of the rabbins reckon four, others ten, orders or ranks of angels; and give them different names according to their supposed degrees of power and knowledge.

HIERARCHY, also denotes the subordination of the clergy, ecclesiastical polity, or the constitution and government of the Christian church considered as a society.

HIERES, a town of France, in the department of Var and late province of Provence, 12 miles E. of Toulon.

HIERES, four islands of France, on the coast of Provence; called Porquerollos, Porteros, and Bagueau, which are inhabited, and Titan; which last is the largest and is capable of cultivation.

HIERO II, K. of Syracuse was a descendant of Gelon, and was elected king B. C. 268. He carried on war against the Romans for some time along with the Carthaginians; but made peace, and continued ever after their firm ally. He was a relation of Archimedes: and was a prince of great learning and virtue, and encouraged arts and commerce. He died B. C. 225.

HIERO'S CROWN, in hydrostatics. Hiero II. having furnished a goldsmith with a quantity of fine gold to make a crown, suspected, upon receiving it, that he had been cheated, by his using a greater quantity of silver-alloy than was necessary. He applied to Archimedes to discover the fraud without defacing the crown; which he did by this experiment: He procured a ball of pure gold, and another of silver, each exactly of the same weight with the crown: and judging that if the crown were of pure gold it would be of equal bulk, and upon putting it in water, expel an equal quantity of the water with the golden ball; if of silver, it would expel an equal quantity with the silver one; but, if of an intermediate quality, the quantity of water expelled would be in exact proportion. This upon trial he found to be the case; and by comparing the quantities of water displaced, discovered the exact proportions of gold and silver in the crown. The following example will shew the process: suppose each of the three masses

above referred to weigh 64 ounces, and that immersing them separately in the same vessel of water, there were displaced 5oz. of water by the golden ball, 9oz. by the silver, and 6oz. by the compound, or the crown itself, then the respective bulks being as the quantities of water displaced, will be as 5, 9, and 6; and we say,

$$9 - 6 = 3$$

$$6 - 5 = 1$$

$$\frac{4}{-}$$

$$4 : 64 :: 3 : 48$$

$$4 : 64 :: 1 : 16$$

And under such circumstances the crown consisted of 48oz. of gold and 16 of silver.

HIEROGLYPHS, or, **HIEROGLYPHICS**, [*ἱερος*, sacred, and *γλυφω*, to carve,] in antiquity, mystical characters or symbols, in use among the Egyptians, and that, as well in their writings as inscriptions; being the figures of various animals, the parts of human bodies, and mechanical instruments. It was the custom to have the walls, doors, &c. of their temples, obelisks, &c. engraven with such figures. Hieroglyphics are properly emblems or signs of divine, sacred, or supernatural things; by which they are distinguished from common symbols, which are signs of sensible and natural things. Hermes Trismegistus is commonly esteemed the inventor of hieroglyphics: he first introduced them into the heathen theology, from whence they have been transplanted into the Jewish and Christian. Sacred things, says Hippocrates, should only be communicated to sacred persons. Hence the ancient Egyptians communicated to none but their kings and priests, and those who were to succeed to the priesthood and the crown, the secrets of nature, of their morality and history; and this they did by a kind of cabbala, which, at the same time that it instructed them, only amused the rest of the people. Hence the use of hieroglyphics, or mystic figures, to veil their morality, politics, &c. from profane eyes. This author and many others do not keep to the precise character of a hieroglyphic, but apply it to profane as well as divine things. Hieroglyphics are a kind of real characters, which do not only denote, but in some measure express, the things. Thus, according to Clemens Alexandrianus, (Strom. v.) a lion is the hieroglyphic of strength and fortitude; a bullock, of agriculture; a horse, of liberty; a sphinx, of subtilty, &c. Such is the opinion that has generally been embraced, both by ancient and modern writers, of the origin and use of hieroglyphics. It has been almost uniformly maintained, that they were invented by the Egyptian priests to conceal their wisdom from the knowledge of the vulgar; but the late bishop Warburton has with much ingenuity and learning, endeavoured to shew that this account is erroneous. He thinks, the first kind of hieroglyphics were mere pictures, because the most natural way of communicating our conceptions, by marks or figures, was by tracing out the images of things; and this is verified in the case of the Mexicans, whose only method of writing their laws and history was by this picture-writing. But the hieroglyphics invented by the Egyptians were an improvement on this rude and inconvenient essay towards writing, for they contrived to make them both pictures and characters. In order to effect this improvement, they were obliged to proceed gradually, by first making the principal circumstance of the subject stand for the whole; as in the hieroglyphics of Horapollon, which represent a battle of two armies in array by two hands, one holding a shield and the other a bow: then putting the instrument of the thing, whether real or metaphorical, for the thing itself, as an eye and sceptre to represent a monarch, a ship and pilot the governor of the universe, &c.; and finally, by making one thing stand for or represent another, where their observations of nature or traditional superstitions led them to discover or imagine any resemblance: thus, the universe was designed by a serpent in a circle, whose variegated spots denoted the stars; and a man who had nobly surmounted his misfortunes was represented by the skin of the hyæna, because this was supposed to furnish an invulnerable defence in battle. The Chinese writing, he observes, was the next kind of improvement in the use of hieroglyphics. The Egyptians joined characteristic marks to images; the Chinese threw out the images and retained only the

the contracted marks, and from these marks proceeded letters. The general concurrence of different people in this method of recording their thoughts can never be supposed to be the effect of imitation, sinister views, or chance; but must be considered as the uniform voice of nature speaking to the rude conceptions of mankind: for not only the Chinese of the East, the Mexicans of the West, and the Egyptians of the South, but the Scythians likewise of the North, and the intermediate inhabitants of the earth, viz. the Indians, Phenicians, Ethiopians, &c. used the same way of writing by picture and hieroglyphic. He farther shews, that the several species of hieroglyphic writing took their rise from nature and necessity, and not from choice and artifice, by tracing at large the origin and progress of the art of speech. He proceeds to shew how in process of time the Egyptian hieroglyphics came to be employed for the vehicle of mystery. They used their hieroglyphics two ways; the one more simple, by putting the part for the whole, which was the curiologic hieroglyphic; and the other more artificial, by putting one thing of resembling qualities for another, called the trophic hieroglyphic: thus the moon was sometimes represented by a half-circle and sometimes by a cynocephalus.

HIEROGRAMMATEI, or HIEROGRAMMATISTS, [*ἱερογραμματῆς, i. e. holy registers,*] were an order of priests among the ancient Egyptians, who presided over religion and learning. They had the care of the hieroglyphics, and were the expositors of religious doctrines.

HIEROLOGY, [from *ἱερός, sacred,* and *λόγος, discourse,*] a discourse on sacred things. Among the Jews and Greeks it was used for the nuptial benediction.

HIEROMANCY, or HIEROMANTIA, [*ἱερομαντεία,*] in antiquity, that species of divination which predicted future events from observing the various things offered in sacrifice.

HIEROMENIA, in ancient Greek chronology, the month in which the Nemean games were celebrated, called also Boedromion.

HIEROMNEMON, [Gr. from *ἱερός, sacred,* and *μνημὼν, a remembrancer,*] an officer in the ancient Greek church, whose principal function was to stand behind the patriarch at the sacraments, ceremonies, &c. and shew him the prayers, psalms, &c. which he was to rehearse.

HIEROMNEMON, in Grecian antiquity, a delegate chosen by lot, and sent to the great council of the Amphictyons, to take care of what concerned religion.

HIEROPHANT, HIEROPHANTA, or HIEROPHANTES, [from *ἱερός, holy,* and *φαίνω, I appear,*] a priest among the Athenians; who was properly the chief person that officiated in the Eleusinia.

HIEROPHYLAX, [*ἱερός and φυλάξ,*] an officer in the Greek church, who was keeper of the holy utensils, vestments, &c. answering to the vestry-keeper in the church of England.

HIEROSCOPIA, [from *ἱερός, sacred,* and *σκοπεῖν, to view,*] a species of divination by inspecting the victims, the same with Hieromancy.

HIERTING, or JETTING, a sea-port town of Denmark, in N. Jutland, at the mouth of the Warde, with a good harbour: 22 miles N. W. of Ripen. Lon. 8. 22. E. Lat. 55. 29. N.

HIGH, in music, is sometimes used in the same sense with loud, and sometimes in the same sense with acute.

HIGH DUTCH is the German tongue in its greatest purity, as it is spoken at Misnia, &c.

HIGHAM FERRERS, a borough of Northamptonshire, 66 miles N. N. W. of London.

HIGHLANDS. See SCOTLAND.

HIGHLANDS, a mountainous country of New York, on the banks of Hudson's river, between 40 and 60 miles N. of New York city.

HIGHLANDER, a general appellation for the inhabitants of the mountainous parts of any country. In Britain, the name is appropriated to the inhabitants of the mountainous parts of Scotland, to the N. and N. W. including those of the Hebrides. They are a branch of the ancient Celts, and are undoubtedly the descendants of the first inhabitants of Britain, as appears from the many monuments of their language, still retained in the most ancient names of places in all parts of the island.

HIGHMORE, JOSEPH, Esq. an eminent painter, born in Lon-

don, June 13, 1692. He was articled as clerk to an attorney, in 1707; but so much against his inclination, that in three years he resolved to indulge his natural disposition to his favourite art; and employed his leisure-hours in designing, and in studying geometry, perspective architecture, and anatomy, without any instructors except books. By these exertions, he soon arrived at such perfection in his favourite art, that he painted many pictures which were not only valued highly in his own time, but are now the objects of admiration to painters. On the institution of the academy of painting, sculpture, &c. in London, in 1683, he was elected one of the professors. In 1734, he published in 4to. "A Critical Examination of those two Paintings (by Rubens) on the Ceiling of the Banqueting-house at Whitehall, in which Architecture is introduced, so far as relates to Perspective; together with the Discussion of a Question which has been the Subject of Debate among Painters:" in the solution of this question, he proved that Rubens and other great painters were mistaken in the practice, and Mr. Kirby and several others in the theory. And in volume 17th of the "Monthly Review, he animadverted (anonymously) on Mr. Kirby's unwarrantable treatment of Mr. Ware, and detected his errors, even when he exults in his own superior science. Mr. Highmore, painted many portraits, of which several have been engraved. In the historical branch, which was then much less cultivated than it is at present, we shall only mention Hagar and Ishmael, a present to the Foundling Hospital: The Good Samaritan; The Finding of Moses, purchased at his sale by general Lister; The Harlowe Family, as described in Clarissa, now in the possession of T. W. Payler, Esq. Clarissa herself; The Graces unveiling Nature, drawn by memory from Rubens: The Clementina of Grandison, and The Queen Mother of Edward IV. with her younger Son, &c. in Westminster Abbey; in the possession of his son. He was the author of various publications which were well received; but his most capital work was his Practice and Perspective, on the principles of Dr. Brook Taylor, &c. in one vol. 4to. 1763. This not only evinced his scientific knowledge of the subject, but, by its perspicuity, removed the only objection that can be made to the system of Dr. Taylor. His Epistle to an Eminent Painter, published in the Gent. Mag. for 1778, shews that his talents were by no means impaired at the age of 86. Indeed he retained them to the last, and had even strength and spirit sufficient to enable him to ride out daily on horseback the summer before he died. A strong constitution, habitual temperance, and constant attention to his health, in youth as well as in age, preserved his faculties to his 88th year, when he died March 3, 1780. He was interred in Canterbury cathedral, leaving one son, Anthony, educated in his own profession; and a daughter. His abilities as a painter appear in his works, which are much and justly admired. His tints, like those of Rubens and Vandyck, instead of being impaired, are improved by time, which some of them have now withstood above 60 years.

HIGHNESS. The kings of England and Spain had formerly no other title but that of highness; the first till the time of James I. and the second till that of Charles V. The petty princes of Italy began first to be complimented with this title in 1630. In France, the duke of Orleans assumed the title of royal highness in 1631, to distinguish himself from the other princes. The princes of the blood in England are each distinguished in the same way.

HIGH OPERATION, in surgery, a method of extracting the stone; thus called, because the stone was taken out at the upper part of the bladder, above the pubis. This operation is now, very properly, superseded by one much safer and more successful. See SURGERY.

HIGH PLACES, were eminences on which the heathens used to worship their gods, chosen for that purpose as being supposed to be nearer heaven, their constant residence. The Jews are frequently blamed for their attachment to high places, after the manner of the Gentiles; though their proseuchæ were frequently upon mountains with groves planted about them. Where high places are reprobated in scripture, therefore, we should understand them as abused and prostituted to idolatrous purposes. Before the temple was built, there was indeed nothing in the high places very contrary to the law, provided God only was adored there, and that no incense or victims were offered to idols. Under the judges they seem to have been tolerated; and Samuel offered sacrifices

in several places besides the tabernacle, where the ark was not present. Even in David's time, they sacrificed to the Lord at Shilo, Jerusalem, and Gibeon; but after the temple was built, and a place prepared for the fixed settlement of the ark, it was no more allowed, to sacrifice out of Jerusalem. Solomon, in the beginning of his reign, went a pilgrimage to Gibeon; but from that time we see no lawful sacrifices offered out of the temple.

HIGH-PRIEST. See **PONTIFEX** and **PRIEST**.

HIGHWAY, a free passage for the king's subjects; on which account it is called the king's highway, though the freehold of the soil belong to the owner of the land. Only those ways which lead from and to different towns or villages, and such as are cart-roads, communicating with the former, are properly called highways: the care of repairing them, &c. is reposed in commissioners and surveyors, who are empowered by various statutes to superintend them, and to see that no obstacles be laid in the roads.

HIGHWAYMEN, REWARDS FOR APPREHENDING. A reward of 40*l.* is given by the statute of 4 and 5 W. and M. to be paid within a month after conviction by the sheriff of the county; to which the statute 8 Geo. II. cap. 16, superadds 10*l.* to be paid by the hundred indemnified by such apprehension.

HIGHWORTH, a town of Wilts, 36 miles N. of Salisbury.

HILARIA, in antiquity, feasts celebrated annually, with great pomp and joy, by the Romans, on the 8 Kal. April, or 25th of March, in honour of Cybele. The Romans took this feast originally from the Greeks, who called it *ἡλικάρις*, *q. d.* ascensus; the eve of that day they spent in tears and lamentations, and thence denominated it *κατάβασις*, descensus. Afterwards, the Greeks took the name *ἡλάρια* from the Romans; as appears from Photius, in his extract of the life of the philosopher Isidore.

HILARY, St. a saint of the Roman Calendar, born at Arles, in 401. He succeeded Honoratus as bishop of Arles, and presided in the council at Rome in 441. He wrote, 1. Homilies, under the name of Eusebius of Emesa: 2. The Life of St. Honoratus: 3. Opuscula. He died in 449, aged 48.

HILARY TERM. See **TERM**.

HILD, in Elrick's grammar, is interpreted a lord or lady: so Hildebert is a noble lord; Mathild, an heroic lady. Gibson.

HILDBURGHAUSEN, a town in Franconia, 22 miles N. by W. of Cobourg, and 32 S. of Erfurt.

HILDESHEIM, a late princely bishopric of Germany, bounded on the N. and E. by the duchies of Lunenburg, Wolfenbützel, and Halberstadt, and on the S. and W. by Calenberg; and which extended 40 miles from E. to W. and 32 from N. to S.

HILDESHEIM, the capital of the above bishopric, seated on the Irneste, 17 miles S. S. E. of Hanover.

HILDESHEIM, or HILLESHEIM, a town of Germany, lately in the electorate of Treves, now annexed to France. It is 31 miles N. of Treves, and 36 W. of Coblenz.

HILLIA, in botany, a genus of the monogynia order, and hexandria class of plants. Calyx hexaphyllous; corolla cleft in six parts, very long; berry inferior, bilocular, polyspermous. It has two species, shrubs of Jamaica.

HILLSBOROUGH, a town of Ireland, in the county of Down, Ulster, 69 miles from Dublin.

HILLSBOROUGH, an island on the E. coast of Labrador. Lon. 61. 20. W. Lat. 57. 20. N.

HILLSBOROUGH, a fertile district of North Carolina, bounded on the E. by Halifax district, S. by Fayette, W. by Salisbury, and N. by Virginia; containing 7 counties, 46,477 citizens, and 13,506 slaves, in 1795.

HILLSBOROUGH, the capital of the above district.

HIMMALEH, a vast chain of mountains in Asia, which extends from Cabul along the N. of Hindostan, and appears to be the general boundary of Thibet. This ridge was by the ancients named Imaus, and the Indian Caucasus. The natives now call it Hindoo-Ko, (*i. e.* the Indian mountains) as well as Himmaleh; which last is a Sanscrit word, signifying snowy; its summit being covered with snow.

HIN, [*ḥin*] a measure of liquids among the Jews, containing about ten pints. It is the sixth part of an ephah.

HINCKLEY, a town of Leicestershire, 91 miles N. N. W. of London.

HIND, a female stag of the third year. See **CERVUS**.

HIND-CASTLE, in sea-language, the elevation of the stern over the last deck, where the officer's cabins and places of assembly are.

HINDECK, a town of the Helvetic republic, in the canton of Bern, 15 miles S. E. of Interlaken.

HINDELBANK, a town of the Helvetic republic, in Bern, 9 miles N. N. E. of Bern.

HINDELOPEN, or HINLOPEN, a seaport of Batavia, in the department of the Eems, and late province of Friesland, on the Zuider Zee.

HINDIA, a district of Hindoostan, in the province of Candish.

HINDIA, a town in the above district, on the Nerbudda, 6 miles E. S. E. of Indore, and 90 N. N. E. of Burhampour. Lon. 77. 10. E. Lat. 22. 35. N.

HINDON, a small town of Wiltshire. Lon. 2. 14. W. Lat. 51. 12. N.

HINDOO KHO, or INDIAN CAUCASUS, a part of a long ridge of mountains in Asia, which separate Cabul from Balk.

HINDOOS, or GENTOOS, the inhabitants of that part of India known by the names of Hindoostan, Hindostan, India, or the Mogul's empire, who profess the religion of the Bramins. From the earliest period of history, these people seem to have maintained the same religion, laws, and customs, which they do at this day: and indeed, they and the Chinese are examples of perseverance in these respects altogether unknown in the western world. But the reason is obvious. The arbitrary form of both governments obliges the people to believe, or profess to believe, as their fathers did. In the time of Diodorus Siculus they are said to have been divided into seven casts or tribes; but the intercourse betwixt Europe and India was in his time so small, that we may well suppose the historian to have been mistaken, and that the same tenacity for which they are so remarkable in other respects has manifested itself also in this. At present they are divided only into four tribes; 1. The Bramin; 2. The Khatri, or Cheltee; 3. The Bhyse, or Bice; and, 4. The Soodera. See **GENTOOS**. All these have distinct and separate offices, and cannot, according to their laws, intermingle with each other; but for certain offences they are subject to the loss of their cast, which is reckoned the highest punishment they can suffer; and hence is formed a kind of fifth cast named Pariars on the coast of Coromandel, but in the Sanscrit language, Chandalas. These are esteemed the dregs of the people, and are never employed but in the meanest offices. There is besides a general division which pervades the four casts indiscriminately; and which is taken from the worship of their gods Vishnou and Sheevah; the worshippers of the former being named Vishnou-bukht; of the latter, Sheevah-bukht. Of these four casts the Bramins are accounted the principal in every respect; see **BRAMINS**, and all the laws have such an evident partiality towards them, as cannot but induce us to suppose, that they have had the principal hand in framing them. They are not, however, allowed to assume the sovereignty; the religious ceremonies and the instruction of the people being their peculiar province. They alone are allowed to read the Veda, or sacred books; the Khatries being only allowed to hear them read; while the other two casts can only read the Sastras, or commentaries upon them. As for the poor Chandalas, they dare not enter a temple, or be present at any religious ceremony. In point of precedence the Bramins claim a superiority even to the princes; the latter being chosen out of the Khatri or second cast. A rajah will receive with respect the food that is prepared by a bramini, but the latter will eat nothing that has been prepared by any member of an inferior cast. The punishment of a bramini for any crime is much milder than if he had belonged to another tribe; and the greatest crime that can be committed is the murder of a bramini. No magistrate must desire the death of one of these sacred persons, or cut off one of his limbs. They must be readily admitted into the presence even of princes whenever they please: when passengers in a boat, they must be the first to enter and go out; and the waterman must besides carry them for nothing; every one who meets them on the road being likewise obliged to give place to them. All the priests are chosen from among this order, such as are not admitted to the sacerdotal function being employed as secretaries and accountants. These can never afterwards become priests,

priests, but continue to be greatly revered by the other cast. The Khatry, or second cast, are those from among whom the sovereigns are chosen. The Blyse, or Banians, who constitute the third cast, have the charge of commercial affairs; see BANIANs, and the Soodera, or fourth cast, the most numerous of all, comprehend the labourers and artisans. These last are divided into as many classes as there are followers of different arts; all the children being invariably brought up to the profession of their fathers, and it being absolutely unlawful for them ever to alter it afterwards. No Hindoo is allowed to quit the cast in which he was born upon any account.

HINDOOSTAN, HINDUSTAN, or INDOSTAN, a celebrated and extensive country of Asia, bounded on the N. by Great and little Thibet; on the S. by the hither peninsula of India, part of the Indian Sea, and Bay of Bengal; on the W. by Persia; and on the E. by Thibet and the farther peninsula. It is situated between 84° and 102° of lon. E. and between 21° and 36° of lat. N: being about 1204 miles long, and 969 broad; though in some places much less. This country was in early times distinguished among the Greeks by the name of India, the most probable derivation of which is from the river Indus, though others derive it from Hind the Persian name. We are assured by Mr. Wilkins, that no such words as Hindoo or Hindoostan exist in the Sanscrit or learned language of the country; in which it is named Bharata, a word totally unknown to Europeans. Towards the north, Hindoostan is very cold and barren; but towards the south, very hot, and fertile in corn, rice, fruits, and other vegetables. The northern provinces are very mountainous and sandy; while the southern are for the most part level, and well watered with several rivers. The weather and seasons are, in general, very regular; the winds blowing constantly for six months from the N. with very little variation. April, May, and the beginning of June, till the rains fall, are so extremely hot, that the reflexion from the ground is apt to blister the face; and but for the breeze, or small gale of wind, which blows every day, there would be no living in that country for people bred in northern climates; for, excepting in the rainy season, the coldest day is hotter there at noon, than the hottest day in England. However, very surprising changes of heat and cold sometimes happen within a few hours; so that a stifling hot day is succeeded by a night cold enough to produce a thin ice on the water, and that night by a noon as scorching as the preceding. The most remarkable mountains are those on the W. separating it from Persia, called, in general, Soleyman Kay, or the mountains of Soleyman, of a vast height as well as breadth, and only passable in certain places, through which roads have been made for the sake of commerce. The mountains on the N. are called Nagrakut, Hima, or Mûs Tâg, which has an affinity with Imaus, and by other names, which are given also in common to the mountains on each side, separating Hindostan from Thibet. The principal rivers of Hindoostan are the INDUS, GANGES, and BURRAMPOOTER, which see. Hindoostan is very rich in every kind of productions, whether fossil, vegetable, or animal. Besides other precious stones, there is a diamond-mine at the town of Soumelpur in Bengal. Quarries of Theban stone are so plentiful in the Mogul's empire, that there are both mosques and pagods built entirely of it. Travellers tell us, there are mines of lead, iron, and copper, and even silver; but those of the last, if there be any, need not be opened, for the bullion of all nations is sunk in this empire, which takes nothing else in exchange for its commodities, and prohibits the exporting it again. The people till the ground with oxen and foot-ploughs, sowing in May and the beginning of June, that all may be over before the rains, and reaping in Nov. and Dec. which with them are the most temperate months in the year. The land is no where inclosed, excepting a little near towns and villages. The grass is never mowed to make hay, but cut off the ground, either green or withered, as they have occasion to use it. Wheat, rice, barley, and other grain, grow here in plenty, and are very good. The country abounds no less in fruits, as pomegranates, citrons, grapes, almonds, and cocoa-nuts; plums, plantanes, mangos, ananas, or pine-apples, lemons, oranges, and many other kinds of fruit-trees peculiar to the country. But the most valuable trees are the cotton and mulberry, on account of the wealth they bring the natives from the manufacture of calicoes and silks. They plant abundance of sugar-canes here, as well as tobacco; but the latter is not so rich and strong as that of America, as they

know not how to cure and order it. There is great variety of quadrupeds in this country, both wild and tame; among the former are elephants, rhinoceroses, lions, tigers, leopards, wolves, jackals, and the like. This country is also much infested with reptiles and insects; some of a noxious kind, as scorpions, snakes, and rats; but the lizards, which are of a green colour, are not hurtful. Snakes and serpents, we are told, are sometimes employed to dispatch criminals, especially such as have been guilty of very atrocious crimes, that kind of death being attended with the most grievous torture. The most troublesome insects in this hot country are flies, musketoes, and chinchies or bugs.

HINDOW, a territory of Hindoostan, bounded by Delhi and Agra on the N. and E.; and by Asimer on the S. and W.

HINDOW, the capital of the above territory. The people boast their descent from the original inhabitants of India. Lon. $78. 5. E.$ Lat. $26. 50. N.$

HINGHAM, a market-town of Norfolk, 12 miles S. W. of Norwich, and 97 N. E. of London. Lon. $1. 4. E.$ Lat. $52. 43. N.$

HING-HOA, a city of China of the first rank, in the province of Fo-kien, near the sea-coast, 900 miles S. of Pekin.

HINKAN, a chain of mountains in Chinese Tartary.

HIO, a town of Sweden, in W. Gothland, seated on the Lake Wetter, 145 miles S. W. of Stockholm. Lon. $14. 0. E.$ Lat. $57. 53. N.$

HIP, in the materia medica, the fruit of the dog-rose or wild brier. See ROSA. It contains an acidulous, yet sweetish pulp; with a rough prickly matter inclosing the seeds, from which the pulp ought to be carefully separated before it be taken internally. The conserve is the only officinal preparation of this fruit, which possesses any medical virtues: it is very pleasant, but is merely used by the apothecaries as a vehicle for other remedies. The Edinburgh College have omitted it.

Hip, in architecture, the angle formed by two parts of the roof when it rises outwards. Hips are also those pieces of timber which are placed at the corners of a roof. They are much longer than rafters, on account of their oblique position.

HIPPARCHIA, a celebrated lady born at Maronea in Thrace, in the time of Alexander the Great. Her attachment to learning and philosophy was so great, that, having attended the lectures of Crates the Cynic, she fell in love with him, and resolved to marry him, though he was both old and ugly, and though she was courted by many handsome young men, distinguished by their rank and riches. Crates himself was prevailed upon by her friends, to try to dissuade her from her singular choice, which he did by displaying his poverty, his cloak, his bag, and his crooked back, but all in vain. At last he told her, she could not be his wife, unless she resolved to live as he did. This she cheerfully agreed to, assumed the habit of the order, and accompanied him every where to public entertainments, &c. which was not customary with the Grecian ladies. She wrote several tragedies, "Philosophical Hypotheses," and "Reasonings and Questions proposed to Theodorus the Atheist; but none of her works are extant.

HIPPARCHUS, an eminent astronomer, born at Nice in Bithynia, who flourished between the 154th and 163d Olympiads. His commentary upon Aratus's Phenomena is still extant. Rhault is very much mistaken when he asserted, that this astronomer was not acquainted with the particular motion of the fixed stars from W. to E. by which their longitude changes. By foretelling eclipses, he taught mankind not to be frightened at them, and that even the gods were bound by laws. Pliny, who tells this, admires him for making a review of all the stars; by which his descendants would be enabled to discover whether they are born or die, whether they change their places, and whether they increase and decrease.

HIPPIA, in botany, a genus of the polygamia necessaria order, and syngenesia class of plants. Receptacle naked; down none; seeds naked, with broad margins; calyx hemispheric, subimbricate, corollets of ten rays, obscure, and rather cleft into three. It has three species.

HIPPOBOSCA, the HORSE-FLY; in zoology, a genus of insects of the order diptera. Beak two-valved, cylindrical, obtuse, hanging; feet armed with several claws; body hard and flat. There are five species, distinguished by their wings, &c. The most remarkable is the H. Equina, the pest of horses and cows. This insect is broad, flat, shining, and as it were scaly. Its head, thorax,



horax, and abdomen, are yellow, undulated with brown; and the legs are intersected with yellow and brown. The wings, crossed one over the other, exceed the length of the body by above one half; they are transparent, tinged with a little yellow towards their outward edge, and have a spot near that edge of a brown colour. These insects are very difficult to be killed, on account of the hard crustaceous shell which covers them; and they fix so close and fast to the poor animals with their claws, that they cannot rub or bite them off without wounding themselves.

HIPPOCASTANUM, the common horse-chesnut. See *Æsculus*.

HIPPOCENTAURS, [from *ἵππος*, a horse, *κέντρον*, I spur, and *ταύρος*, a bull,] in antiquity, a fabulous animal, half man and half horse. What gave rise to the fable of hippocentaurs, was this. The Thessalians are said to have been the first inventors of the art of breaking horses; and being first seen on horseback, they seemed but one body with the horses; whence the origin of the fable.

HIPPOCRAS, [*hipocras* French; *quasi vinum Hippocratis*, Lat.] a medicated wine. It is composed of wine, with spices and other ingredients; and is much used in France, as a cordial after meals. There are various kinds of it, according to the kind of wine and other ingredients used; as white, red, claret, and strawberry hippocras without wine; cyder hippocras, &c. The London Dispensatory directs it to be made of cloves, ginger, cinnamon and nutmegs, grossly powdered, and infused in canary with sugar: to this infusion may be added, milk, a lemon, and some slips of rosemary, and the whole strained through flannel. It is recommended as a cordial, and in paralytic and nervous cases.

HIPPOCRATEA, in botany, a genus of the monogynia order, and tetrandria class of plants. Calyx five-parted, petals five, capsules three, obcordate, or elliptic. It has two species, *H. comosa*, and *H. volubilis*.

HIPPOCRATES, the greatest physician of antiquity, was born in the island of Coos, in the 80th Olympiad, and flourished during the Peloponnesian war. He was the first on record, who laid down precepts concerning physic; and, according to his biographer Soranus was descended from Hercules and Æsculapius. He was first a pupil of his father Heraclides, then of Herodicus, then of Gorgias of Leontium the orator, and according to some, of Democritus of Abdera. After being instructed in physic and the liberal arts, and losing his parents, he left Coos, and practised physic all over Greece; where he was so much admired for his skill, that he was publicly sent for, by Perdiccas king of Macedonia, who was then thought to be consumptive. But Hippocrates pronounced the disease to be entirely mental. For upon the death of his father Alexander, Perdiccas fell in love with Philips, his father's mistress; which Hippocrates discerning by the great change her presence always wrought upon him, a cure was soon effected. Being entreated by the people of Abdera to come and cure Democritus of a supposed madness, he went; but, upon his arrival, he declared that Democritus was the only wise man among them. He heard many lectures, and learned much philosophy from him; which made Celsus and others imagine, that Hippocrates was the disciple of Democritus, though it is probable they never saw each other till this interview. Hippocrates had also public invitations to other countries. Thus, when a plague invaded the Illyrians and Pæonians, the kings of those countries begged him to come to their relief: he refused to go; but predicted that the distemper would come to Athens; and, foretelling what would happen, applied himself to take care of the city and the students. The Athenians conferred on him great honours, and voted a public maintenance for him and his family. He died B. C. 361. His memory is still venerated in his native island, and the inhabitants shew with pride a house in which they say he resided. The best editions of his works are those of Geneva, fol. 1657; Amsterdam, 2 vols. 8vo, 1665; and Vienna, 2 vols. folio, 1740.

HIPPOCRATES'S SLEEVE, a woollen bag, made by joining the two opposite angles of a square piece of flannel, used to strain syrups and decoctions for clarification.

HIPPOCREPIS, COMMON HORSE-SHOE VETCH; in botany, a genus of the decandria order, and diadelphia class of plants; natural order, Papilionaceæ. Legume compressed, several times emarginate along one of the sutures, curved. There are five species. These are small herbaceous plants; with unequally-pinnate leaves and stipules; peduncles axillary, and terminating, one

or many-flowered, in umbels; corollas mostly yellow. Natives of the South of Europe.

HIPPODROME, or **HIPPODROMUS**, [from *ἵππος*, a horse, and *δρομος*, a course,] in antiquity, a course wherein chariot and horse races were performed, and horses exercised.

HIPPOMANE, the **MANCHINEEL-TREE**, a genus of the monadelphia order, and monœcia class of plants; natural order, Tricocceæ. See Plate LXV. Male, ament; perianthium bifid; corolla none; female, perianthium bifid; corolla none; stigma three-parted; drupe or capsule three-grained. There are three species. *H. mancinella*, manchineel-tree, is a very large tree in the West Indies, almost equalling the oak in size. The first accounts of this tree stated that it was dangerous to sit or lie under it, and that the rain which falls from the leaves will raise blisters in the skin. However professor Jacquin informs us, that he and his companions reposed upwards of three hours under a manchineel-tree, without receiving any injury; and that rain dropping from the leaves upon them was perfectly innocent. It is dangerous to eat of the fruit, which resembles crab-apples; it occasions vomiting, and a burning heat in the mouth, throat, and stomach, for many hours after. The juice of the buds of the white cedar is esteemed an antidote to this poison, and is generally used with success.

HIPPOMANES, [from *ἵππος*, a horse, and *μανία*, madness,] a sort of poison famous among the ancients as an ingredient in amorous philters or love-charms. Virgil, and after him Servius and Columella, describe it as a poisonous matter tricking from the pudendum of a mare when proud, or longing for the horse. At the end of M. Bayle's Dictionary is a very learned dissertation on the hippomanes, and all its virtues real and pretended.

HIPPONA, [from *ἵππος*, a horse,] or **EPONA**, in ancient mythology, the goddess of horses.

HIPPOPHAE, **SEA-BUCKTHORN**; a genus of the tetrandria order, and diœcia class of plants; natural order, Calycifloræ. Male, calyx two-parted; corolla none; Female, calyx bifid; corolla none; style one; berry one-seeded. It has two species, viz. *H. rhamnoides*, common sea-buckthorn, and *H. canadensis*, Canadian sea-buckthorn.

HIPPOPHAGI, in ancient geography, a people of Scythia, so called from their living on horseflesh; the fare at this day of the Tartars their descendants. Also, a people of Persia.

HIPPOPODES, or **HIPPOPODIÆ**, [from *ἵππος*, a horse, and *πῶς*, a foot,] in ancient geography, an appellation, given to a certain people situated on the banks of the Scythian sea, who were supposed to have had horses feet.

HIPPOPOTAMUS, [*ἵππος* and *ποταμός*,] the **RIVER-HORSE**, a genus of quadrupeds of the order belluæ. The generic character is, the front-teeth of the upper jaw four, placed in pairs; those of the lower jaw prominent, and the intermediate ones protruded forward; canine teeth single, obliquely truncated; teats only two, placed near the groin. It is a native of the warmer regions of the globe, and is chiefly found in the middle parts of Africa, inhabiting large rivers, and especially such as run through countries overshadowed by large forests; walking about at the bottom, and raising itself at intervals to the surface, for the purpose of respiration. By night it quits its watery residence, to graze in the neighbouring plains, devouring great quantities of herbage, and with its vast teeth destroying the more tender kind of trees and other vegetables. It is sometimes seen even in the sea, at some distance from the mouths of rivers, but this is supposed to be merely for the purpose of exercise; for it will not even drink salt-water, and does not prey on fish, or indeed live on any kind of animal food. The general size of the hippopotamus seems to be nearly equal to that of the rhinoceros, and it is sometimes even superior. Its form is highly uncouth; the body being extremely large, fat, and round; the legs very short and thick; the head very large; the mouth extremely wide, and the teeth of vast strength and size, more particularly the tusks or canine teeth of the lower jaw, which are of a curved form; they sometimes measure more than two feet in length, and weigh upwards of six pounds each. The whole animal is covered with short hair, which is more thinly set on the under parts than on the upper. The hippopotamus when just emerged from the water appears of a palish-brown, or mouse-colour, with a bluish or slate-coloured cast on the upper parts; and the belly is flesh-coloured, the skin appearing through the hair. When perfectly dry the colour is an obscure brown, with

out any of the bluish cast. The skin is most excessively tough and strong, except on the belly, where it is considerably softer. Its voice is a peculiar kind of interrupted roar, between that of a bull and the braying of an elephant. When on land it moves in a somewhat slow and awkward manner; but if pursued, can run with considerable speed, and directly plunging into the water sinks to the bottom, and pursues its progress beneath. It is observed to be extremely cautious of making its appearance by day, especially in such places as are much frequented by mankind, scarcely lifting its nose above the surface while breathing; but it is fearless in rivers, which run through unfrequented regions, where it is occasionally seen to rush out of the water with sudden impetuosity, trampling down every thing in its way; and at such times is, of course, highly dangerous. It is, however, naturally of a harmless disposition; not attacking other animals, but merely committing havoc in plantations of maize, rice, sugar-canes, &c. and destroying the roots of trees, by loosening them with its vast teeth. It is capable, notwithstanding its great bulk, of swimming very swiftly. See Plate LXIX. The hippopotamus was known to the Romans. Scaurus treated the people with the sight of five crocodiles and one hippopotamus during his ædileship, and exhibited them in a temporary lake. Augustus produced one at his triumph over Cleopatra. This animal appears to be the Behemoth of Job; who admirably describes its manner, its food, and its haunts: chap. xl. verse 15.—24. Ver. 15th, the learned Bochart observes, implies the locality of its situation, being an inhabitant of the Nile, in the neighbourhood of Uz, the land of Job. The 16th describes its great strength; and the 18th the peculiar hardness of its bones. The 21st and 22d indicate its residence amidst the vast reeds of the Nile and other African rivers overshadowed with thick forests. The 23d the characteristic wideness of its mouth; which is hyperbolically described as large enough to exhaust the Jordan. An entertaining account of the hippopotamus is given in Sparman's Voyage to the Cape of Good Hope, where these animals are called sea-cows.

HIPPURIS, *MARE'S-TAIL*; a genus of the monogynia order, and monandria class of plants; natural order, Inundatæ. There is no calyx; petals a two-lobed rim; stigma simple; seed one. It has three species.

HIPPUS, an affection of the eyes, that makes them represent objects in the like kind of motion as when on horseback.

HIR, a town of Persia, in the province of Kirman.

HIRÆA, in botany, a genus of the trigynia order, and decandria class of plants. Calyx pentaphyllous; petals roundish and unguiculated; there are three bilabiated seeds.

HIRCH-HORN, a town in the Lower Rhine, seven miles E. of Heidelberg.

HIRCUS, in astronomy, a fixed star of the first magnitude, called also Capella.

HIRCUS is also used for a comet, encompassed with a mane, seemingly hairy.

HIRE, **PHILIP DE LA**, an eminent French mathematician and astronomer, born at Paris in 1640. His father was painter in ordinary to the king, and designed him for the same profession: but he devoted himself to mathematical studies, and was nominated together with M. Picard to make the necessary observations for a new map of France, by the directions of M. Colbert. In 1683, he was employed in continuing the famous meridian-line begun by M. Picard; and was next engaged in constructing the grand aqueducts projected by Lewis XIV. He died in 1718, after having written a great number of works, besides several occasional papers dispersed in Journals, and in Memoirs of the Academy of Sciences.

HIRPINI, in ancient geography, a people of Italy, next to the Samnites, to the S. E. and descendants from them; situated to the N. of the Picentini, and to the W. of the Apuli, having on the N. the Apennine and a part of Samnium. The name is from *Hirpus*, a term denoting a wolf in their language; either because under the conduct of this animal the colony was led and settled, according to Strabo; or because, like that prowling animal, they lived on plunder, according to Servius.

HIRTELLA, in botany, a genus of the monogynia order, and pentandria class of plants. Petals five; filaments very long, persisting, spiral; berry monospermous; style, lateral. It has three species.

HIRUDO, the *LEECH*; a genus of insects of the order vermes intestina. The body moves either forward or backward. There are seventeen species, principally distinguished by their colour. The most remarkable are the following:

H. GEOMETRA, the *GEOMETRICAL LEECH*, grows to an inch and a half in length; and has a smooth and glossy skin of a dusky brown colour, but in some seasons greenish-spotted with white. When in motion, its back is elevated into a kind of ridge; and it then appears as if measuring the space it passed over like a compass, whence its name. Its tail is remarkably broad; and it holds as firmly by it as by the head. It is common on stones in shallow running waters; and is often found on trouts and other fish after spawning-time.

H. MEDICINALIS, the *MEDICINAL LEECH*, the form of which is well known, grows to the length of two or three inches. The body is of a blackish brown colour, marked on the back with six yellow spots, and edged with a yellow line on each side; but both the spots and the lines grow faint, and almost disappear, at some seasons. The head is smaller than the tail, which fixes itself very firmly to anything the creature pleases. It is viviparous, and produces but one young one at a time, which is in July. It is an inhabitant of clear running waters, and is well known for its use in bleeding. The leech's head is armed with a sharp instrument that makes three wounds at once. They are three sharp tubercles, strong enough to cut through the skin of a man, or even of an ox or horse. The mouth is as it were the body of the pump, and the tongue or fleshy nipple the sucker; by the working of this piece of mechanism, the blood is made to rise up to the conduit which conveys it to the animal's stomach, which is a membranaceous skin, divided into 24 small cells. The blood which is sucked out is there preserved for several months almost without coagulating, and proves a store of provision to the animal. The nutritious parts, pure and already digested by animals, require not to be disengaged from the heterogeneous substances: nor indeed is there any thing like an anus discoverable in the leech; mere transpiration seems to be all that it performs, the matter fixing on the surface of its body, and afterwards coming off in small threads. Of this an experiment may be tried by putting a leech into oil, where it keeps alive for several days; upon being taken out and put into water, there appears to loosen from its body a kind of slough shaped like the creature's body. The organ of respiration seems to be situated in the mouth; for if, like an insect, it drew its breath through vent-holes, it would not subsist in oil, as by it they would be stopped up. This is the only species that is used for local bleedings. It may be applied with great safety and advantage, especially for obstinate head-aches arising from fullness of blood, as well as in many cases of external inflammation, with a view to extract the thick and superfluous humour with which the vessels are overcharged. If the leech will not readily fix itself, a few drops of milk may be rubbed on the spot where it is to perform the operation; or a little blood may be drawn, by making a slight puncture, after which it will immediately settle. When employed for relieving the piles, or to extract blood from the gums, it is requisite to secure the insect with a piece of rush, to prevent it either from creeping into the anus or gullet, in which cases it would occasion great distress, in the stomach or intestines. To induce the leech to quit its hold when it adheres longer than required, oil of tartar, volatile alkali, pepper, or acids, are occasionally employed; though a little common salt, strewed on its head, will answer the same purpose. On the contrary, if it be intended to draw a larger quantity of blood, the tail of the leech should be cut off; in consequence of which it continues to draw blood, in order to repair the loss it has sustained. The discharge occasioned by the puncture of a leech, is easily stopped with brandy, vinegar, &c. or may be kept open by applying warm fomentations.

H. MURICATA, the *MURICATED LEECH*, has a taper body, rounded at the greater extremity, and furnished with two small tentacula, or horns, strongly annulated and rugged upon the rings, the tail dilated. It inhabits the Atlantic Ocean, and is by the fishermen called the sea-leech. It adheres to fish, and generally leaves a black mark on the spot.

H. SANGUI-SUGA, the *HORSE-LEECH*, is of a larger size than the medicinal leech. Its skin is smooth and glossy; the body is depressed; the back is dusky; and the belly is of a yellowish green,

green, having a yellow lateral margin. It inhabits stagnant waters. At Ceylon, travellers who walk bare-legged are molested by the great numbers of leeches concealed under the grass.

HIRUNDO, in ornithology, a genus of birds of the order, *passeres*. See Plate LVIII. Bill short, depressed at the base, small at the point, and a little bending; nostrils open; tongue short, broad, and cleft; wings long; legs short; tail, in general, forked. There are thirty-seven species. The birds of this genus, subsist chiefly on the insects which are known to abound in the air, where they are almost constantly on the wing, and seize their prey with admirable dexterity; and for this purpose they are furnished with a most extraordinary power of distending their jaws. The service they perform to man by their assiduity in this work of destruction is not lightly to be appreciated, and those who observe the crowded population of the atmosphere through the beams of a summer-evening, will easily be led to believe, that, but for the interception of incalculable myriads of insects by these birds, the annoyance of man by these minute animals would be highly distressing, and perhaps almost intolerable. Each species of *hirundo* drinks as it flies along, sipping the surface of the water; but the swallow alone, in general, washes on the wing, by dropping into a pool for many times together: in very hot weather house-martins and bank-martins dip and wash a little. The swallow is a delicate songster, and in soft sunny weather sings both perching and flying; on trees in a kind of concert, and on chimney-tops. Horsemen on wide downs are often closely attended by a little party of swallows for miles together, which plays before and behind them, sweeping around, and collecting all the sculking insects that are roused by the trampling of the horses' feet: when the wind blows hard, without this expedient, they are forced to settle to pick up their lurking prey. Thus the swallow is very useful to mankind in defending him from the personal and domestic annoyance of flies and gnats; and, what is of infinitely more consequence, they keep down the numbers of our minute enemies, who either in the grub or winged state, would otherwise render the labours of the husbandman fruitless. Since then swallows are guardians of our corn, they should every where be protected by the same popular veneration which in Egypt defend the ibis, and the stork in Holland. We more frequently hear of unproductive harvests on the Continent than in this country; and it is well known that swallows are caught and sold as food in the markets of Spain, France, and Italy. In England we are not driven to such resources to furnish our tables. But what apology can be made for those, and many there are, whose education and rank should have taught them more innocent amusements, who wantonly murder swallows, under the idle pretence of improving their skill in shooting game? Setting aside the cruelty of starving whole nests of young by killing the dam; those who follow this barbarous diversion would do well to reflect, that by every swallow they kill, they assist blasts, mildews, and vermin, in causing a scarcity of bread. Every lord of a manor should restrain his game-keeper from this execrable practice; nor should he permit any person to sport on his lands who does not refrain from it. These birds disappear during the winter-season to account for which various opinions have been entertained. Some suppose that they lie torpid, in the banks of rivers, or in decayed trees, or in ruined edifices or vaults; and others, that they retire for the winter from the air to the water, lying in immense clusters, like swarms of bees, at the bottoms of rivers. Particular facts are on record, by respectable testimony, in favour of both these hypotheses. It is also attested, on similar authority, that migrations of these birds actually take place. They have frequently been seen by mariners at a vast distance from land, and in very numerous flocks; and have occasionally converted the rigging and yards of vessels into resting places, which have most conveniently relieved their long and wearisome flight. This last opinion is most generally received, and appears the most reasonable.

H. ESCULENTA, the **EDIBLE SWALLOW**, according to Buffon, is less than the wren, and only two inches and a quarter in length. The bill is black; the upper parts of the body are brown, the under whitish; the tail is forked, and each feather of it tipped with white; the legs are brown. The most curious part of the natural history of this bird consists in the nest, which is composed of such materials as render it not only edible, but one of the greatest dainties of the Asiatic epicures. These nests are found in vast num-

bers, in certain caverns, in various isles in the Soolo Archipelago, situated between lon. 117° and 120° E. and lat. 5° and 7° N. in the caverns of which the nests are found fixed to the stones in astonishing numbers. They are also found in amazing quantities on a small island called Toc, in the straits of Sunda; the caverns of which are lined with the nests: but no where in greater abundance than about Croee; near the S. end. They are common from Java to Cochinchina on the N. and from the point of Sumatra W. to New Guinea on the E. where the sea is said to be covered with a viscous substance like half-melted glue, which the bird is supposed either to take up from the surface with its bill during flight, or to pick it from the rocks when left there by the waves. Of these nests, it is said, the Dutch alone export from Batavia 1000 pickles, upwards of 1300lb. English weight, every year, which are brought from the isles of Cochinchina, and those lying to the E. of them.

H. RUSTICA, the **COMMON** or **CHIMNEY SWALLOW**, is distinguished from all the other species by the superior forkiness of its tail, and by the red spot on the forehead under the chin. The crown of the head, the whole upper part of the body, and the coverts of the wings, are black, glossed with a rich purplish blue, and most resplendent in the male: the breast and belly white, and in the male tinged with red: the tail is black; the two middle-feathers are plain, the others marked transversely near the ends with a white spot: the exterior feathers of the tail are much longer in the male than in the female. This species is the first comer of all the British *hirundines*: and appears in general on or about the 13th of April, though now and then a straggler is seen much earlier. This species, though called the chimney-swallow, by no means builds altogether in chimneys, but often in barns and out-houses against the rafters; as Virgil long ago remarked. (*Georg. lib. iv. 306.*) In Sweden she builds in barns, and is called *ladu swala*, the barn-swallow. In the warmer parts of Europe, where there are no chimneys to houses except they are English built, she constructs her nest in porches, gate-ways, galleries, and open halls. But in general, with us, this species breeds in chimneys; and haunts those stacks where there is a constant fire, for the sake of warmth; generally preferring one adjoining to the kitchen, and disregarding the perpetual smoke of that funnel. Five or six or more feet down the chimney, does this little bird begin to form her nest about the middle of May, which consists, like that of the house-martin, of a crust or shell composed of dirt or mud, mixed with short pieces of straw to render it tough and permanent; with this difference, that, whereas the shell of the martin is nearly hemispheric, that of the swallow is open at the top, and like half a deep dish. This nest is lined with fine grasses, which are often collected as they float in the air. Wonderful is the address (*Mr. White* observes) which this adroit bird shews all day long in ascending and descending through so narrow a pass. When hovering over the mouth of the funnel, the vibration of her wings acting on the confined air occasions a rumbling noise like thunder. It is probable that the dam submits to this inconvenient situation, so low in the shaft, in order to secure her brood from rapacious birds, and particularly from owls, which frequently fall down chimneys, perhaps in attempting to get at these nestlings. This bird lays from four to six white eggs, dotted with red specks; and brings out her first brood about the last week in June, or the first in July. The progressive method by which the young are introduced into life is very curious: first, they emerge from the shaft with difficulty enough, and often fall down into the room below: for a day or so they are fed on the chimney-top, and are then conducted to the dead leafless bough of some tree, where, sitting in a row, they are attended with great assiduity, and may then be called perchers. In a day or two more they become flyers, but are still unable to take their own food: therefore they play about near the place where the dams are hawking for flies; and, when a mouthful is collected, at a certain signal given, the dam and the nestling advance, rising towards each other, and meeting at an angle; the young one all the while uttering such a little quick note of gratitude and complacency, that one must have paid very little regard to the wonders of Nature, who has not remarked this feat. The dam betakes herself immediately to the rearing of a second brood, as soon as she is disengaged from her first; which she at once associates with the first broods of house-martins; and with them congregates, clustering on sunny roofs, towers, and trees. She brings out her second brood towards the middle

middle and end of August. All the summer long is the swallow a most instructive pattern of unwearied industry and affection; for from morning to night, while there is a family to be supported, she spends the whole in skimming close to the ground, and exerting the most sudden turns and quick evolutions. Avenues, and long walks under hedges, and pasture-fields, and mown meadows where cattle graze, are her delight, especially if trees be interspersed; because in such spots insects most abound. When a fly is taken, a smart snap from her bill is heard, resembling the noise at the shutting of a watch-case; but the motion of the mandibles is too quick for the eye. The swallow, probably the male bird, is the excubitor to house-martins and other little birds, announcing the approach of birds of prey. For as soon as an hawk appears, with a shrill alarming note he calls all the swallows and martins about him; who pursue in a body, and buffet and strike their enemy till they have driven him from the village, darting down from above on his back, and rising in a perpendicular line in perfect security. This bird will sound also the alarm, and strike at cats when they climb on the roofs of houses, or otherwise approach the nests. This species feeds much on little coleoptera, as well as on gnats and flies; and often settles on dug ground, or paths, for gravel to grind and digest its food. Mr. White informs us, that before they depart, for some weeks, they all forsake houses and chimneys, and roost in trees; and usually withdraw about the beginning of October; though some few stragglers may be seen at all times the first week in November. Mr. Pennant says, that for a few days previous to their departure, they assemble in vast stocks on house-tops, churches, and trees, from whence they take their flight. They are supposed to take up their winter-quarters in Senegal and parts adjacent; and seem to possess in turn the whole of the old continent, being known from Norway to the Cape of Good Hope on the one hand, and from Kamtschatka to India and Japan on the other. They are also found in all parts of North America, migrating N. and S. as with us. See Plate LVIII.

H. URBICA, the MARTIN, is inferior in size to the chimney-swallow, and its tail much less forked. The head and upper part of the body, except the rump, are black glossed with blue: the breast, belly, and rump, are white: the feet are covered with a short white down. This is the second of the swallow-kind that appears in our country; and of its manners and economy we have the following curious account in the Rev. Mr. White's *Natural History of Selborne*. "They begin to appear about the 16th of April; and for some time they in general pay no attention to the business of nidification: they play and sport about, either to recruit from the fatigue of their journey, if they do migrate at all; or else that their blood may recover its true tone and texture after it has been so long benumbed by the severities of winter. About the middle of May, if the weather be fine, the martin begins to think in earnest of providing a mansion for its family. The crust or shell of this nest seems to be formed of such dirt or loam as comes most readily to hand, and as tempered and wrought together with little bits of broken straws to render it tough and tenacious. As this bird often builds against a perpendicular wall without any projecting ledge under it, it requires its utmost efforts to get the foundation firmly fixed, so that it may safely carry on the superstructure. On this occasion the bird not only clings with its claws, but partly supports itself by strongly inclining its tail against the wall, making that a fulcrum; and thus steadied, it works and plasters the materials into the face of the brick or stone. But then, that this work may not, while it is soft and green, pull itself down by its own weight, the provident architect has prudence and forbearance enough not to advance her work too fast; but by building only in the morning, and by dedicating the rest of the day to food and amusement, gives it sufficient time to dry and harden. About half an inch seems to be a sufficient layer for a day. Thus careful workmen, when they build mud-walls (informed at first perhaps by this little bird,) raise but a moderate layer at a time, and then desist; lest the work should become top-heavy, and so be ruined by its own weight. By this method in about ten or twelve days is formed an hemispheric nest, with a small aperture towards the top, strong, compact, and warm; and perfectly fitted for all the purposes for which it was intended. But then nothing is more common than for the house-sparrow, as soon as the shell is finished, to seize on it as its own, to eject the

owner, and to line it after its own manner. After so much labour is bestowed in erecting a mansion, as nature seldom works in vain, martins will breed on for several years together in the same nest, where it happens to be well sheltered and secure from the injuries of the weather. The shell or crust of the nest is a sort of rustic work, full of knobs and protuberances on the outside: nor is the inside of those that I have examined smoothed with any exactness at all; but it is rendered soft and warm, and fit for incubation, by a lining of small straws, grasses, and feathers; and sometimes by a bed of moss interwoven with wool. As soon as the young are able to shift for themselves, the dams immediately turn their thoughts to the business of a second brood: while the first flight, shaken off and rejected by their nurses, congregate in great flocks, and are the birds that are seen clustering and hovering, on sunny mornings and evenings, round towers and steeples, and on the roofs of churches and houses. These congregations usually begin to take place about the first week in August; and therefore we may conclude that by that time the first flight is pretty well over. The young of this species do not quit their abodes all together; but the more forward birds get abroad some days before the rest. These approaching the eaves of buildings, and playing about before them, make people think that several old ones attend one nest. They are often capricious in fixing on a nesting-place, beginning many edifices, and leaving them unfinished; but when once a nest is completed in a sheltered place, it serves for several seasons. Those which breed in a ready-finished house, get the start in hatching, of those that build new, by ten days or a fortnight. These industrious artificers are at their labours in the long days before four in the morning; when they fix their materials, they plaster them on with their chins, moving their heads with a quick vibratory motion. They dip and wash as they fly sometimes in hot weather, but not so often as swallows. Martins love to frequent towns, especially if there are great lakes and rivers at hand. They are by far the least agile of the British hirundines; their wings and tails are short, and therefore they are not capable of such surprising turns, and quick and glancing evolutions, as the swallow. Accordingly, they make use of a placid easy motion, in a middle region of the air, seldom mounting to any great height, and never sweeping long together over the surface of the ground or water. They do not wander far for food; but affect sheltered districts, over some lake, or under some hanging wood, or in some hollow vale, especially in windy weather. They breed the latest of all the swallow-kind; in 1772, they had nestlings on to October the 21st, and are never without young as late as Michaelmas. As the summer declines, the congregating flocks increase in numbers daily, by the constant accession of the second broods; till at last they swarm in myriads upon myriads round the villages on the Thames, darkening the face of the sky as they frequent the aits of that river, where they roost. They retire, the bulk of them I mean, in vast flocks together about the beginning of October: but have appeared of late years in a considerable flight in this neighbourhood, for one day or two, as late as November the 3d and 6th, after they were supposed to have been gone for more than a fortnight. They therefore withdraw, with us, the latest of any species. Unless these birds are very short-lived indeed, or unless they do not return to the district where they are bred, they must undergo vast devastations somehow, and somewhere; for the birds that return yearly bear no manner of proportion to the birds that retire." See Plate LVIII.

HIRZHOLMEN, or HERTZHOLM, three small islands of Denmark, in the Cattegat, Lon. 10. 24. E. Lat. 57. 31. N.

HISINGEN, an island near the coast of Sweden, at the mouth of the Gotha, 16 miles long and 6 broad, containing seven parishes. Lon. 11. 48. E. Lat. 57. 45. N.

HISPA, in zoology, a genus of insects of the coleoptera order. Antennæ fusiform, growing gradually larger from each extremity towards the middle, situated between the eyes; thorax and elytra covered with protuberances or spires. There are twenty-six species, very few of which are natives of Europe.

H. ATREA, found in Britain, is all over of a deep unpolished black, and has the upper part of its body entirely covered with long and strong spires, which render it bristly like the shell of a chesnut. See Plate LXXVI. It bears its antennæ upright before it.

HISPALIS,

HISPALIS, in ancient geography, a town of Batica, in Hispania Ultra, now called Seville.

HISPANIA, in ancient geography, a country or kingdom of Europe, now called Spain; called Hesperia Ultima, by Horace, because the western-most part of Europe; also Iberia, from the river Iberus. Its name Hispania, or *Ἰσπανία*, is of Phœnician original, from its great number of rabbits. See SPAIN.

HISPANIOLA, or **ST. DOMINGO**, the largest of the Antilles or Caribbee islands, in the West Indies. It lies between 17° 55' and 20° of N. lat. and between 67° 35' and 74° 15' W. lon. It is 60 miles N. W. by W. of Porto Rico, 66 S. E. of Cuba, 135 E. N. E. of Jamaica, and 3,500 from the Land's End of England. The climate is hot, but not reckoned unwholesome; and some of the inhabitants are said to arrive at the age of 120. It is sometimes refreshed by breezes and rains; and its salubrity is likewise in a great measure owing to the beautiful variety of hills and valleys, woods and rivers, which every where present themselves. It is indeed reckoned by far the finest and most pleasant island of the Antilles, as being the best accommodated to all the purposes of life when duly cultivated. Its extent is estimated at 420 miles in length from E. to W. and 140 in breadth, where broadest, from N. to S. This island was discovered by Christopher Columbus, on the 9th of December 1492. It then formed five kingdoms, called Maqua, Marien, Higuay, Maguana, and Xaraguay, each governed by sovereigns called caciques. The Spaniards had possession of the whole of it for 120 years. This island, famous for being their earliest settlement in the world, was the first in high estimation for the quantity of gold it supplied. This wealth diminished with the inhabitants of the country, whom they obliged to dig it out of the bowels of the earth; and the source of it was entirely dried up, when they were exterminated, which was quickly done, by a series of the most shocking barbarities that ever disgraced the history of any nation. Benzon relates, that of two millions of inhabitants, contained in the island when discovered by Columbus in 1492, scarcely 153 were alive in 1545. For many years this island was possessed by the Spaniards and French jointly. It was afterwards ceded entirely to the French, but is now erected into an independent republic.

HISSAR, a district of Hindoostan, in Delhi: with its capital. The latter lies near the Surfooty, 112 miles W. N. W. of Delhi.

HISTER, in entomology, a genus of the coleoptera order of insects. Antennæ clavate, the club solid; the last joint compressed, decurved; head retractile within the body; mouth forcipated; shells shorter than the body, truncate; fore-shanks toothed, hind-shanks spinous. There are twenty-four species. The most common in Europe is *H. unicolor*, which is of a glossy coal black colour, and of a slightly flattened shape. It is often seen in the gardens, but its larva is unknown.

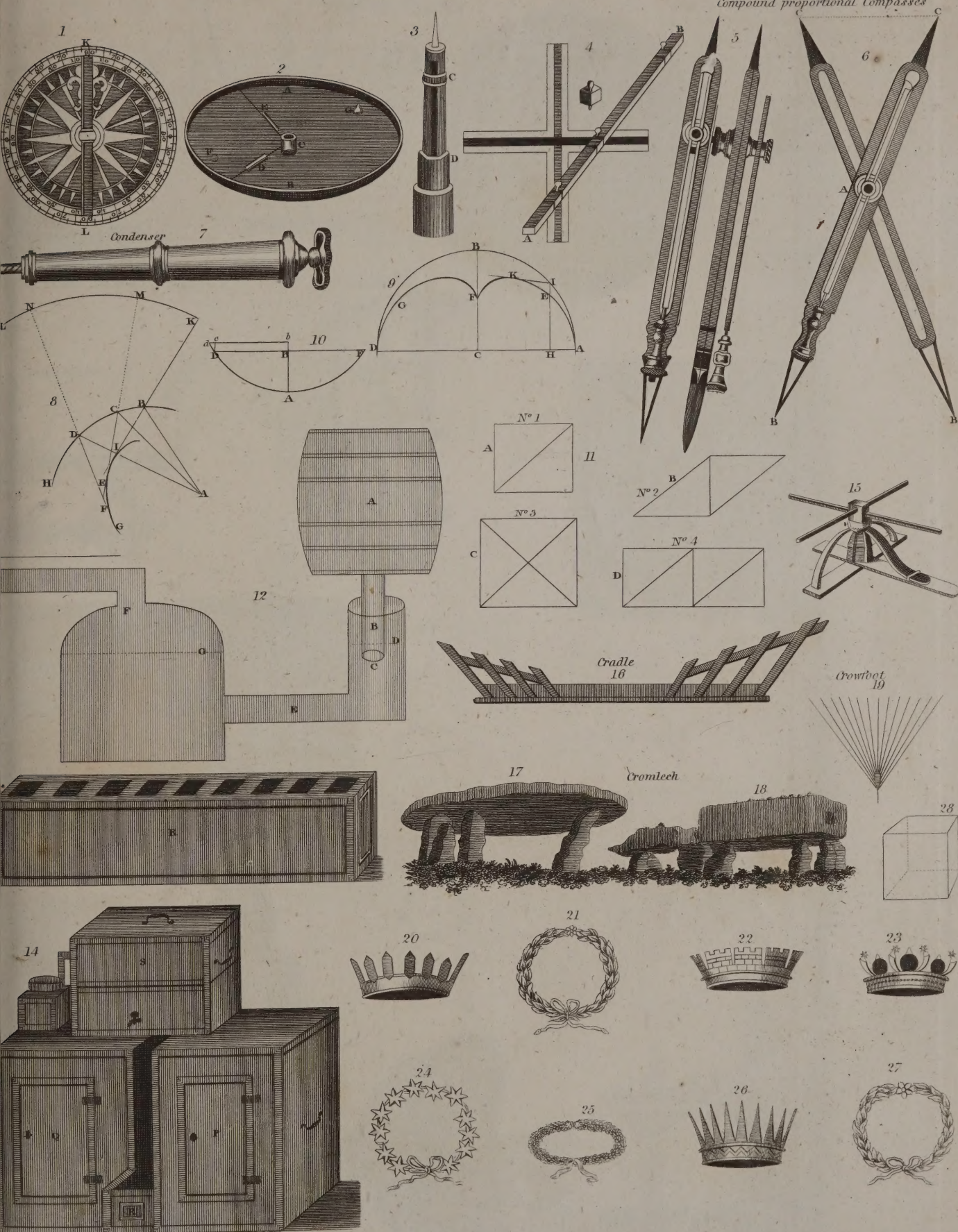
HISTORIOGRAPHER, [*ἱστορικὸς γραφεύς*], a professed historian, or writer of history. An historian, of all authors, spreads the most ample theatre; he erects the greatest tribunal on earth; for it is his office to sit supreme judge of all that passes in the world, to pronounce the destiny of the great ones of the earth, and fix their character with posterity; to do justice to virtue and worth, in bestowing eternity upon great and good actions, and fixing an everlasting mark of infamy on bad ones; to instruct all people and nations, and direct the conduct of ages; he therefore ought to be endowed with many great and uncommon qualifications. He must be a person of consummate knowledge of men and things, of sound judgement, uncommon sagacity and penetration, experienced in matters of state and war, of great integrity, firmness of mind, freedom of sentiment, and master of a pure, clear, nervous, and exalted style. An historian whose province it is to speak to kings and princes, to the great men of all ages and countries, and to be the common master and instructor of mankind, must not only write with purity, simplicity, and manly sense, but with dignity and elegance: he must reject all that is vulgar and low in style, make the majesty and sublimity of his expression comport with the dignity of the subject; must by an exact choice and propriety of words, a natural disposition of phrases, and a prudent moderate use of figures, give weight to his thoughts, force to his language, and imprint a character of greatness on all that he says. He must at the same time represent things with an air of gravity and prudence, and not give a loose to the heat of imagination.

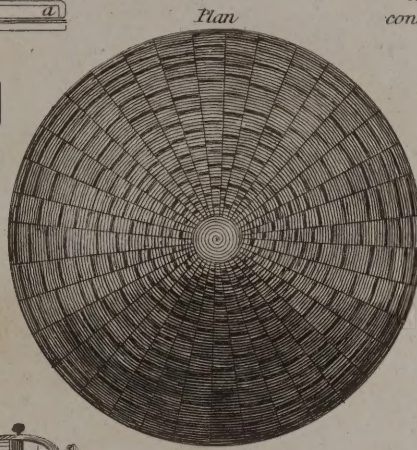
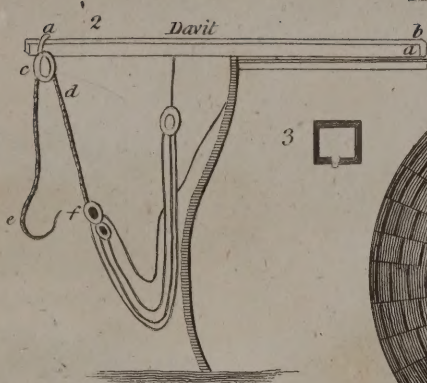
tion, or vivacity of wit; but discreetly suppress every thing that shall seem idle, languid, and unprofitable, and give every thing that just figure and proportion which is consistent with propriety and decorum. He must endeavour at a noble simplicity of thought, language, design, and ordinance, and carefully avoid all profuseness of false conceit, strained expression, and affected pompousness so inconsistent with the gravity, dignity, and noble character, of history. In a word, he must write so as to be intelligible to the ignorant, and yet charm the wise; form and express such ideas as are great, and yet shall appear very common, and intermix no other ornament with his narration than what the modesty of truth can bear. He should be above the reach and power of hopes and fears, and all kinds of interest, that he may always dare to speak the truth, and write of all without prejudice; religiously observing never to abuse the public faith, nor to advance any thing upon common fame, which is always uncertain, but upon undoubted memoirs and faithful relations of such persons as have had a hand in affairs. He must always be upon his guard against the bias and affections of those who supply him with matter, and must not credulously give his assent to the historians that went before him, without enquiring narrowly into their character, and what influence they may have been under when they wrote, in order to make a just estimate of their weight and credit. An historian, as to his matter, should choose subjects great in themselves, and such as are worthy of public fame and remembrance; and should make himself so far master of his matter, as to be able to cast it into what form he pleases, and to strike upon all his subjects the colours they are naturally disposed to bear, in order to make his lessons profitable to posterity, by regulating the heart and spirits of men, animating them to great and virtuous actions by illustrious examples, and cautioning them against vice, folly, cruelty, and injustice, by laying open the fatal consequences resulting from them. The course of his narration must proceed in the order of time in which the facts happened, in a pure, grave, uninterrupted series, such as may not improperly be compared to a great river flowing with composed majesty and stately smoothness; and when it falls in his way to introduce little occurrences, they must be so artfully interwoven with the great, in the thread of the narration, as to offer a seasonable entertainment and relief to the reader from the fatigue that too sedulous an attention to the great requireth. He must also observe great judgement in the ordinance and disposition of events and their circumstances, so as to interest the reader, and let him into all his thoughts and views, by making his persons act as their character and temper inclined them; discovering their manners, sentiments, designs, motives, and operations, as they really stand in a necessary dependence upon each other, and with so natural a connection, as to shew nothing out of its place. His transitions, in which consists the great art of narration, and one of its principal beauties, must be natural and easy, arising from the difference of subject rather than expression. He must make a wise and judicious choice of circumstances, such as are proper to enlarge and improve the ideas of things, and to strike that light and colour upon them which most easily attracts belief, and engages the mind; and must for that purpose always observe a due mixture of great and little circumstances, neither of which must be carried beyond nature, or be so minute, low, or frivolous, as to debase his subject. He must not only recite the bare events and actions of men, but also lay open the motives and principles from which they took their rise, and upon which they proceeded to their final issues. He must lay open the hearts of the actors, let his reader into the most important secrets of their councils and designs, and oblige him with a sight of those secret springs which move them to enterprizes, and of the causes of their success or miscarriage. He must be very sparing and cautious in the use of descriptions, which are to be introduced so far only as they serve to illustrate things that are essential to the main subject, and to enliven the narration; and even in that case they must be succinct and elegant. The frequent use of harangues are disapproved of by many judicious persons; for these long formal harangues of generals to their soldiers, when in the presence of the enemy, and ready to enter upon action, which we find in many historians, are undoubtedly not only unnatural and improbable, but contrary to the truth of history. Nevertheless, a short speech suited to the subject, made by a person of eminent character, has its proper beauty, and animates a narration. A judicious historian ought

ought not to admit any portraits into his work but those of the greatest persons, and such as are principally interested, and have the chief hand in affairs, and these must be real, natural, and truly resembling their originals; expressive of their genius, the qualities of the head and heart, rather than descriptive of the external form of his personages. When such are finished with a masterly hand, with true judgement and success, they are not only great ornaments and embellishments in history, but of use to strip the hearts of men of their disguises, to lay open all their secret folds, and disclose the real springs of actions. It is a great fault in an historiographer to abound too much in reflections of his own; he therefore must not turn philosopher or moralist indifferently upon all occasions; for every man desires to be free in his judgement of the facts represented to him, and the consequences he is to draw from them, in which consists the greatest pleasure of the reader. But if an author should throw in, or mingle reflections of his own,

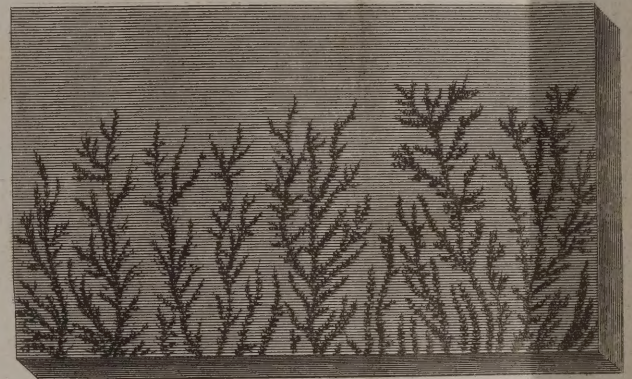
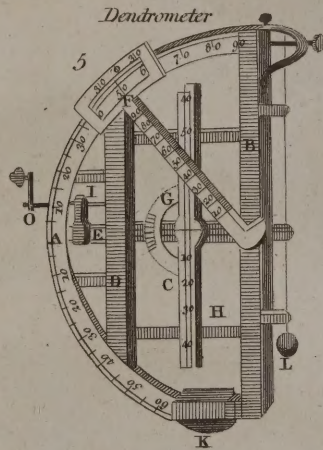
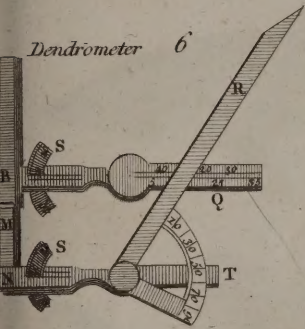
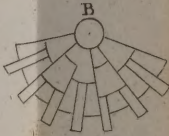
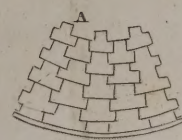
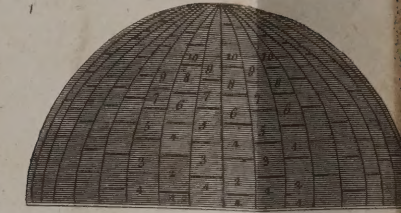
with his story, they must be such as arise naturally from the subject, and contain a great and noble sense in a few words; they must not be too finely spun or studied, nor have more brightness than solidity, but appear rather to be the reasoning of a wise statesman than the affectation of a declaimer; nor must they be too frequent, or too loose and disjointed, but be enamelled in the body of the work. Digressions, if made with judgement, and not too wide and foreign from the subject, have also their proper grace and ornament in history; as they give an agreeable variety to the narration, and relieve the mind of the reader; but they must be introduced by the historian with an artful hand and great address; they must bear an alliance and connection with the purport of the history, and their length must be proportionably greater or less, as they are more nearly or remotely allied to the capital point of the story.

END OF VOLUME II.

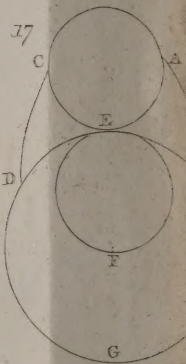
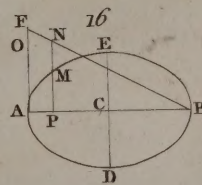
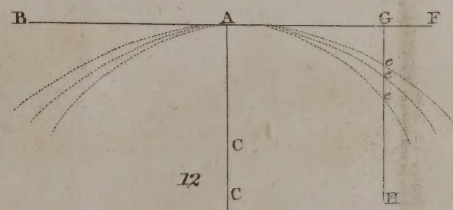
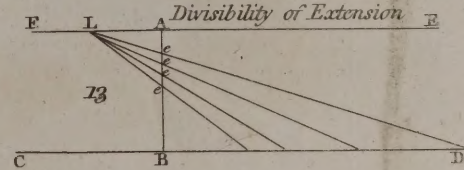
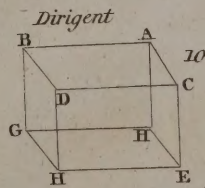
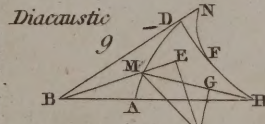




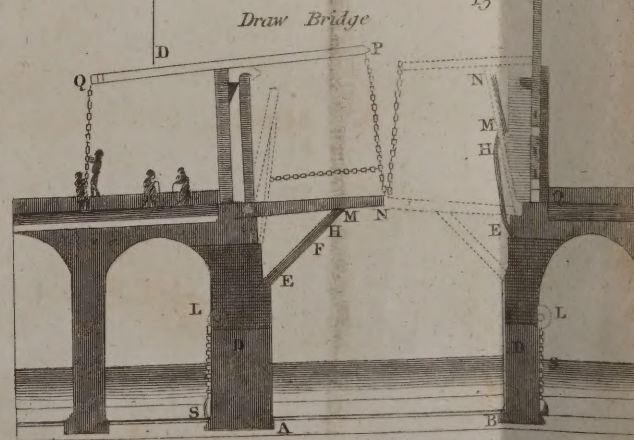
*Cupola or Dome
constructed without Centering*



Dendrites



Draco volans: Flying Dragon.



PISCES.



Coryphæna rupestris.



Cottus Cataphractus.
Mailed Bull Head.



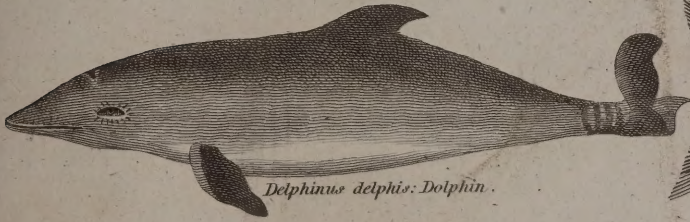
Diodon atinga.



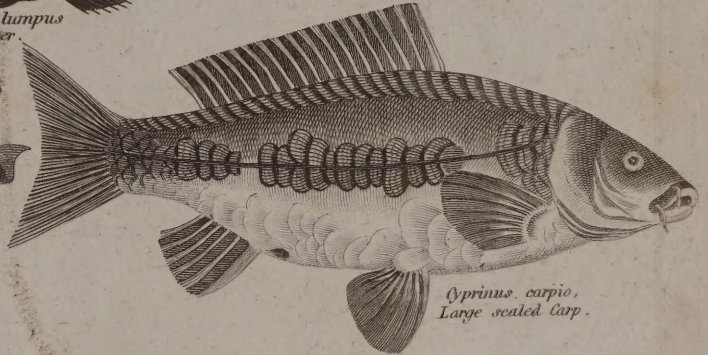
Cyclopterus lumpus
Lump sucker.



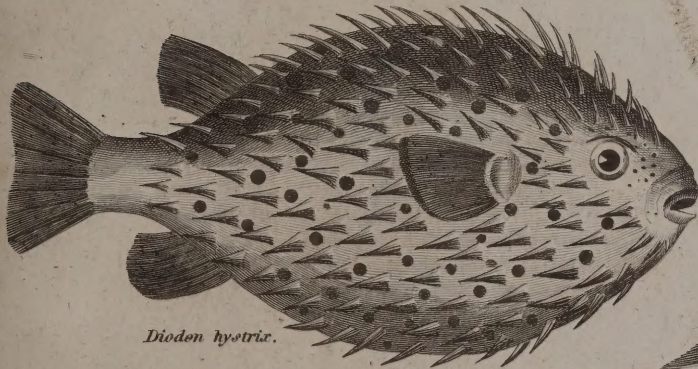
Cyprinus latius.



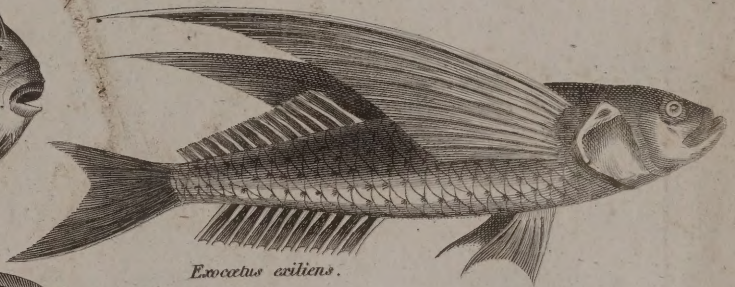
Delphinus delphis. Dolphin.



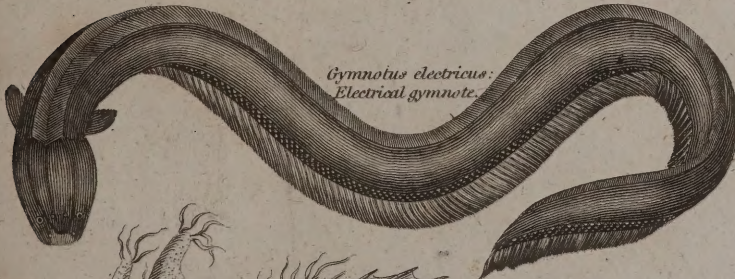
Cyprinus carpio.
Large scaled Carp.



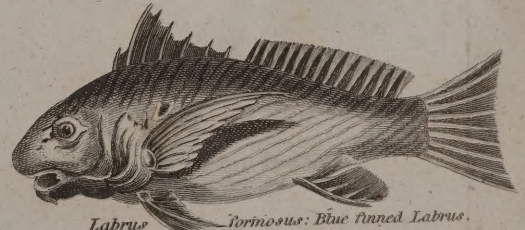
Diodon hystrix.



Exocoetus ciliatus.



Gymnotus electricus.
Electrical gymnote.



Labrus formosus. Blue finned Labrus.



Lophius histrio.
Harlequin fishing frog.



Gobius lanceolatus. Lance tailed goby.



Mullus Ruber.



Monodon the Narwhal.

Phobastria immutabilis: Hooded Dido.



Diomedea Exulans: Wandering Albatross.



Falco chrysaius: Golden Eagle.



Emberiza Nivalis: Snow Bunting.



Emberiza hortulana: Cirl Bunting.



Ossifragus: Osprey.



Falco litho fulco: Stone Falcon.



Hirundo Rustica: Swallow.



Glaucola Austriaca: Austrian Pratincole.



Fulica aterrima: Greater Coot.



Hirundo Ureica: Martin.



Fringilla Montana: Tree Sparrow.



Fringilla Linaria: Lesser red pole.



Lanius Antiquarius: The Antiquan Shrike.



Loxia pensilis: Pensile Grosbeak with its Nest.



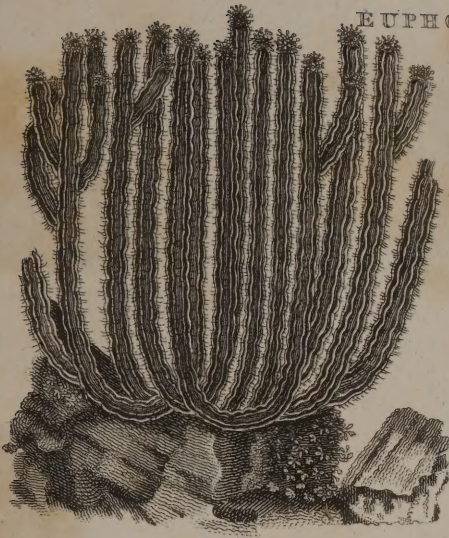
Larus Parasiticus.



Loxia Oriz: Grenadier Grosbeak.



EUPHORBIA.



Ferula assa foetida: *Assa foetida*.



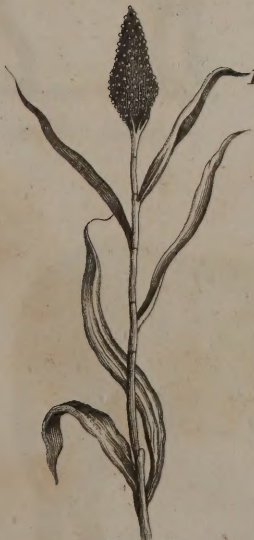
Hippomane Mancinella.



Hedysarum gyrans.



Geoffræa.



Holcus Sorghum.



Jatropha Elastica.



Guaiacum officinale.



Jatropha Janipha.



Erinaceus Malaccensis: Malacca Hedge hog.



Didelphis volans:
Flying opossum.



Erinaceus Europæus:
Common Hedge hog.



Didelphis maculata:
Spotted opossum.



Didelphis gigantea: Kangaroo.

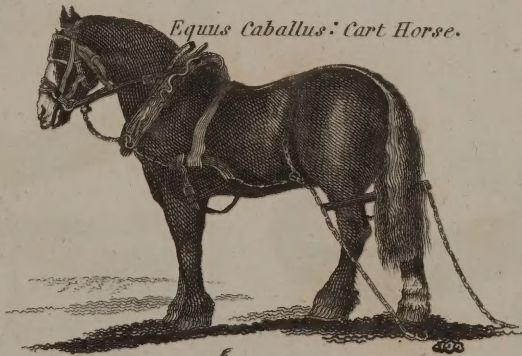


Didelphis murina.

Dipus Aegyptius: the Egyptian Jerboa.



Equus Caballus: Race Horse.



Equus Caballus: Cart Horse.



Equus Zebra: Zebra.



Equus Asinus: Ass.



Elephas maximus: elephant.



Crotalus horridus: banded rattle snake.



Haliotis tuberculata.



Haematites wiformis.



Helix sepium.



Holothuria tremula.



Lacerta Gangetica.



Lacerta Basilsicus: Basilisk.

Holothuria Pentactes.



Lacerta Crocodile.



Lacerta Iguana.



Lacerta Chameleon.



Lacerta Alligator.





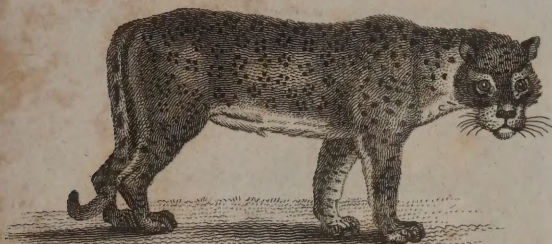
Felis Tigris: Tiger.



Felis Lynx.



Felis pardalis: Mexican cat.



Felis Leopardus: Leopard.



Felis Leo: Lioness and Whelps.



Hippopotamus amphibius: river horse.



Felis Leo: Lion.



Hystrix Prehensilis: Brazilian Porcupine.

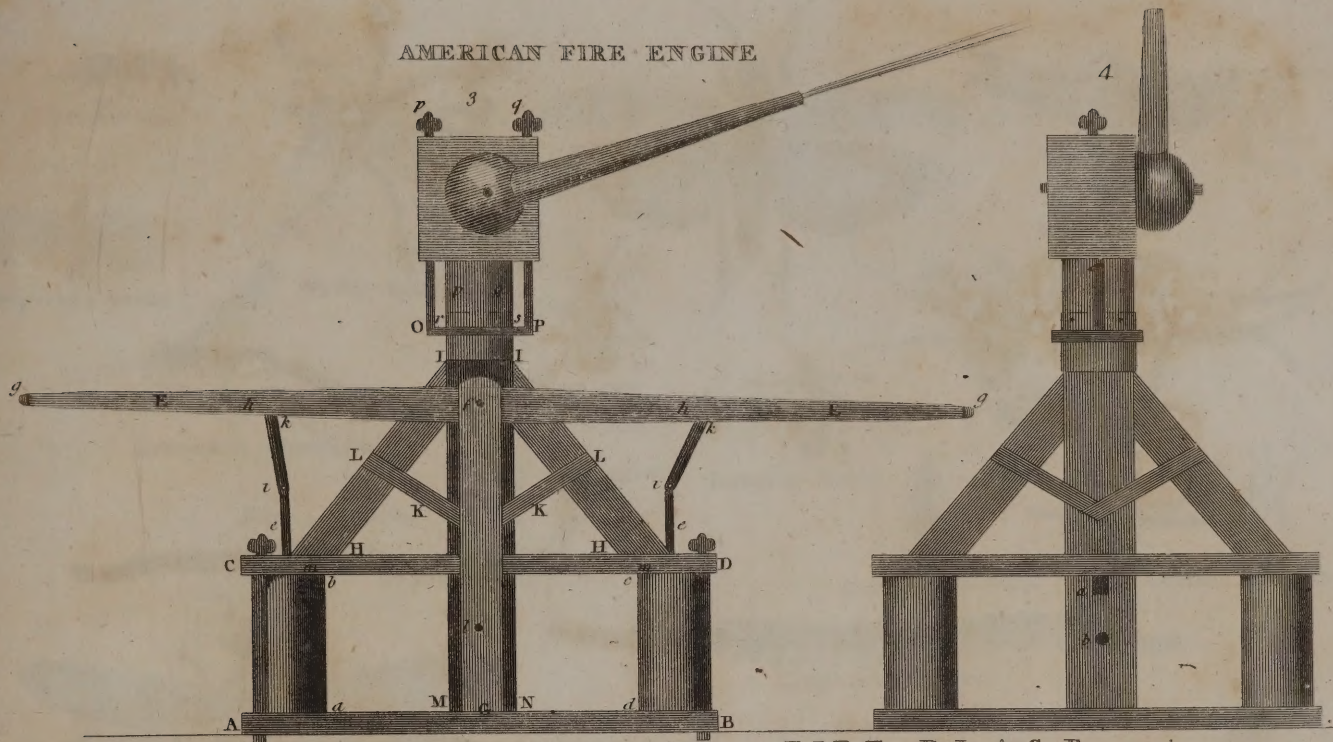


Hyrax Capensis: Cape Hyrax.

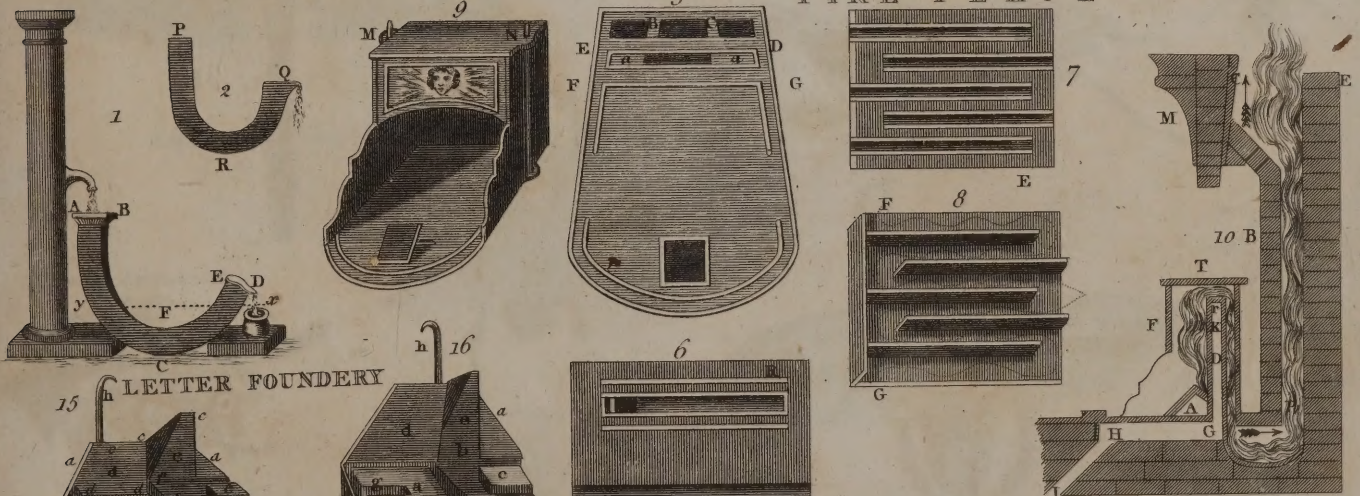


Hystrix cristata.

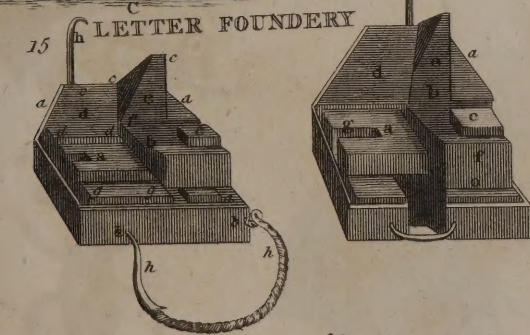
AMERICAN FIRE ENGINE



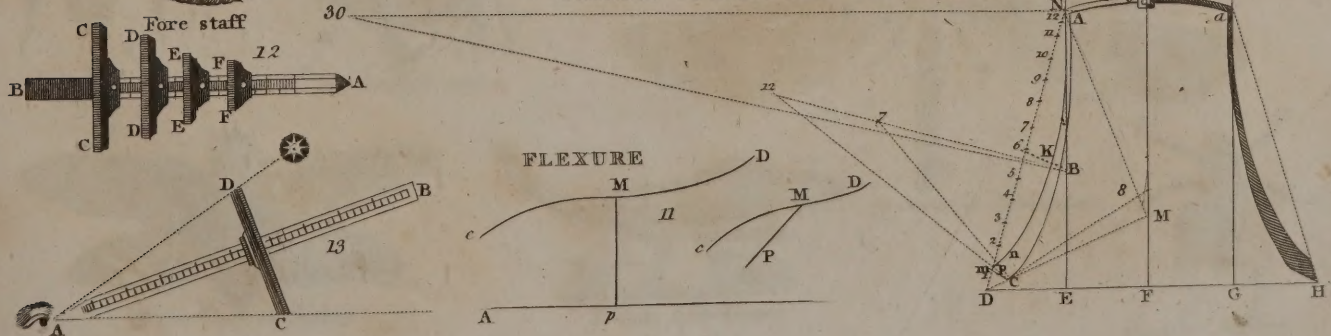
FIRE PLACE



LETTER FOUNDRY



PROFILE OF A BELL IN FOUNDRY







1

Aqueo Mercurial Gage

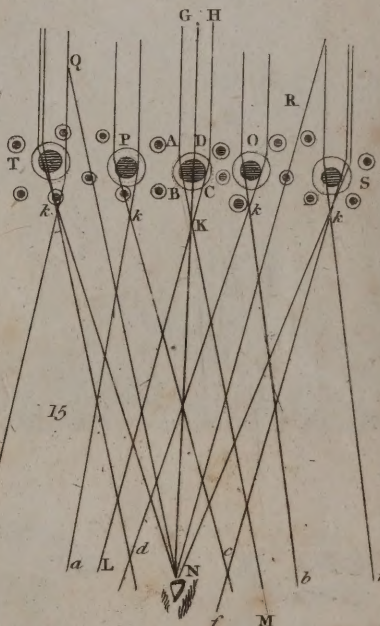
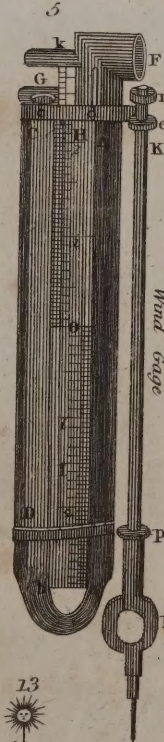
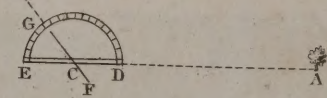
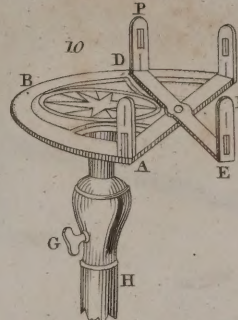
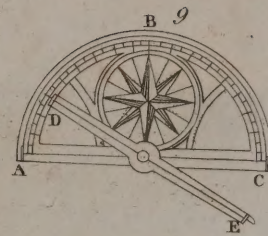
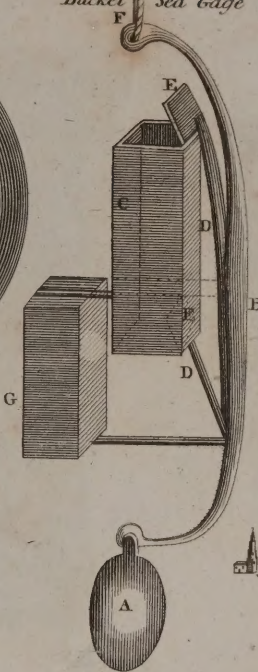


3. Sea Gage

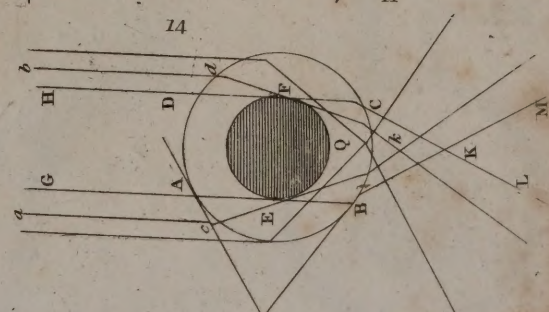
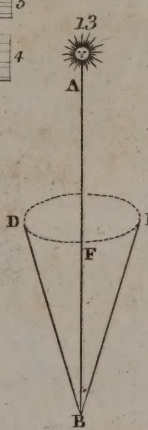
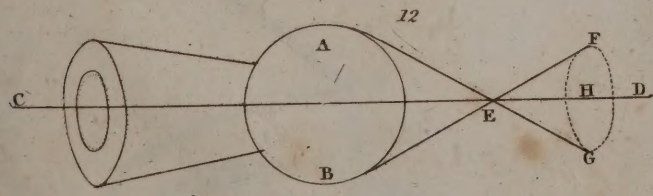
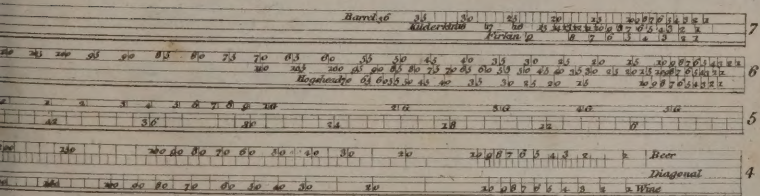


2

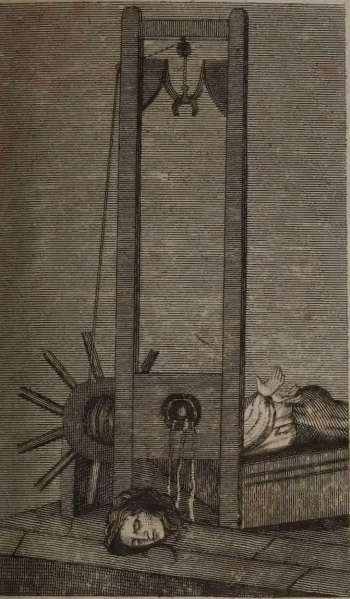
Bucket Sea Gage



8 Four foot Gauging Rod.



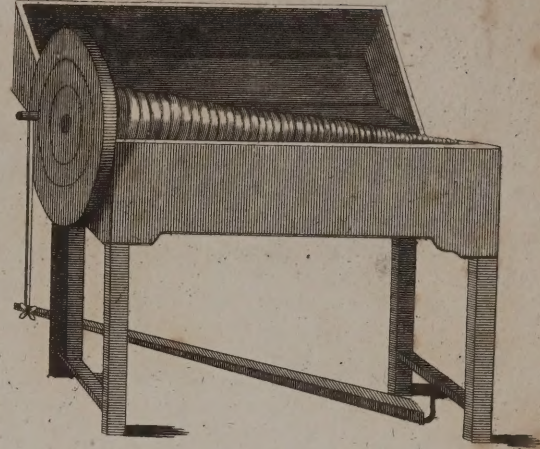
4. GUILLOTINE



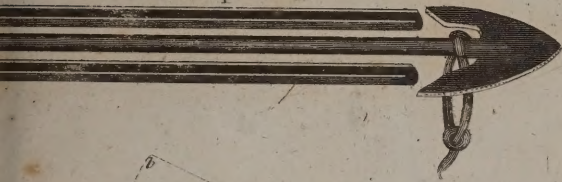
5.



Harmonica 3.



Gun Harpoon 7.



HUER. 9

